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Opportunities, challenges, and risks relating to the EU and domestic regulations of energy efficiency in buildings in Ireland and Finland

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Abbreviations

ARA - The Housing Finance and Development Centre of Finland

the Buildings Directive - the Directive 2010/30/EU on the energy performance of buildings

CRU - the Commission of Regulation Utilities

DEHELGH - The Department of Housing, Local Government and Heritage

EED - Energy Efficiency Directive

EU - the European Union

GHG - greenhouse gas

HVAC - heating, ventilation, and air system

IEA - International Energy Agency

OECD - the Organisation for economic co-operation and development

SEAI - the Sustainable Energy Authority of Ireland

UN - United Nations

UNEP - the United Nations Environmental Programme

UNFCCC - the United Nations Framework Convention on Climate Change

TFEU - Treaty of the Functioning of the European Union

Abstract

According to statistical data, almost three-quarters of global GHG emissions belong to the energy sector. In these terms, developing energy efficiency tools in the building sector is a vital key to reaching the Paris Agreement goals. What is more, the development of energy efficiency contributes toward accomplishing sustainable development goals. This thesis presents a comparative study of energy efficiency in the building sector in Finland and Ireland through examining and analyzing their legal frameworks, the EU legal framework, administrative and regulating authorities at the national levels, and challenges in the implementation of energy efficiency related measures in existing residential and building sectors, and also sheds light on specific domestic measures. Further, this thesis presents a comparative discussion and suggests recommendations for the development of energy efficiency measures in the building sector in Finland and Ireland.

Keywords: energy efficiency, building sector, legal system, Finland, Ireland

Chapter 1. Introduction

"Energy is the golden thread that connects economic growth, increased social equity, and an environment that allows the world to thrive."[1]

in this phrase, the United Nations (the UN) former secretaire Ban Ki-Moon pointed out the extreme **importance of energy for humanity**. The value of energy also lies in the fact that human civilization stagnated without the development of energy.[2] In other words, energy is the trigger for the progress of human society.[3]

However, as all of the benchmarks of our civilization, energy also has a dualistic nature. Energy is the fuel for human progress. However, on the other hand, usage of energy is accompanied by threats such as energy poverty, equal access to quality and affordable energy, energy security, or a reasonable choice of energy sources. Withal, humanity has sought to address these threats and challenges with solutions such as the pursuit of energy efficiency.[4]

[1] United Nations, "Press Release" (12 May 2014) <https://www.un.org/press/en/2014/sgsm15839.doc.htm> (last access 23 March 2022).

[2] Hossain 2019, p.18.

[3] Smil 2017, p. 4.

[4] Chen et al 2021, p. 1.

American architect William W. Braham in his vital study "Architecture and Energy: Performance and Style." highlighted the importance of energy and pointed out energy efficiency as a critical solution for overcoming continuous energy challenges:

"Energy efficiency is a tactic for slowing the overshooting environmental limits, but the urgent work facing our civilization is to use the time we gain to build richer, more resilient kinds of buildings that serve the common good."[5]

Various studies have assessed **the value of energy efficiency.** For example, in a study conducted by Pei-dong et al. (2007) has been shown the direct link between using of energy and greenhouse gas (GHG) emissions.[6] In turn, n turn, analytic data of energy usage strongly support arguments from academia and science. In 2021, the annual report of the International Energy Agency (the IEA) declared that almost three-quarters of global emissions belong to the energy sector.[7] What is more, after a slight drop in energy usage in 2020, in 2021 it increased again.[8]

In the same vein, Valle and Bertoldi (2022) have also pointed out that energy efficiency is not just an essential solution for combating climate change through GHG emissions reduction. It is also a fundamental tool to enhance the quality of life and to even ease energy poverty.[9] One more pattern was demonstrated in a study by Geller et al. (2006), where it was found that with the usage of energy efficiency tools, countries that are a part of the Organization for Economic Cooperation and Development (OECD) spent almost less than 50% of necessary energy in the 2000s compared to 1990s.[10] Similarly, Rosenow and Bayer (2017) have shown that the adoption of energy efficiency tools can also positively lower operating costs of energy usage.[11]

In turn, the law enforcers agreed with scientists on the importance of developing energy efficiency tools. For example, in the United Nations Environmental Programme (the UNEP)

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[5] Braham 2013, p. 9.

