



Beitrag zur Diskussion

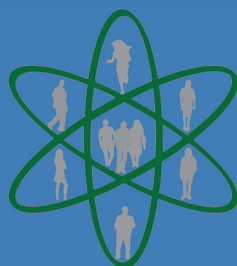
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Responsible Research & Innovation in Finland



Technical Report

RRIL - Responsible Research and Innovation Learning

**Jonna Hjelt, Elias Pekkola,
Jari Stenvall & Yohannes Mehari**



Responsible Research & Innovation in Finland

IO-1 Report

RRIL - Responsible Research and Innovation Learning

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Presentation of RRIL - Responsible Research and Innovation Learning

Responsible Research & Innovation is a genius concept developed by the European Commission for the governance of research and innovation processes with a view on the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products. It aims to shape, maintain, develop, coordinate and align existing and novel research and innovation-related processes, actors and responsibilities with a view to ensuring desirable and acceptable research outcomes.

In the Horizon 2020 programmes, there were and are some projects focusing on related training needs. But there is no substantial attempt observable to develop continuous higher education programmes supporting the implementation of this concept and the respective reorganisation processes in universities, research centres, research and innovation oriented enterprises and public authorities like cities or regional governments. This project pretends to fulfil this gap through the co-creation of higher education modules between different research and innovation actors.

RRIL will especially focus on public engagement, gender equality and ethics (in the knowledge fields Energy and Economy) testing the learning modules in innovative environments based on interactive real-problem approaches. In a later stage, the developed modules will be offered to research and innovation actors supporting the implementation of RRI principles in the organisations capacitating the learners to develop jointly innovative solution for societal problems.

RRIL is based on co-creation and open innovation processes giving a prominent role to the learners. The co-creation is conceived as multidisciplinary and transversal among different kinds of actors as HEI, research centres, NGO's and cities paving the way for knowledge exchange between them. It consists in informed learning among practitioners considering learners as a knowledgeable and critical partners in designing and implementation of the learning means. Under this perspective the potential learners – programme coordinators and tutors - are considered peers working collaboratively on the project outputs.

RRIL - consortium

Universitat Rovira i Virgili (Coordinator)

Tampereen Yliopisto (Tampere University)

Akademia Leona Koźmińskiego (Kozminski University)

NOTUS applied social research

Fundació Tarragona Smart Mediterranean City

Instytut Innowacyjna Gospodarka (Institute of Innovative Economy)

Executive Summary

The report presents a systemic view of the regional innovation system in the energy and economy knowledge areas of Finland in general and in the Tampere region in particular. It specifically focusses on analysing how the actors on the regional stage interact and engage with the concept of Responsible Research and Innovation (RRI) in the energy and economy knowledge areas and investigates the strategies and practices involved in RRI. The report employed qualitative content analysis and 12 participants were involved in the study that are mainly in the energy and economy innovation ecosystem in the Tampere region. The document analysis show that the Finnish national innovation system is largely led by the investment from the public sector and with recognisable involvement of the private sectors. Finland's economic growth has been dependent on its innovations, However, investment in research, development and innovation (RDI) from both public and private research funding has been in decline for several years now due to political decisions and to changes in industrial levels.

The interview results indicated that the RRI concept is not generally known in the Finnish research and innovation field of the energy and economy. Nevertheless, research institutions, companies and civil servants in Tampere region has previously used the United Nations concept of Sustainable Development Goals, which in some degree follows the RRI concept. The interviewees commented that in the energy sector the social responsibility means the willingness to develop sustainable energy solutions that consider the social impacts from different perspectives. The environmental responsibility in the field of energy means the willingness to reach climate goals, such as carbon neutrality, by fostering energy efficiency and new energy production, but the most disturbing fact is that very often the solutions are only 'greenwashing'. Similarly, in the knowledge area of the economy, the interviewees commented that the social responsibility demands efforts to overcome the barriers created between different administrative silos. In the economy sector, the environmental responsibility is understood as the willingness to co-operate to solve large social problems such as climate change. The ethical responsibility means responsible behaviour when using funds collected by taxation.

The interviewees provided practical solutions that are believed to promote responsibility and solve ethical dilemmas in research and innovation, including, but not limited to focusing on the ability to co-operate with different actors in multi-dimensional way and understanding the necessity of scientifically diverse perspectives in innovation process. The respondents further argued that responsibility in research and innovation is value-based and therefore needs broad engagement with people affected and in large in society. The interview results also highlighted that in Finland ethics and trustworthiness are valued in research institutions and researchers, which promote the willingness to include the responsibility dimension in projects. In addition, the study shows that in Finnish organisations there are no problem with gender equality, but there are highly stereotypical professions. Finally, the interviewees underlined that the need for educating RRI dimensions or concept could be relevant to the students in universities, but the best way to learn engagement, gender equality and ethics are by doing those in practice.

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1. Responsible Research and Innovation

The aim of this report is to present a systemic view of a regional innovation system in the energy and economy knowledge areas. We ask how the actors on the regional stage interact and engage with the concept of responsible research and innovation (RRI) in the energy and economy knowledge areas. The research was conducted on the innovation platforms or networks in the Tampere area in Finland. We investigate the strategies and practices involved in RRI. We consider the innovation networks and platforms of the universities, companies and city of Tampere. In conducting the research, we interview 12 actors involved in the energy and economy innovation ecosystem in the Tampere region.

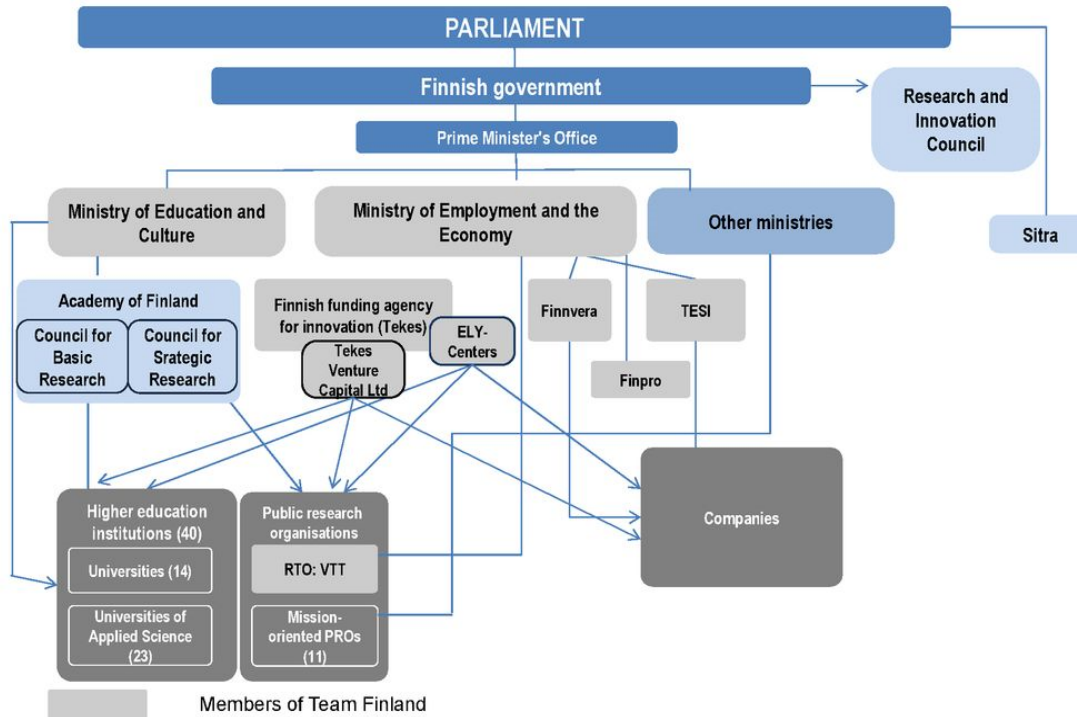
1.1. General description of the Finnish innovation system