[6] Pei-dong et al. 2007, p. 1908.

[7] International Energy Agency, "Report Extract. Executive summary" (2021) <https://www.iea.org/reports/world-energy-outlook-2021/executive-summary> (last access 23 March 2022).

[8] International Energy Agency, "Report Extract. Executive summary" (2022) <https://www.iea.org/reports/electricity-market-report-january-2022/executive-summary> (last access 23 March 2022).

[9] Valle and Bertoldi 2022, p. 1.

[10] Geller et al 2006, p. 556.

[11] Rosenow and Bayer 2017, p.54.

Guide for Energy Efficiency, it was stressed that energy efficiency is the most influential economic measure to deal with energy challenges.[12] In turn, in the Communication of the European Commission issued in 2019, the European Commission highlighted the necessary conditions for reaching ambitious goals of the European Union (the EU) set by the European Green Deal:

"energy efficiency must be prioritized."[13]

Nonetheless, it is vital to keep in mind that **energy efficiency has drawbacks** among its advantages. Several studies have analyzed this pattern. As noted by Shove (2018) in her analysis of energy efficiency, she concluded that the energy efficiency tools are working but not undermining the habitual routine .[14] Likewise, Herring (2006) holds the view that energy efficiency does improve consumers' cost savings, which is why energy efficiency does not contribute to the reduction of consumption.[15] This correlation manifests itself in the Jevons paradox, or in the "rebound effect," where increasing energy efficiency does not reduce resource consumption and even increases it.[16]

Regardless of its controversies, energy efficiency, as a fundamental tool to reduce GHG emissions, has become one way to **mitigate climate change**. *Inter alia*, the importance of energy efficiency was highlighted by the Paris Agreement. Drawing on an extensive range of sources, Chen et al. (2021) argued that the concept of energy efficiency has also connected with global problems of decreasing GHG emissions and climate change-related issues and are strongly interlinked, or inextricable, with Sustainable Development Goals (SDG).[17]

Despite the fact that the most vital sustainable goal for energy-related issues is goal 7 (affordable and clean energy) of the SDG, it is not limited only by goal number 7. Here it is also crucial to keep in mind that all sustainable development goals are interconnected. It follows that due to energy efficiency being a holistic and multileveled concept, it overlaps a few sustainable development goals—and legal scientists quite well demonstrated this in their studies. This pattern has been seen in the study conducted by Narunnabi et al. (2020) that according to energy efficiency relations, goal number 7 is tied to goal number 9 (industry

[12] UNEP Guide for energy efficiency and renewable energy laws 2016, p 39.

[13] The European Green Deal, COM(2019) 640 final).

[14] Shove, 2018, p. 780.

[15] Herring 2006, p. 19.

[16] York and McGee 2016, p. 78.

[17] Chen et al 2021, p. 1.

infrastructure and innovation) of the SDG.[18] In the same vein, in his exciting study Foggia (2018) demonstrated that energy efficiency is also interlinked with achieving goals 11 (sustainable cities and communities) of the SDG and 13 (climate action) of the SDG.[19]

Considering all of this evidence, it is impossible to deny the importance of energy efficiency for the continuous development of human civilization and comfortable existence in facing modern challenges.

In the European Union, energy efficiency has become one of the most vital energy targets for the last decades. What is more, it has become an essential component of the European energy policies.[20]

In an investigation into energy efficiency-related issues, Chen et al. (2021) found that energy efficiency measures are equally effective in household and industry sectors.[21] Unfortunately, it is impossible to cover all aspects of energy efficiency. **This paper's primary focus** will be on energy efficiency in the building sector.

One of the reasons for the importance of energy efficiency in building sector issues in the European Union lies in the well-known fact that one of the primary energy consumers in Europe and the world is the building sector.[22] For example, according to data from the Eurostat statistics agency, within the European Union in 2021, final energy consumption (in the 27 countries) amounted to 885 764.446 tonnes.[23] In turn, the household sector in 2021 issued 248 243,382 tonnes, which is approximately 28% out of 100%.[24] This percentage has increased compared to 2019, where final energy consumption by the household sector (28 countries) was 26,3 % out of 100 %.[25] This dynamic is disappointing.