The Finnish national research and innovation system reflects global changes in which the driving forces are knowledge, social networks, technology and innovation (Schienstock & Hämäläinen 2001). The fundamental elements of society's current economic system can be described as knowledge-based and innovation-driven. In this type of economy, the technological environment is changing rapidly, and there is ever-increasing competition between nations, regions and companies. Technological drivers of the rapid changes occurring for instance in information and communication technology (ICT). Social drivers of change include government deregulation of economies and therefore, market liberalisation. In addition, the now common understanding of climate change has been a driving force for governments to promote cleaner technologies, for instance in the energy sector; while new economic possibilities, for instance through digitalization and business model innovations, have changed the economic field (see Dahlman et al. 2007; Karhunmaa 2018; Şener & Saridoğan 2011; Schienstock & Hämäläinen 2001). In 2008, in its climate and energy report, the Finnish government announced that all regions, including provinces and municipalities, should have their own climate strategy, to be included within their energy strategy. Finnish cities and municipalities are expected to promote a business-friendly environment, and the Ministry of Economic Affairs and Employment is encouraging companies to embrace sustainable growth and productivity (see Dahlman *et al.* 2007; Karhunmaa 2018; Şener & Saridoğan 2011; and Schienstock & Hämäläinen 2001).

The Ministry of Education and Culture is responsible for higher education and for policy targets for science. It develops its higher education policies together with stakeholders in the field, namely, the universities and polytechnics. All universities in Finland are state universities, although the constitution ensures that they are largely autonomous. The polytechnics are governed by the municipalities, and the autonomy of the municipalities is also supported by the constitution. In Finland there are fourteen (14) universities and twenty-three (23) polytechnics. Eleven (11) of the universities teach economics, business and technology. Compared to other Nordic countries, Finland has a relatively large number of higher education institutions. Within the Finnish universities, there are several governmental research institutions that promote research and innovation. The research institutions include the Technical Research Centre (VTT), the Natural Resources Institute (LUKE), the National Institute for Health and Welfare (THL) and the Government Institute for Economic Research (VATT). Funding institutions include the Academy of Finland and Business Finland (formerly Tekes and Finpro). There is also an independent funding institution called Sitra, which reports directly to parliament. Throughout Finland, the research community relies extensively on the public sector, and the goal is that the public sector

and privately-owned companies should co-operate in raising funds for innovation and that together, they should engage civil society and citizens in innovations that will result in better living conditions for all. Generally, in Finland there is close coordination between public and private sector.

Figure 1
Main innovation policy actors in Finland



Source: OECD Finland 2017, p. 157

Research and Innovation council is Finnish government advisory body chaired by the Prime Minister and is responsible for the strategic development and coordination of Finnish research and innovation policy and the national innovation system as a whole. The Council promote the discussions relating to the development of research and innovation policy that supports the wellbeing, growth and competitiveness (see OECD Finland 2017; Dahlman *et al.* 2007:12 – 13; and Valtioneuvosto 2019).

The Academy of Finland in focused on financing basic and strategic research and promoting high-level of scientific research in all scientific disciplines. It operates under Ministry of Education and Culture and is funded through the state budget (see Dahlman *et al.* 2007: 13; and Suomen Akatemia 2019).

Business Finland (formerly Tekes and Finpro, which united in the beginning of 2018) promote and support Finnish companies' international growth, ecosystems and financial efforts, which means that figure 1 is in this dimension outdated. Business Finland functions under the Ministry of Employment and Economy and accelerates the global growth of companies (see Dahlman *et al.* 2007; and Business Finland 2017).

Finnvera is the state-owned, a specialised financing company and official export credit agency (ECA) of Finland. Finnvera provides financing and guarantees for the start-ups, growth business and internationalisation of small and medium size and large companies (Finnvera 2019). Compared to Finnvera also Tesi is a venture capital and private equity company, which invest to the growth businesses (Tesi 2019). ELY-Centres forecast business and employment trends and competence, educating and training needs. They coordinate the regional and structural policy of the European Union (ELY -Keskus 2019).

Sitra, The Finnish National Fund for Research and Development is the actor which launch and implement projects with private third and public sector aiming to increase and promote sustainable well-being and the grow business. According to law, the funds originally granted by the Finnish Parliament, the funds must be invested in profitable manner (see Dahlman et al. 2007, 13; Sitra 2019 and Sitra 2019/1).

The technical research centre of Finland (VTT) is public research organisation. It has become the largest applied science research organisation, which develop new technical solutions and applied technologies to improve company's competitiveness. VTT promotes technology transfer by participating in national and international research programs and networks (Dahlman *et al.* 2007).

The main private actors in the Finnish innovation systems are the large companies, although there have been efforts to promote the involvement of small and medium-sized enterprises (SME) in the development of policy around growth and internationality. The tradition of subcontracting is very strong, and among SME actors there is limited willingness to take risks in seeking growth (see Tilastokeskus 2017, 4/2017, 11/2018). In Finland there is an annual 'Slush' event in Helsinki where the primary target is to get start-ups and risk funders together to initiate and grow businesses (Slush Helsinki). Previously, little was known about the relationships between the actors in innovation systems, for example in the cities, companies and research institutions (Schiensstock & Hämäläinen 2001). However, there is growing interest in a regional innovation system (RIS) (Rinkinen *et al.* 2016).

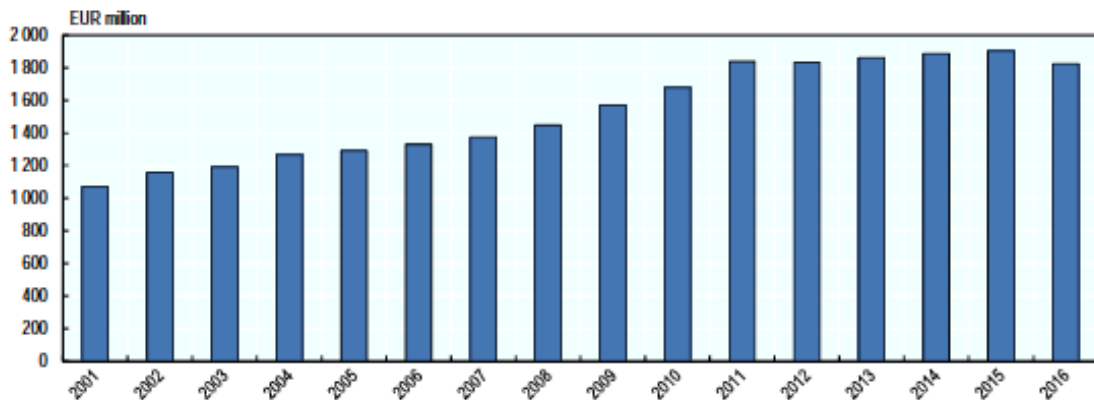
1.2. Finnish research and innovation strategy

In response to the pressure for research and innovation, the Finnish government has declared its strategic goal of promoting Finland as the most attractive and competent environment for innovation and experimentation by 2030. To advance its goals of improved quality and impact, the intention is to enhance the knowledge-base, to develop knowledge platforms and growth ecosystems and to encourage internationality (Valtioneuvosto 2017). It is anticipated that innovation will be boosted through a more effective exploitation of scientific knowledge (Sotarauta & Mustikkamäki 2015). To bring about these changes will require research into the way Finnish national innovation systems currently function and how they can compete in the new science-based innovation system (*ibid*). Strategic implementation of the Finnish national innovation goals is required in the regions where the innovation actors interact and in all innovation ecosystems where innovation platforms or networks can be created. Endorsing the importance of innovation, the Organisation for Economic Co-operation and Development (OECD) has recommended that Finland should further enhance its research and development policy by working towards co-operation between its universities, research centres and companies (Pirkanmaan liitto 2017). The European Union (EU) also has a growth strategy, 'Europe 2020',

in which the focus is on regional innovation and specialization. It is evident that any strategy for research and innovation will involve multi-dimensional interests.