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[18] Narunnabi et all 2020, p. 366.

[19] Fogia 2018, p. 1.

[20] Fawcett et al. 2019, p. 57.

[21] Chen et al 2021, p. 2.

[22] Martinopoulos et all 2018 p. 687.

[23] Eurostat, “Final energy consumption by sector” (04 March 2022) <https://ec.europa.eu/eurostat/databrowser/view/ten00124/default/table?lang=en> (last access 23 March 2022).

[24] Eurostat, “Final energy consumption in households” (04 March 2022) <https://ec.europa.eu/eurostat/databrowser/view/t2020_rk200/default/table?lang=en> (last access 23 March 2022).

[25] Eurostat, “Energy statistics an overview” (2020) <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview> (last access 23 March 2022).

It is also vital to keep in mind that this thesis does not engage with all of the energy efficiency issues in the building sector in the European Union. As was pointed out before, energy efficiency is a vital part of reaching sustainable development goals and an essential part of European energy policies. As a part of the Paris Convention, the European Union, which is in line with the Energy Union Strategy, has specific climate targets.[26] Legal researchers highlight that energy efficiency regulations (European and national) are a vital part of reaching the EU's climate targets.[27] Legal examination of European and domestic legislation of the Member States (about energy efficiency) is a crucial solution for understanding the effectiveness of measures.

However, energy challenges are multilevel, and solutions are not absolute. Energy efficiency is not an exemption here. **Energy efficiency in the building sector** has a list of **disadvantages**. According to Gupta et al. (2017), lack of financial funds, lack of knowledge, lack of technical supplements, and lack of legal instruments are deliberate issues that impede progress in this area.[28]

However, it is beyond **the scope of this study** to examine all of the existing legislation of all twenty-seven Member States. The research presented here will focus on two Member States - The Republic of Ireland and the Republic of Finland. The choice of these two countries was determined by differences in climate conditions, geological and biological circumstances, background, and legal implementations of the European legislation.

The main **research question** of the thesis is:

How does the current domestic legislation of Ireland and Finland, in conjunction with the EU regulations, help to ensure energy efficiency in buildings and meet countries' climate goals?

This research question is supplemented by the following subquestions:

- *What is energy efficiency? How is energy efficiency determined by the European legislation and linked to the European climate goals?*
- *Does current Irish legislation about energy efficiency in buildings sufficient enough to reach Irish climate goals? What are the pros and cons of it?*
- *Does current Finnish legislation about energy efficiency in buildings sufficient enough to reach Finnish climate goals? What are the pros and cons of it?*

[26] COM/2015/080

[27] Economidou et al. 2020, p. 7.

[28] Gupta et al 2017, p. 246- 249.

- *What are the similarities and differences between current Irish and Finnish legislation about energy efficiency in the building sector?*
- *How can current legislation in Ireland and Finland regarding energy efficiency in the building sector be improved in a way that reaches their climate targets?*

The thesis will proceed in **five chapters**: the introduction (chapter one), four following chapters (chapters two, three, four, and five), and the conclusion (chapter six). The second chapter will give a brief overview of the background of the energy efficiency concept, how energy efficiency is shaped by the European legislation, and the connection of the energy efficiency with European climate targets. The third chapter will examine Finnish domestic legislation about energy efficiency in the building sector. The fourth chapter will examine Irish domestic legislation about energy efficiency in the building sector. The fifth chapter presents the findings of the research.

The study will offer some vital insights into how domestic legislation and domestic policies of these two countries are helping in reaching the EU climate targets *lex ferenda.*

1.2 Methodology

The research questions posed in this thesis set up ambitious goals and long-term targets. The recent research that will be presented will be based on comparative approaches, including quantitative, qualitative, and mixed methods.

To begin with, it is vital to keep in mind that the current study raises questions that could not be solved only with a legal perspective. As can be seen from the outline provided above, the second chapter of the thesis examines the background issues, including points such as defining the concept of energy efficiency and describing ways of measuring it. A holistic approach will be used to conduct a more in-depth analysis in this chapter. What is more, legal sources will be used in conjunction with scientific sources with interdisciplinary considerations.