The OECD report ‘Finland 2017’, remarked that Finland has been a forerunner among the knowledge-based economies, but the recession of 2009 harmed the ICT-industry as a whole, and Finland’s traditional industries were also negatively affected. During this period, Finnish industries lost their international competitiveness, and productivity, growth and research and development (R&D) were all in decline. Public research funding had increased steadily from 2001 to 2011, but since 2011 it has stagnated, and in 2016, it dropped by 4.2% (OECD Finland 2017: 98 – 99). Between 2011 and 2015, R&D funding by Finnish companies fell by 24%. Both public and private funding for research, development and innovation in Finland has been in a significant decline relative to its previous performance, even though, among OECD countries, Finland still has one of the largest numbers of researchers (*ibid* 99).

Figure 2
Public funding for universities



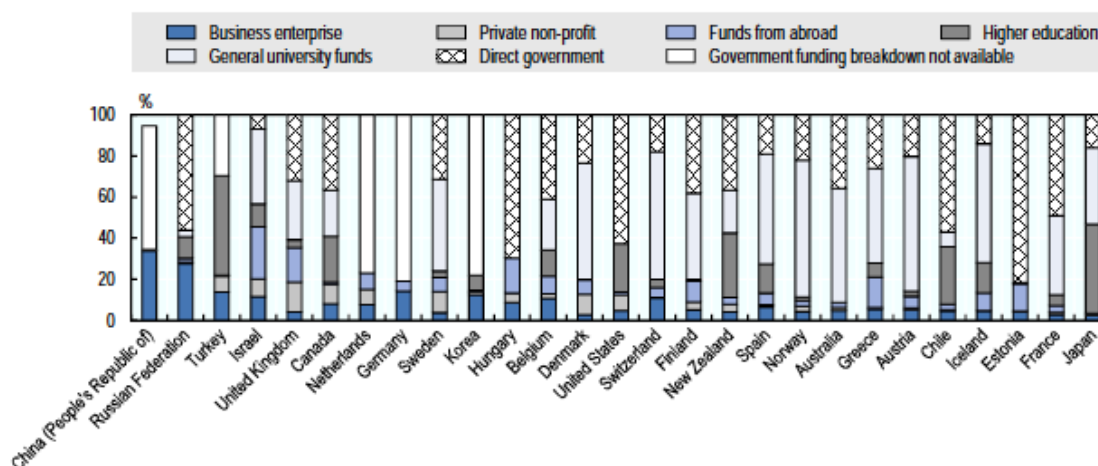
Source: OECD Finland 2017, p. 98 based on Ministry of Education and Culture (2016b), Database, <https://vipunen.fi/en-gb/higher-educationand-r-d-activity> (accessed 5 March 2017).

Investment in research, development and innovation (RDI) from both public and private research funding has been in decline for several years now due to political decisions and to changes in industrial levels. This is worrying because, previously, Finland’s economic growth was dependent on its innovations (see Pirkanmaan liitto 2017 and OECD Finland 2017). The Finnish business sector has not yet recovered from the global financial crisis and the subsequent industrial decline. Compared to its Nordic peer countries, Finland’s tenuous recovery is the exception, and the recovery of Finland has been particularly hard because of the decline in investment in its RDI (OECD Finland 2017). Beside the general governmental funding for universities the focused funding for R&D in higher education also comes predominantly from the government. The government focused funding for R&D in higher education covers from all funding (38%), from abroad (10%), and from companies (5%), which matches the trend in other Nordic countries.

Previously, Finland was at the forefront of investment in research, development and innovation capabilities, including human resources in science, technology and innovation (STI), but it has now lost its former position. Because of changes in competitiveness and productivity, Finland’s innovation system needs a new vision to enable it to respond to the economic and societal

challenges, including energy efficiency, climate change and population ageing. In order to meet sustainable solutions, the STI system requires better co-operation between the actors at both national and regional levels (*Ibid*).

Figure 3
Funding for R&D in higher education by source 2013

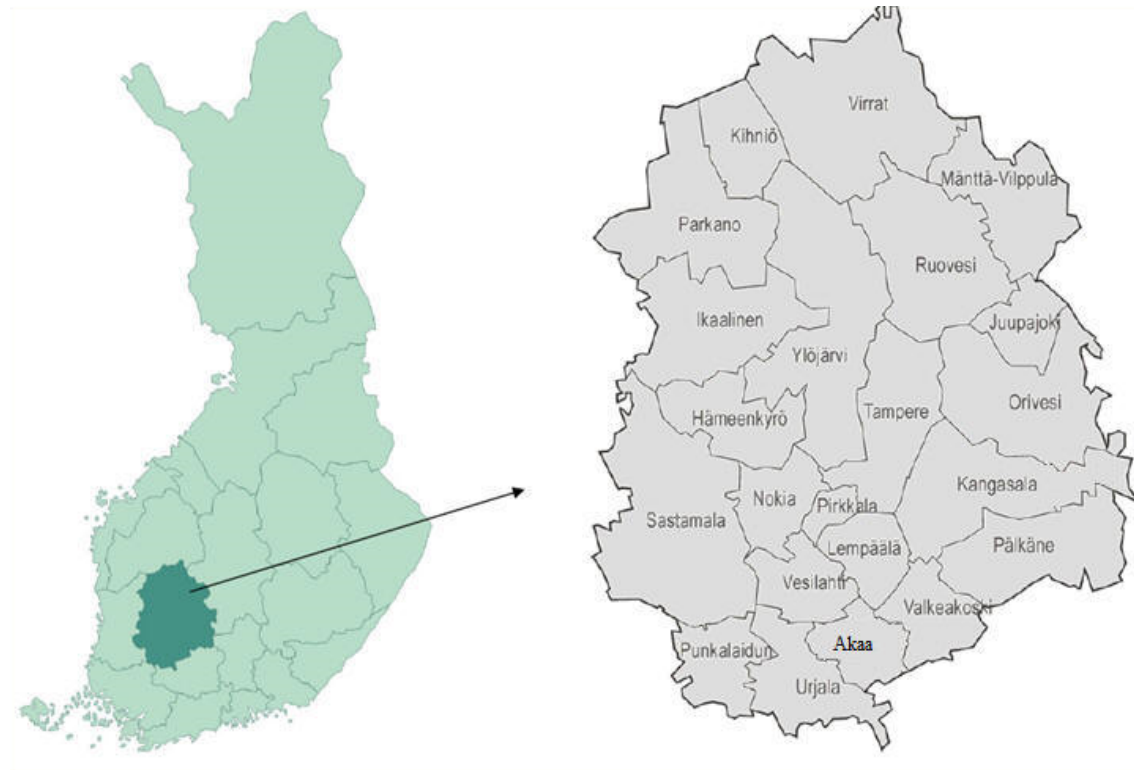


Source: OECD Finland 2017, p. 98 based on OECD (2015), OECD Science, Technology and Industry Scoreboard 2015: Innovation for Growth and Society. Paris

1.3. The research and innovation strategy of the city of Tampere

The primary goals of the city of Tampere's research and innovation strategy are to promote the business environment, growth, internationality and employment by the year 2025. There is a need for an intelligent research and innovation policy where the aim is for a closely-defined, green, international and low carbon community structure. This should promote sustainable development, digitalization and an innovation ecosystem in which both citizens and businesses can grow and achieve well-being and an improved life-style. The vision for the city of Tampere by 2025 is that Tampere will be 'superior in regeneration – sustainably growing'. The strategic goals for the knowledge area of the economy in the Tampere area are to diversify and renew business activities and to increase R&D and innovation investments. It is also important to ensure that the economy has the necessary knowledge and capabilities to increase its ability in industrial renewal and in creating world-class companies and an innovation ecosystem. There is a need for a proactive land policy and for developing accessibility if sustainable development is to be achieved. These goals are being promoted by Business Tampere, for instance, through their Smart Tampere programme (see Tampereen kaupunkistrategia 2025, 2013 and Smart Tampere). Business Tampere is the Tampere region's economic development agency, the aim of which is to work as a platform for different networks (Business Tampere). The goal of Business Tampere is to promote the knowledge area for the economy, while the Smart Tampere programme promotes the knowledge area for energy. The Smart Tampere programme aims to promote and enhance sustainable development in energy, and it has the primary goals of impacting climate change positively and developing energy efficiency.