In addition, for solving the main research question, the current study will primarily use comparative approaches using qualitative and quantitative methods. The qualitative approach will be conducted through in-depth legal doctrinal analysis emphasizing primary (International Conventions, European Union's legal act, domestic legal acts of the Republic of Ireland and the Republic of Finland) and secondary sources (academic articles, books, chapters, and reports). This research will also be focused on the analysis and interpretation of primary legal sources, both current and expired. The quantitative approach will be performed

by analyzing the descriptive statistical data from official organizations (such as statistical agencies).

Furthermore, here it is important to note that the current research will not only be based on legal doctrinal methodology but also the enforcement of laws will be examined. More specifically, an analysis of the effectiveness of existing legal frameworks in the Republic of Ireland and the Republic of Finland will be conducted through their interpretation.

Chapter 2. Energy efficiency in buildings: where to start

It is vital to keep in mind that the current research will be incomplete without defining the essential terms and grounds.

A more detailed account of understanding energy efficiency, and its background, as well as an overview of its interconnection with the European climate targets, is given in the following chapter.

2.1 The concept of the energy efficiency

To begin with, Patterson (1996) pointed out that the term "energy efficiency" is too broad, and there is no univocal definition in the legal literature.[29] It follows the fact that Irrek et al. (2008) also highlighted that due to its holistic nature, "energy efficiency" is defined inexplicitly by science as well.[30]

In general, therefore, it seems that the concept of "energy efficiency" lies way beyond the legal science, and for defining this term, a holistic approach is strongly needed.

Physicist Lovins (2017) uses "energy efficiency" to describe attention to goods and services using less energy.[31] Economists Alcott and Greenstone (2012), in their exciting study, have shown that various "energy efficiency" concepts included the "win-win" theory. In other words, the “win-win” theory refers to the concept of using less energy and spending less money by applying more conservation measures.[32] On the other hand, physicist Herring (2006) strongly disagrees that energy conservation and energy efficiency are interchangeable conceptions. He describes energy efficiency as a technical term, whereas consumer gets from one energy unit “the most out.”[33] Sociologist Shove (2018) also pointed out that understanding "energy efficiency" highly depends on society's social and historical terms,

[29] Patterson 1996, p. 377.

[30] Irrek et al 2008, p. 1.

[31] Lovins 2017, p. 236.

[32] Alcott and Greenstone 2012, p. 3.

[33] Herring 2006, p. 11.

e.g., what kind of energy services are defined as vital. In other words, the "energy efficiency" concept is vibrant and depends on external factors.[34]

The most obvious finding from the examination of the academic literature confirms difficulties in interpreting the term “energy efficiency.” What is more, the definition of “energy efficiency” varies in the academic literature and there is terminological confusion.

It follows by the fact that beyond the academic literature legal acts also define energy efficiency. In Article 2 of The Energy Efficiency Directive (the EED) has decreed energy efficiency as

“the ratio of output of performance, service, goods or energy, to input of energy.”[35]

In turn, the Communication of the Commission about energy efficiency Plan 2011 gives a different explanation:

“using less energy inputs while maintaining an equivalent level of economic activity or service.”[36]

These issues in defining “energy efficiency” are similar to those found in the academic literature - there is no clear standard view.

While a variety of definitions of the term “energy efficiency” have been suggested, throughout this thesis, the term "energy efficiency" refers to using less energy to achieve the same amount of necessary performance or service or energy.

In addition, it is important to examine another significant aspect - how to quantify and measure actual energy efficiency. As discussed before, it is also vital to keep in mind that this practical question about measuring energy efficiency is also sophisticated, multileveled, and requires a holistic approach.

To date, several studies have investigated various approaches to measure what is left behind by the term "energy efficiency," or in other words, how to determine in practice the achievement of energy efficiency goals.

For example, economist Patterson in his major study (1996), describes four main tools to count energy efficiency:

1. thermodynamic method;

[34] Shove 2018, p. 779.

[35]Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency [2018] OJ L 328/210

[36] COM(2011) 109 final.

measuring through using calculations based on first-law energy efficiency and second-law energy efficiency.[37]

2. physical-thermodynamic method;

   measuring through calculations based on using thermodynamics rules and physical units.[38]

3. economic-thermodynamic method;

   measuring through using calculations based on physical units and market prices.[39]

4. economic method;

   measuring through using calculations based on monetary values.[40]

The approach introduced by Patterson (1996) is multi-dimensional and includes calculating energy efficiency in general. Conversely, recent scientific works focus more on the calculation of energy efficiency in specific sectors instead of broad calculations of it in general.

In a study conducted by Zhang et al. (2015), scholars examine the prediction of buildings' energy performance by using various counting models, including artificial neural networks.[41] In the same vein, in their exciting study, Fuentes et al. (2018) researched the effectiveness of using an artificial neural network to find a way to calculate energy performance for hot water in residential buildings.[42] In another major work, Shi et al. (2017) introduced a new model for predicting energy usage in the heating, ventilation, and air system (HVAC) systems.[43]

The evidence presented in this section suggests that there are various ways to calculate energy efficiency. Here, it is vital to keep in mind that these methods are out of the scope of legal science, and it is not the task of this paper to make an in-depth examination of them. However, for proper legal research, it is crucial to know possible ways to calculate energy efficiency. Later, statistical data about the actual efficiency of different building stocks will be used as one of the criteria for comparison.

2.2 Energy efficiency in the building sector: the next step to understanding the background

[37] Petterson 1996, p, 378-380.

[38] Ibid, p 380.

[39] Ibid, p 381.

[40] Ibid, p 382.

[41] Zhang et al 2015, p. 188.

[42] Fuentes et al 2018, p 1530.

[43] Shi et al 2017, p.

As indicated previously in accordance with the analytical and statistical data, the building sector is one of the most energy-intensive in the EU.[44]

The previous subchapter has shown what "energy efficiency" is by introducing necessary terminology and describing peculiar ways to calculate actual efficiency. Keeping in mind the current thesis's limitation and considering already clarified background issues, this subchapter will give a short overview of what exactly energy efficiency is in the building sector.

To begin with, it is vital to note that the building sector is diverse. In general, academic literature and legal acts have shown that the building stock could be split into two main groups: already existing buildings and buildings under construction. A more detailed examination provides an insight that it is possible to draw more specific criteria for dividing building stocks. For example, by their type (residential and commercial), type of property (public and private), specific purpose (clerical, government, life necessity), or specific value (historical, cultural, architectural).

However, despite the fact that there are different types of buildings, it is now well established from a variety of studies that measures for achieving energy efficiency goals in the building sector will not vary for them differently.

To date, Sztubecka et al. (2020) suggested classification of energy efficiency measures in the building sector based on standard features.[45]

1. introducing more sustainable and sophisticated thermal and cooling systems;
   for example, using a predictable control model for HVAC systems in buildings.[46]
2. using more sustainable materials during the processes of construction and renovations;
   for example, using more thermal resistance materials for wall bricks.[47]
3. implementation of a smart house system;
   including smart-grid system overall energy reduction through using smart predictable algorithms.[48]

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[44] The Eurostat, "Energy Statistics. An overview" (February 2022). <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview> (last access 22 April 2022).

[45] Sztubecka et al, 2020 p. 2.

[46] Ruano et al 2021, p.

[47] da Cunha and de Aguiar 2020, p. 8.

[48] Pallonetto et al 2019, p. 1281.

4. enhancing the indoor environment preventing spending more energy on improving these conditions independently by consumers;[49]
5. the preferred use of integrated renewable sources of energy as an energy source for the household;

   including possibilities for implementing renewable sources in the household, e.g., solar panels.[50]
6. improving water management;

   for example, reducing waste of water and lessening the impact on the plump city system.[51]
7. improving waste management in householding;

   for example, introducing management of wasted thermal energy, more specifically wasted realized heat.[52]
8. improving the lighting system in the household.

   for example, by replacing the household's current lights system with an intellectual LED lighting system.[53]