Figure 4
The Province of Pirkanmaa showing the Tampere region in Finland



Source: [Pirkanmaan kunnat virtuaalikoulu.org]

Tampere belongs to the Pirkanmaa province, and Pirkanmaa is one of two provinces in Finland that are included in the Hinku network, which promotes carbon-neutral municipalities. Hinku is coordinated by the Finnish Environment Institute. The goal of this institute is to decrease the province's carbon emissions by 80% between 2007 and 2030. In the Pirkanmaa province, 13 municipalities, which include Tampere, are involved in the Hinku-network, which covers 87% of the citizens of the area (Hiilineutraali Suomi 2019). The city of Tampere is promoting a sustainable development project in the energy knowledge area through its Smart Tampere. The project is called Hiedanranta and it involves an innovation platform in the Tampere area. Different actors are involved in this project, including companies, citizens, civil servants and researchers, who together, aim to create sustainable living conditions. Hiedanranta is a living laboratory for the testing of new energy solutions prior to their being scaled up elsewhere. It also contains platforms on which companies can promote businesses and growth through networks such as Demola, which connects companies, researchers and students from the universities and polytechnics in creating new solutions to various problems that the regional authorities are interested in. The national level strategy for Finland and the regional level strategy in the city of Tampere are both in line with the need to support sustainable development in the energy and economy knowledge areas. Both are interested in involving the citizens and community in innovation, as recommended by the European Commission. However, it seems to be quite difficult to get citizens involved in a reliable and valid way. Social innovations may be needed to achieve this (Pirkanmaan liitto 2014).

1.4. Tampere University research and innovation strategy

In 2019, two universities from the Tampere region united and the new Tampere University was formed, which focuses on technology and the social and health sciences. The Tampere polytechnic also joined this coalition, which was called Tampere3 during the process of combining. The city of Tampere is one of the charter members. The university is now multi-disciplinary, and it may be in a good position to answer the multi-dimensional questions that are asked in the energy and economy knowledge areas. Tampere University is an important actor in the responsible research and innovation system. The strategy of Tampere University is to promote equality and to appreciate diversity. The university is promoting sustainability in society by evaluating social impact, improving multi-dimensional metrics in both short- and long-term missions and by enhancing the multi-disciplinary nature of the academic community. In addition, it is strategically situated to engender co-operation between the academic community, the business community, the public sector, non-governmental organisations and the sharing economy, both domestically and internationally. Its goal is ‘impact through integration’ (Tampere University strategy statement 2018). Tampere University is committed to openness, to the sharing of ideas, to sustainable development, to fairness and equality. The university’s vision is to promote responsible and open science that can benefit humanity through creating well-being, a sustainable society and a sustainable economy (Ibid). The university mission is to enhance a fair, democratic and inclusive society, the health and well-being of all ages, a resource-efficient and safe environment, socially responsible digitalization and the transformation of work. The university’s approach to responsible research and innovation is totally in-line with the RRI concept, although it does not specifically use the term RRI. In fact, the Tampere University website gave only one hit for RRI.

Figure 5
Tampere University mission



Source: Tampere University research strategy (2018: 10.)

1.5. Description of the research and innovation structure in the selected knowledge areas

This report focuses on a description of the research and innovation (R&I) structure in the knowledge areas of energy solutions and the economy in Finland, generally, and in the city of Tampere area, in particular.

1.5.1. *Knowledge area for energy solutions*

The area of energy solutions receives strong guidance from the government due to legislation and the national level interest. The energy policies of the Finnish government promote renewable energy production. The aim is to increase renewable energy by more than 50%, to phase out coal and to halve the current use of mineral oil. Another Finnish goal is that export industries should benefit from the technological innovations around renewable energy (Karhunmaa 2018 and Haukkala 2018). To make the energy policy effective, there is a need to engage citizens in participating in innovative actions aimed at an increasingly decarbonized built environment. To achieve this kind of change, the regions need to be encouraged to take part in nation-wide programmes committed to climate and energy targets. In Finland, the energy policy is the responsibility of the Ministry of Economic Affairs and Employment. The principal tasks of the Ministry in relation to energy are to develop energy markets and the security of supply, to promote renewable energy and energy efficiency, and to regulate nuclear energy. The same Ministry is also responsible for emission trading and the implementation of climate policy. Finland is part of the Nordic (Nordic countries plus the Baltic States) wholesale electricity market, which, through the EU directive on harmonization, is becoming Europe-wide (Työ- ja elinkeinoministeriö (TEM) 2019).

The majority of carbon emissions in Finland result from energy production and consumption, which includes traffic use. Therefore Finnish energy and climate policies are intertwined. In Finland, there are approximately 75 energy retailers and also a number of consumers who produce electricity on a small-scale and provide it to the market (Työ- ja elinkeinoministeriö (TEM) 2019/1; 2019/2). The energy supply is diversified, and it is provided by regional energy companies that both produce and distribute electricity and are mainly owned by cities and municipalities. Cities and municipalities also have a zoning monopoly that allows them to make strategic plans for developing land for construction and new building requirements, which will include efficient energy supply. An increasing awareness of energy efficiency has emerged among citizens and, when faced with technological change, there is tendency towards increasingly complex interactions so that energy projects are integrated with the development of sustainable innovations (Heiskanen *et al.* 2019 and Kuntaliitto 2019).

1.5.2. *Knowledge area for the economy*

The strategy for the knowledge area of the economy is for Finland to be more international by 2025 and to grow through innovation. The Ministry of Economic Affairs and Employment stresses the importance of innovation in promoting sustainable growth and production. Economic growth means that better employment conditions will be promoted through high-quality education and skills. The aim is for Finland to be bold in its innovations and thereby promote economic renewal and internationality. It is essential to develop competitiveness and an attractive operating environment in which businesses can grow and the abilities to exploit digitalization and to create value through service will be enhanced. There is a need for internationality and increased export, for top expertise and foreign investment, for diversification in the industrial structure and for success in global markets. Renewal and diversification will be supported by creating competitive centres of excellence and economic ecosystems. Because of the high level of risk in innovation, the government has decided to support innovativeness with innovation funding, innovation-

friendly legislation, a supportive environment and the development of co-operative networks and platforms (Työ- ja elinkeinoministeriö (TEM) 2019/1; 2019/2).

The renewal of the innovation process and the stimulation of new innovations must include end-user views. In addition, the public sector is expected to renew its innovation process and to create cost-effectiveness through innovation. The knowledge-based economy needs greater efforts at co-operation between science, technology and the innovation actors. There is a need to reduce the regulatory burden carried by businesses and to enhance the competition-friendly environment (*Ibid* and OECD Finland 201).

2. Content Analysis and method

The method used in this report follows the qualitative content analysis and is based on the collected data. Qualitative content analysis is data-driven. The data is collected from 12 interviewees. Interviewees has been made during October – December 2019 and analysed in same period. Interviewees are from City and region (3), companies (3), universities (4) and public research institutions (2). Time for one interview was approximately a one hour.