Overall, it can therefore be assumed that reaching energy efficiency in a building sector is a multileveled and sophisticated process, which includes numerous stages and requires a responsible and detailed approach to planning. Himeur et al (2020) also highlighted that reaching energy efficiency in buildings requires several challenges.[54]

2.3 Energy Efficiency in the building sector: a legal framework in the European Union

As noted by Zhang and Wang (2013) legal frameworks are an apical factor that shapes energy efficiency.[55] In turn, according to findings of Redgwell (2016), even if energy efficiency is a quite well-recognized concept worldwide, there is a lack of international legal acts, and the vast majority of regulations are laid at a national level due to the non-transboundary nature of energy efficiency.[56]

[49] Diakaki et al 2008, p. 1748.

[50] Chel and Kaushik 2017, p. 656.

[51] Ribeiro 2018, p. 369.

[52] Nižetić et al 2019, p. 567.

[53] Wang et al 2021, p. 8180.

[54] Himeur et al 2020, p. 12.

[55] Zhang and Wang 2013, p. 770.

[56] Redgwell 2016, p. 99.

It is vital to keep in mind that the concept of energy efficiency itself is relatively new in European law.[57] The Oil Crisis in OECD countries in the 1970s has become a fundamental trigger for boosting the energy efficiency concept.[58] Here it is crucial that both target countries of this thesis are part of the OECD. Ireland was one of the 20 co-founded Countries of the OECD (signed the OECD Convention in 1960),[59] while Finland ratified the OECD Convention in 1969.[60]

Many recent studies have analyzed European policies relating to energy efficiency. According to scholars, the formation process of the energy efficiency concept in the EU could be split into two stages. The first phase, which took place in the 70s right after the Oil crisis, focused on addressing energy security issues. In contrast, the second phase (from the 80s) is related to climate change mitigation.[61] This insight could briefly overlook how European legislation has been shaped over the years.

To begin with, up to date, it is well established that European energy policies were introduced firstly through the ESC Treaty and the European Treaty.[62] Currently, energy is still a part of the *acquis communautaire.* So far, article 4 (2(i)) of the Treaty of the Functioning of the European Union (the TFEU)[63] defines the energy area as an area of shared competence between the EU and the Member States. In turn, Article 191 (1) of the TFEU introduces energy efficiency in the European legal framework.[64]

It is beyond the scope of the current study to examine all of the existing European legal acts relevant to the energy efficiency in the building sector. The most valuable legal acts will be analyzed in this subchapter. For ease of reference, all the legal acts were divided by their type: council resolutions, council communications, and directives.

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[57] Vedder et al. 2016, p. 330.

[58] Bertoldi 2020, p. 453.

[59] The OECD, "Timeline" (2021) <https://www.oecd.org/60-years/timeline/> (last access 08 April 2022).

[60] The OECD Library, "Finland's cautious path to OECD membership" (29 January 2020) <https://www.oecd-ilibrary.org/sites/5ee17ef3-en/index.html?itemId=/content/paper/5ee17ef3-en> (last access 08 April 2022).

[61] Cornelis 2019, p. 567.

[62] IBID 27, p. 5.

[63] 2012/C 326/01 Consolidated version of the Treaty of the Functioning of the European Union [20122] OJ C 326.

[64] Ibid.

In 1974 the European Council published the first Council Resolution of 17 December 1974, OJ C 153/2, concerning Community energy policy objectives for 1985. In this Resolution, the Council defined targets for energy consumers and producers, such as energy demand and supply.[65] Following Council Resolution of 9 June 1980, OJ C 149/1 prioritized energy saving and rational energy use amongst member states.[66] In 1986 the Council Resolution of 16 September 1986 OJ C 241 highlighted a few horizontal targets for member states including implementing balanced policies (nature and energy) regarding energy efficiency.[67] It was followed by Communication from the Commission towards a continuous policy for energy efficiency in the European Community COM (1987) 233 final) 14, where the Commission stressed the need for specific regulation on the national level of Member States concerning

"*boilers of central heating systems; ventilation, air conditioning, and heat recovery and buildings*."[68]

During the analysis of these legal acts, McGowan (2011) pointed out that these acts [early acts from the previos para] were marked as the first energy efficiency-related documents and an example of so-called "*crisis management*."[69] This study supports evidence from previous observations with few remarks. So far, all of the Council resolutions provide a superficial framework with general concepts without specification of particular areas (such as energy efficiency in the building sector). However, the presented analysis has shown that European legislation was constantly developing and every new legal act became more specific and more sophisticated. Early European legal acts were not specific enough, but they were steadily enhanced.