1.6. Content Analysis in the Knowledge Area for Energy

1.6.1. Social responsibility

Interviewees stated that social responsibility in the energy sector involves the willingness to develop sustainable energy solutions that consider the social impacts from different perspectives. The results may be different when looking at solutions from either a micro or a macro level, and it is essential to find a balance between the benefits and the disadvantages. When considering social responsibility, you also need to think about, for instance, the technology development life cycle and how it will develop and change our living conditions. For example, recycling can save materials and energy in the long run. Such things need more attention from research and greater effort from innovation, but even so, it is unrealistic to expect an optimal solution to be found because of the difficulties in measuring the various factors and the qualitative perspective, which includes an understanding of systems theory, and how the issues, actors and systems interconnect (interviewees 1–11). A concern was expressed that encouraging disruptive solutions may interfere with existing energy systems, which have provided a very organized and reliable system in the past (interviewee 1).

Interviewees said that the social responsibility includes a consideration of how sustainable the community structure will be, for instance, when faced by regional diversity. Social responsibility must include the involvement and engagement of citizens, customers and users in the energy research and innovation process. The results and the goals may take a long time to achieve, and they may be of little interest to citizens who do have no incentive to engage with the process. In addition, there is a tendency to believe that the ordinary citizen lacks the knowledge to make a relevant input into the energy sector's innovation process. The language and relationships may be difficult to understand for people with limited knowledge of technology and systems. Most of the interviewees raised the question of the ability and willingness of citizens to make relevant comments relating to energy solutions or to an understanding of the scientific process. Nevertheless, increasing efforts are being made to include citizens in the discussion on the

dilemma of responsibility in innovation and in society, but it is still at an early stage. Discussions on values and on eliminating threats ahead of time are the main dilemmas that need the involvement of citizens, customers and users. In practice, social responsibility involves the willingness to promote co-creation platforms and networks and to create visionary strategic goals that encompass a broad evaluation of solutions (interviewees 1–10).

1.6.2. Environmental responsibility

Interviews gave the notion that the starting point for R&I in the energy sector today is usually an environmental issue. The aim is to reach climate goals, such as carbon neutrality, by fostering energy efficiency and new energy production. There is real interest in looking for different ways of producing energy and diminishing carbon emissions. However, according to the interviewees environmental issues are seldom straightforward, and life-cycle evaluations are needed for every solution, which should come from different perspectives and consider possible indirect effects. Interviewees said that environment issues are often associated with ‘a good image’, and not necessarily with the hard facts of environmentally friendly solutions. This is called ‘greenwashing’. Interviewees commented that different technological fields can make a considerable contribution to energy saving, both through materials and through energy technologies. Greater effort is needed to save natural materials, and in this field, the R&I should be more ambitious. However, civil servants should not be choosing ‘the winners’ but only providing the framework and the goals. Innovation needs to think about environmental questions from a broad perspective, and it is necessary to ask whether an innovation will provide a better solution for the environment. The life-cycle perspective and possible changes in the social order are relevant to environmental responsibility. Environmental responsibility includes making an effort to influence things such as housing, traffic and food production, which together, produce most of the carbon emissions (interviewees 1–10).

1.6.3. Ethical responsibility

The interviewees suggested that, in energy sector, it is essential that politicians facilitate new ways of thinking about energy production at the governmental level and create legislation that supports different energy solutions. Legislation for energy solutions should be precise, that is, there should be no ‘room for interpretation’, but currently, the legislation lags behind and interferes with the ability to discover new energy solutions. There is a need to rethink how solutions can be supported politically and legislatively, and how legislation can effectively direct development and encourage change (interviewees 1,5–7,9). Several interviewees said that if different solutions are to be supported, there is a need for adequate and transparent funding that supports co-operation among researchers from different knowledge fields and encourages them to coordinate their activities. The funding should not be awarded to ‘winners’ without any competition, and the energy sector needs political intervention and support if it is to change. Several interviewees commented that the real risk to society is that political enthusiasm and passion takes over from scientific reasoning in the energy sector (interviewees 1–3,5–9).

1.6.4. Practical examples of developing energy solutions

Almost every interviewee gave Hiedanranta as a practical example of taking steps towards the sustainable development of energy solutions. Hiedanranta is a new region in the city of Tampere where public actors are promoting the practice of a new sustainable development solution. The aim is to generate co-operation between research institutions and new companies and to create various hybrid solutions for sustainable energy production. At the centre, are customers from the community whose opinions regarding what is responsible should be taken into account. As a practical project, Hiedanranta has created a good way of engaging different actors in co-operation. In addition, it provides a platform where innovations are boosted by bringing competitors and competitive solutions together. The Hiedanranta project is based on a strategy of the city of Tampere in which responsibility means environmental and social responsibility, and where sustainable climate and energy solutions are among its four strategic goals (interviewees 1–4,9,10). In Hiedanranta, there is real interest in getting citizens involved in the innovation process and in exploring their different views regarding the creation of good living conditions for the future (interviewees 1,3,4,7). Practical innovation platforms like that of Hiedanranta are valuable because other cities and municipalities can imitate the solution and copy ‘best practices’ from one another.

1.7. Content Analysis in the Knowledge Area of the Economy

1.7.1. Social responsibility

Interviewees said that in the knowledge field of economy, the social impact of every innovation project should be evaluated broadly and systematically. However, they also stated that it is not yet known how to direct an ecosystem where there are multiple actors with different priorities and different organisational governance practices. For instance, in cities, the dilemma may be that we need more co-operation between different administrative silos and NGOs and that there may be actors whom the researchers, companies and civil servants have not yet recognized. In addition, problems in the future may be very different from those of today, and very often people try to solve problems with the tools that they used in the past, but which do not fit the new situation. What is needed is new thinking and a mindset adjusted to the new social problems (interviewees 1,3–5,7,9,11,12). Interviewees commented that for example, when doing research and innovation, there should be an impact evaluation of the changes that the innovation can create in society. The innovation processes in ecosystems should be transparent, and the co-operation should be based on trust because it is not possible to create a tool that suits every situation, but there can be processes that follow good practice. When promoting practical and real time co-operation between companies, public servants, researchers and citizens, co-operation is very fruitful. It is useful to have practical testing platforms where solutions can be evaluated timeously and where knowledge can be created together (interviewees 2–6,8–12).

1.7.2. Environmental responsibility

In the economy, environmental responsibility means, for instance, that we try to solve the climate change dilemma together, and we must take into account the environmental limits of every decision. There cannot be economic responsibility without environmental responsibility.

Responsibility means that we understand the need for a multidimensional approach, for instance, as relating to pressing environmental, biodiversity, climatic and pollution problems. Also, when using public funds, there should not even be a possibility of innovating anything that seems irresponsible from the environmental point of view, and technological advantages must serve to save the environment and the climate, they are not to be seen as free entities. Environmental and climatic questions must be considered broadly in every innovation project, meaning that there are always unintended and unexpected consequences, the impacts of which must be evaluated and considered (interviewees 7,11,12). Therefore, together with responsibility, it may be important to emphasize sustainability, which will include the time dimension in environmental questions (interviewee 12).

1.7.3. Ethical responsibility

The ethical questions that arise from responses in the area of the economy include the responsibility for using public funds, and the responsibility of civil servants and politicians to show their real concern for being responsible, for instance when using the taxes collected. It is essential to ensure that there is no conflict of interest when dealing with a public and private partnership. It is important to maintain transparency regarding conflicting interests, especially in the public sector, because eventually conflicts will surface and harm the co-operation. For instance, instead of achieving the stated goal, it is sometimes more important for civil servants and politicians that a particular research project is executed in their region, and a partial optimization is promoted. A partial optimization in the public sector means that the system is harmed, because the goal achieved was not the prime motivator, but this may have been a political interest or a lust for power (interviewees 1,4–6,9–12). One interviewee suggested that it may be effective if different actors bring long-distance and multi-dimensional perspectives to the problems of society, and if they try to create mission-based solutions to pressing social problems they must also take note of the intertwining nature of the problems. This suggestion would require a huge amount of courage to be successful and would involve a new way of thinking, for instance, about funding. Currently, funding is bound to a programme and is controlled by the responsible organisation, which is seldom very flexible (interviewees 11,12). In the city context, the problem may arise when consultants are used for an evaluation process, but they aim to please the client rather than challenge the prevailing view (interviewee 4).

1.7.4. A practical example of developing an economy solution

In the city of Tampere, there are three open innovation platforms called Demola, Mediapolis and Campus Arena. Demola supports multi-disciplinary co-creation between students and firms. Mediapolis is a gathering place for ICT and the media to enhance different knowledge bases. Campus Arena is designed to enhance the strong technical knowledge base in the Tampere area (OECD Finland 2017). Sote TKI is an innovation platform in the Pirkanmaa area, which brings together PSHP (Tampere University Hospital), civil servants from the Pirkanmaa cities, companies, the university and the polytechnic to create innovative future health care services (interviewee 11).

1.8. Content Analysis held in Common by the Energy and Economy Fields

In the knowledge areas of the energy and economy there are ethical dimensions which are held in common. Interviewees in these areas commented in the same manner about gender equality, the responsibility in research and innovation, solving ethical dilemmas and educating above-mentioned dimensions and therefore these issues are described in common in following section. Furthermore, responsibility in research and innovation gather the common understanding of interviewees how to promote RRI without the exact knowledge about the precise concept. Also solving ethical dilemmas opens the question, how interviewees has previously solved problems involving RRI concept.

1.8.1. Responsibility in research and innovation

Responsibility in research and innovation means that it is essential for the people affected to become involved in the development process because many technological and economic changes are also values-based decisions. Evaluation should not only consider acceptability, but also things like desirability or usability, which means for instance, that technological research and innovation should be conducted and evaluated from many points of view. The dilemmas around social impact in the future need a multi-dimensional approach because the problems we face are so challenging that no one approach can resolve these questions. Interviewees said that it is useful for the research and innovation responsibility if there are practical testing platforms called living labs where knowledge can be created and solutions can be evaluated together.

According to interviewees the Finnish innovation system has in some degree a division of labour, which can be described in the way that the universities conduct the basic research, institutions like VTT do the applied research and companies get involved in product development. However, it is also clear that this division is not always precise. Responsibility for research and innovation has its roots deep within the Finnish research and innovation institutions, although over time, this has broadened and, for example, things that people had previously seen as technological are now also being considered from the social and environmental perspectives. It is widely known that technology has enabled enormous changes in both energy and the economy, but now changes are needed in political processes and in human behaviour, for instance, by allowing new business models and involving consumers in collaboration. However, when developing technological solutions, it is important to be careful because there is always the possibility that someone will misuse for instance a technological advantage (interviewees 3,5–7).

According to interviewees the responsibility in research and innovation involves a multi-dimensional approach to the changes made possible by technology, accompanied by an evaluation of their impact on society. To enhance responsibility, it is common that when people in research and innovation institutions draw up project plans, apply for public funding and start on a project, they have to provide a '360 degrees' or 'systemic' impact evaluation in advance, and the final report on every project is expected to answer questions about responsibility. For instance, they may be expected to analyse how and why the research project impacts or does not impact on society or on the environment, why there are both positive and negative impacts, what the direct and indirect impacts are, etc. Overall, responsibility in research and innovation means wide stakeholder involvement, transparency during the process and desirability of content (interviewees 3–12).

Interviewees felt that, in Finland, the ethical norms of research institutions are in good condition and are, to some degree, supported by legislation, but they felt the wide impact evaluation at an early stage of the innovation process could be improved upon. Generally, they considered that research and innovation actions are regulated effectively and that ethics and trustworthiness are valued in research institutions and among researchers. Interviewees also felt that, if there are actors who do not care about responsibility or who are untrustworthy, they are usually not working in co-operation with research institutions or with responsible companies. Interviewees insisted that it is important for research institutions and companies to evaluate in advance which research and innovation projects they can participate in, in other words, which are ethical and responsible. The evaluation process is designed to build trust among participants and stakeholders. On balance, the Finnish research and innovation system has a very good reputation, and most of the interviewees felt quite confused that it was possible to be otherwise, in other words that research and innovation could be irresponsible (interviewees 1–3,5–8,10–12).

Interviewees said that at governmental level, weaknesses in responsibility for research and innovation are focused on research funding, first because it is not long-term, and second because it is dependent on civil servants' willingness and personal interests. This means that funding for long-term research and development is in bad shape and lags far behind, for instance, that of Sweden and Germany where funding may be granted for as much as five to twelve years (interviewee 6). Another problem is that research funding is very much directed by the government because the Academy of Finland is under the Ministry of Education and Culture (interviewees 6,12). Weaknesses at the practical level in research and innovation include taking too narrow a perspective on responsibility and impacts. Today, responsibility in research and innovation requires a multi-disciplinary approach, because, worldwide, problems are not only technological and financial, but also social (interviewees 1–3,5–9,11,12). However, it is important to remember that the needs of different stakeholders may differ, for instance, for companies, co-operation may mean the ability to create competitive business; for civil servants, it is important that they serve the citizens; while for the citizens, the goal is to have better living conditions and sustainable taxation (interviewees 6,12).

1.8.2. Solving ethical dilemmas in co-operation

In relation to ethical responsibility, a broad perspective on possible impacts is needed. Solving one ethical problem may open another problem that could not have been anticipated beforehand. It is helpful when projects include a framework for handling ethical issues, and this should be dealt with in advance. Ethical issues may need to be considered more actively and broadly when engaging in research and innovation, but in general, researchers, companies and civil servants respond by using the ethical norms of their own professions. Public funding could be made dependent on ethical issues being considered in advance. Ethical responsibility should be considered in applications for funding; for example, applicants could be expected to include plans for engaging citizens in the innovation process as just one component of the application evaluation process (interviewees 1,3–7,9,10). Many ethical problems have profound complex implications and need a broad perspective and a far-reaching evaluation process. There is always a need for balance between the positive and negative effects and a need to make a values evaluation, but even then, our understanding and knowledge is limited, because our rationality has its boundaries.

However, better living conditions for all can be created if we maintain a dialogue about ethical responsibility in our everyday lives.

Ethical responsibilities involving intellectual property rights (IPR), General Data Protection Regulations (GDPR) or Procurement are easy to observe because there is clear legislation for these areas. However, when drawing up a contract for a project, it is essential to consider how ethical responsibilities will be handled, for example, who owns the data and how it should be managed. Ethical responsibility for IPR, GDPR or procurement is essential but is relatively easy to observe in comparison to ethical responsibility for social impact, which is a far more complex and problematic issue.

The method most used to respond to ethical dilemmas in social co-operation is open dialogue between actors and if, in the worst case, they refuse to co-operate, it is to use ethical reasoning. If ethical problems are to be resolved, there must be dialogue when the ethical issues first occur because people identify problems in different areas and different situations. Ethical dilemmas are seldom black and white, and some are more easily defined than others, but a good way to solve ethical problems is to search for information and to monitor and measure things that are important, such as responsibilities. If ethical dilemmas are to be resolved, it is vital for organisational policies to support valid and reliable research methods. For instance, if there are questions relating to ethical issues, such as political intervention, it is possible to get a second opinion from other researchers and to discuss the ethical questions openly. A multi-disciplinary approach improves responsibility, that is, when research includes different methods and fields of science it will bring many perspectives to common issues, and there is greater possibility of finding synergy between the perspectives. Generally, a multi-dimensional approach leads to better solutions, and in Finland, there is common understanding of the necessity to solve complex problems through co-operation and in a responsible manner (interviewees 1–3,5–12). Nevertheless, the problem is that, very often, there are no measurable indicators to evaluate, for instance, sustainable development, and it therefore depends on individuals' own willingness or passion to be responsible regarding sustainable development and to promote their own professional or institutional reputation (interviewees 2,3,7,9,10,12).

According to interviewees to solve ethical dilemmas the central mean is to promote co-operation. Co-operation with different actors and institutions means ability to have a dialogue about difficult questions when these occur. Also, actors need knowledge about processes how to 'blow whistle' when needed and understanding of methods and multi-dimensional perspectives in research reasoning. Therefore, in next sections 2.3.2.1 and 2.3.2.2 there are need to take a view to the advantages and difficulties of co-operation and solving ethical dilemmas.

1.8.2.1. The advantages of co-operation

Interviewees said that the advantages of co-operation include a wide diversity of long-term partners and therefore a breadth of perspective. This kind of co-operation is a good approach to creating better developments and solutions, to making better living conditions and financial decisions, and to the possibility of creating international business and collecting taxes. Nevertheless, research is increasingly promoted by large companies that have the resources, connections, networks and a common language, and the research may also be in line with the large company's needs. In innovation practices, the interests of large companies are very important when evaluating what kind of ideas to promote and fund. This kind of co-operation is

a very effective way of innovating for better solutions. Generally, when research institutions, public sector actors and companies co-operate, the benefits include the decisions being based on research knowledge and results. The aim is for public funding and research to boost the companies to develop their own products and production methods, and here responsibility means that the innovation processes must be open and transparent and impacts must be broadly evaluated. It is important to enhance the engagement of different actors in the research and innovation process, as this can promote responsible systemic change. Finland has the potential to be a forerunner in the dimension of responsibility because there is strong trust within the society and a willingness to co-operate and to resolve problems together (interviewees 1–6,9–12). We should remember that academic research, that is basic research, is both now and in the future, very important, even though the orientation is towards innovation (interviewees 5,6,12). The promotion of responsibility through innovation is particularly evident in the start-up field where the people involved have a passion for creating sustainable solutions, socially, ecologically and technologically (interviewees 2–4,6).

1.8.2.2. Difficulties in co-operation

Interviewees commented that political passion is the factor that most often disturbs co-operation, because political stakeholders may be very influential and strident, even though they may lack real power, and politicians often eagerly desire results that will support their political viewpoint. Another area of difficulty in co-operation arises when the partners do not have the same mindset regarding issues of responsibility, that is, they do not see responsible questions as important, and they feel that responsibility requires greater effort and costs in relation to the estimated benefit, even though the trouble required may not be significant. Everyone involved in the co-operation has their own strategic goals and needs, which are sometimes hard to reconcile, for instance, when the co-operator does not want to hear disturbing information. All difficulties in co-operation reflect the need for open dialogue in advance, before the partners know whether they will win and benefit, in other words, the difficulties will include the willingness to take risks (interviewees 1–12). When a large number of partners need to coordinate in facing difficulties, sometimes the feeling can't be avoided that, when applying public funds, co-operation is the absolute value and not the goals or the results (interviewees 9–11). On the other hand, the opinion was also expressed that we should see the process as being relevant and not only the results, because it is a way of building trust and co-operation for the future (interviewee 12). Interviewees also suggested that, when thinking about innovations, we expect the results to be only positive, and therefore responsibility is hardly discussed or barely noticed as being relevant (interviewees 9–12).

Interviewees commented that sometimes difficulties arise because the research needed is long-term and requires a lot of time, but the planning process in cities and municipalities has a timetable for development, so waiting for research knowledge before producing usable solutions becomes problematic. Also, when companies are involved in the research and innovation process, they need time, for instance to renew their processes and best practices based on their research results. The experts may also experience that citizens and civil servants lack the requisite understanding and knowledge to bring any value to the innovation process, and this will include technological dilemmas and basic research needs. Alternatively, it may be that civil servants perceive that the research does not answer their practical questions. Generally, the time tables, the knowledge needed and the perceived benefits are the big questions that affect co-operation in research and

innovation. Furthermore, sometimes there are situations where it is quite difficult to engage with citizens or customers and to get them involved in the innovation process, or the experts leave them aside. There are also public servants who communicate directly with the representatives of companies or research institutions. To promote the engagement of citizens and customers in the innovation process, it is the public sector, which takes the lead in the co-creation of platforms, that requires appropriate resources to bring the different interests together (interviewees 1,3–7,9,10,12).

1.8.3. Gender equality

In general, gender equality is not a big issue in Finnish society, but there are still gendered and polarized labour markets where men and women hold stereotypical jobs and positions. However, women are increasingly involved in the energy sector, which was previously seen as a very masculine domain. In technologically focused fields, it would seem that the men take more risks, while in other areas such as responsibility and impact evaluation, more women are involved. Research and the public sector have both paid attention to their gender policies, but expertise remains a crucial factor. In Finland, legislation supports gender equality in organisations, but it is also important that there is a variety and diversity of age, professional background and people who are holistic, dualistic, or monotheistic in their thinking. These factors also play a crucial role in equality and ethics. Generally, diversity is the most important factor about which we need to think more broadly (interviewees 1–4,6,8,9,11,12). Nevertheless, the long history of gender equality in European Union research funding applications and reports has sustained and promoted gender equality, and interviewees perceived that while it has been successful, it has mainly promoted a head-counting exercise. Interviewees said that every project plan and research report should take gender equality into account (interviewees 2,4–6,9,11). Some interviewees commented that they hired more women than men, and one interviewee suggested that, in the future, the situation as it affects men should also be considered. Gender equality should not be from just one perspective, and even though gender equality is a very important issue, it needs to be more relevant (interviewees 6,7,11,12).

1.8.4. Educating for engagement, gender policy and ethics

Interviewees said that the best way to learn engagement, gender policy and an ethical approach in co-operation was by doing those things in practice, that is, learning by doing. Also, different projects may require education regarding the different ethical dimensions. However, organisations have the responsibility of enabling their employees to understand the organisation and the network's ethical norms, which are part of organisational culture. Increasingly, this is about ethical norms in networks, which, in the long run, support co-operation. Most of the interviewees commented that it is essential for universities to include courses that cover broad responsibility as part of university degrees. Broad responsibility means that there should be an understanding of engagement and ethics in the research process and in impact evaluation (interviewees 1,3–12). In their opinion, significant efforts are being made to learn engagement and ethics in co-operation and in research and innovation. The commentators did not support the idea of taking part in the education process themselves, but it could be good for engagement and

ethics for this to be openly considered, for instance when the innovation research platform is at its starting point. That is the time to discuss the different interests and to seek common grounds for future co-operation.

3. Competing Concepts

Finnish research and innovation communities are dependent on public funding and, in some cases, these funding institutions expect to receive applications and reports which take into account different dimensions of responsibility. But only recently has there been the requirement that technology-oriented projects should also take into account humanistic and social science approaches, and that there may be small components of responsibility that must evaluate ethical questions and dilemmas and how to resolve these questions. The public and private partnership is a good starting point for responsible research and innovation. The need for a multi-disciplinary approach has been noted, but at all organisational levels it is important that organisations have their own ethical norms, for example a white paper giving responsibility guidelines (interviewees 5,6,8,11). There are several good ways to engage, for instance, organisations can use UNESCO's social development goals as guidelines or the United Nations' concepts. Overall, the most frequently used concept involves the United Nations sustainable development goals (SDG), but rarely are choices made in which these goals are the primary aim or where they are the means for promoting different goals (interviewees 1,2,4,7,8).

	ENERGY	ECONOMY
Social responsibility	Micro and macro level sustainable energy solution Life-cycle thinking Shareholder engagement and knowledge barriers	Co-operation through administrative silos Enhance recognition of actors
Environmental Responsibility	Climate goals Promote innovativeness through housing, traffic and food production	Climate change Promote innovativeness through environmental and time dimensional perspective
Ethical responsibility	Neutrality of legislation Neutrality of energy solutions	No conflict of interest Responsible public investment
Solving ethical dilemmas	- procurement, ipr, gdpr Co-operation Multi-dimensional approach	
Gender equality	- diversity of gender Diversity of professions Diversity of thinking	
Research and innovation responsibility	Multi-dimensional perspectives Wide impact evaluation trustworthiness - practical living labs	

One comment was that CSIRO in Australia is a good organisation against which to benchmark responsibility in research and innovation (interviewee 7). In addition, Fair Trade and AASHE's Sustainability Tracking, Assessment and Rating System (STARS) for higher education evaluates sustainability in the dimensions of education and research, operations, administration and finance (interviewee 2). For researchers in universities, the responsibility guidelines are defined, for instance, by the Academy of Finland or the Academy of Management, and these organisations promote the concepts that researchers follow (interviewees 5,12). Two interviewees introduced RRI as the concept for the future that their organisation will follow (interviewees 7,11). Nevertheless, as a concept, responsibility is quite abstract and does not provide exact guidelines to follow and remains vague regarding content (interviewee 12). There were criticisms regarding funding by the Academy of Finland, as it is politically directed and introduces the risk that the research is not free and autonomous, and therefore could be used to explore unethical questions (interviewees 6,12). In table one we have summarised our key findings.

4. Conclusions

The RRI concept is not generally known in the Finnish research and innovation field of the energy and economy. Nevertheless, research institutions, companies and civil servants in Tampere region has previously used the United Nations concept of Sustainable Development Goals, which in some degree follows the RRI concept. The interviewees described, that to promote responsibility and to solve ethical dilemmas in research and innovation there is need to focus to the ability to co-operate with different actors in multi-dimensional way and to understand the necessity of scientifically diverse perspectives in innovation process. Responsibility in research and innovation is value-based and therefore needs broad engagement with people affected and in large in society. Also, the problems in society are so challenging that the multi-dimensional co-operation is evident. Therefore, the broad engagement to the responsible research and innovation is necessary and perspectives are widening only from technological also to the societal. Nowadays in research and innovation there is almost in every project for instance a '360 degrees' or 'systemic' impact evaluation in advance. In Finland ethics and trustworthiness are valued in research institutions and among researchers, which promote the willingness to underline the responsibility dimension in projects. The main risk promoting responsible research and innovation is that the research funding is short-term and may be at risk for political intervention.

When questioning about the gender equality the interviewees typically commented that in Finnish organisations there are no problem with gender equality, but there are highly stereotypical professions in which different gender end up in Finnish society, which is general problem in Finland. Interviewees highlighted that gender equality is only one dimension, but there are also other things that provide diversity to the research and innovation actions, such as the way of thinking and the former background for instance in professional field. The interviewees underlined that the need for educating RRI dimensions or concept could be relevant to the students in universities, but the best way to learn engagement, gender equality and ethics are by doing those in practice.

In the knowledge area of the energy, the interviewees commented that particularly in the energy sector the social responsibility means the sustainable energy solutions which include the perspective from micro and macro level. Despite this, there is almost impossible to create the optimal solutions when considering the life-cycle thinking of energy field, but there are

possibilities to improve the energy efficiency and save materials in the long run. The problems in social responsibility in energy sector lies in citizens, customers and users participating, where the barriers are defined to be in the knowledge field. The environmental responsibility in the field of energy means the willingness to reach climate goals, such as carbon neutrality, by fostering energy efficiency and new energy production, but the most disturbing fact is that very often the solutions are only 'greenwashing'. There are certainly fields that are more effective to promote environmental results such as housing, traffic and food production and it is important to improve these dimensions. In the knowledge field of energy, the ethical responsibility lies on the neutrality of legislation towards different energy solutions. When legislation do not make any favours, then it gives more possibilities to create different energy solutions and innovations. Even tough legislation should also be exact, because the solutions in the energy sector need heavy investments and therefore the risks for adequate legislation is quite relevant.

In the knowledge area of the economy, the interviewees commented that the social responsibility demands efforts to overcome the barriers created between different administrative silos. Also, there is noted that there may be actors in the ecosystems whom the researchers, companies and civil servants have not yet recognized. Therefore, there may be lack of social responsibility which demands the ecosystem engagement and impact evaluation of innovations of society in large. The environmental responsibility means the willingness to co-operate to solve large social problems such as climate change together. Economic responsibility is very much environmental responsibility and it should be remembered that in every project that there are always unintended and unexpected consequences which must be evaluated and considered broadly also from the environmental and time dimensional perspective. The ethical responsibility means responsible behaviour when using funds collected by taxation. This also means that there should not be any conflict in interests. An example of ethical problem is that a political interest or a lust for power may be the prime motivator to act, which harms the co-operation.

Solving ethical dilemmas in co-operation means the willingness and the ability to co-operate in multi-dimensional manner and recognize the positive effect of methods and multi-dimensional perspectives in research reasoning. Ethical responsibilities involving intellectual property rights (IPR), General Data Protection Regulations (GDPR) or Procurement have clear legislation for these areas and therefore these seldom crate problems. In social dimension the ethical questions may be vaguer and therefore interviewees commented that they use dialogue when the ethical issues occur. Generally, people identify problems in different areas and different situations and according to the interviewees dialogue is the best way to handle these problems. Advantages of co-operation are the long-term partnerships, which also enhance the engagement of different actors in the research and innovation process. Generally, co-operation can promote responsible systemic change. According to interviewees difficulties of co-operation occurs when political passion takes over the scientific reasoning. The other common dilemma is when the mindset of actors heavily differs from one another and they feel that responsibility demands too much effort. The difference between needs can sometimes make co-operation quite difficult in practice such as needed time for exploration and exploitation of results.

5. Interviewees

Higher Education

Aalto Pami, Professor, International Relations, Energy Politics, Tampere University, Faculty of Management and Business

Kujala Johanna, Professor and Vice-Dean of Research, Tampere University, Faculty of Management and Business

Pilvi Taru, Innovation Leader, Tampere University

Raatikainen Saana, Tampere University, Environmental coordinator and Chairman of the Board of Energy of Lempäälä

Public Research Institutes

Nieminen Mika, Leading researcher, VTT Technical Research Centre of Finland Ltd.

Vainio Terttu, Special researcher, VTT Technical Research Centre of Finland Ltd.

City and Region

Mylykangas Päivi, Innovation Leader, Council of Tampere Region

Vanhanen Tuomas, City of Tampere, Smart Tampere, Sustainable Tampere 2030, Project manager

Vehviläinen Maarit, City of Tampere, Smart Tampere, Sustainable Tampere 2030, Project manager

Business

Muurinen Pasi, Vice president, customer relations, Tampereen sähkölaitos Oy

Kulmala Harri, Chief executive officer, Dimecc Oy

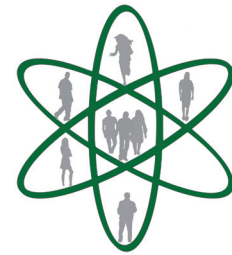
Boström Anna-Stiina, Executive director, FinDHC,

[FinDHC is the Finnish Heating and Cooling Association, which is a non-profit organisation and whose mission is to improve awareness and recognition of district energy.]

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Responsible Research & Innovation (RRI) is a genius concept developed by the European Commission for the governance of research and innovation processes with a view on the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products. It aims to shape, maintain, develop, coordinate and align existing and novel research and innovation-related processes, actors and responsibilities with a view to ensuring desirable and acceptable research outcomes.

RRIL – Responsible Research and Innovation Learning will develop and test learning modules focusing on three core dimensions of RRI: public engagement, gender equality and ethics based on interactive real-problem approaches. Previously, the implementation of RRI and its principles in the R&I systems of Finland, Poland and Spain (Catalonia) has been analysed based on desk research and series of interviews. The results are presented now in a series of 4 discussion papers (DP) by dia-e-logos:

DP 1: Responsible Research & Innovation in Catalonia

DP 2: Responsible Research & Innovation in Finland

DP 3: Responsible Research & Innovation in Poland

DP 4: Responsible Research & Innovation in three EU-countries

The reports are the inputs for co-creation and open innovation processes giving a prominent role to the learners. The co-creation is conceived as informed learning among practitioners as knowledgeable and critical partners in designing and implementation of the learning means.