The first European Council Directive that addressed energy efficiency in the building sector became the Council Directive 78/170/EEC of 13 February 1978 on the performance of heat generators for space heating and the production of hot water in new or existing

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[65] Council Resolution of 17 December 1974 concerning Community energy policy objectives for 1985 [1974] OJ C 153/2.

[66] Council Resolution of 9 June 1980 concerning Community energy policy objectives for 1990 and convergence of the policies of the Member States [1980] OJ C 149/1.

[67] Council Resolution of 16 September 1986 concerning new Community energy policy objectives for 1995 and convergence of the policies of the Member States[1986] OJ C 241.

[68] COM (1987) 233 final) Communication from the Commission towards a continuous policy for energy efficiency in the European Community (9) [1987]

[69] McGowan 2011, p. 492

non-industrial buildings and on the insulation of heat and domestic hot-water distribution in new non-industrial buildings.[70] This Directive precisely shapes performances in the building sector by defining new standards for generator systems in facilities and the duty to inform the implementation of these standards to the Commission. What is more, the Council Directive 78/170/EEC was supplemented by the Council Directive 1992/42/EEC of 21 May 1992 on efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels.[71] In 2002 both of the Directives were amended by the consolidated and updated version—the Energy Performance of Buildings Directive (2002/91/EC).[72] [73] In his exciting analysis of energy efficiency regulations, Papadopoulos (2016) identifies that 2002/91/EC Directive becomes "a quantum leap" because it is the first consolidated legal act regarding energy efficiency in buildings in Europe.[74]

European legislation also adopted various relevant instruments in areas related to the building sector. In 1992, the Council Directive 1992/75/EEC of 22 September 1992 on the indication by labeling and standard product information of the consumption of energy and other resources by household appliances was introduced.[75] The main target of this Directive is the promotion of more conscious energy efficiency choices by consumers. Labeling of certain products, e.g. labeling ovens and lightbulbs, was chosen as an instrument of these promotions. In the same vein, the Council Directive 93/76/eec to limit carbon dioxide emissions by improving energy efficiency (SAVE) provides a legal framework for determining CO2 emissions through improving energy efficiency in specific sectors, including the building sector.[76] Lately, both Directives were amended by the latest Directive 2017/1369 of the European Parliament and the Council of 4 July 2017.

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[70] Council Directive 78/170/EEC of 13 February 1978 on the performance of heat generators for space heating and the production of hot water in new or existing non- industrial buildings and on the insulation of heat and domestic hot-water distribution in new non-industrial buildings [1978] OJ L 52/32.

[71] Council Directive 1992/42/EEC of 21 May 1992 on efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels OJ L 167/17.

[72] Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings [2002] OJ L 1/65.

[73] Tsagarakis et al, 2012, p. 3987.

[74] Papadopoulos 2016, p. 943.

[75] Council Directive 92/75/EEC of 22 September 1992 on the indication by labeling and standard product information of the consumption of energy and other resources by household appliances [1992] OJ L 297 / 16.

[76] Council Directive 93/76/EEC of 13 September 1993 limits carbon dioxide emissions by improving energy efficiency (SAVE) [1993] OJ L 237/28.

In 2009 the European Commission issued the Green Paper (COM (2005) 265 final) "Energy Efficiency or Doing More With Less."[77] One of the primary purposes of the Green Paper is to identify different ways of increasing energy efficiency (for example, better information to consumers or carbon-related taxation). This paper is addressed to all different levels, including the National level of the Member States.

Overall, a detailed examination of the development of European legislation has been given showing legislation from its most primitive to its becoming a complicated multileveled system.

Previous studies have explored a few positive patterns in European regulations on energy efficiency in the building sector. As noted by Einchhammer and Schlomann (1999), building regulations, in general, are vast and multileveled, and that is why they are primarily settled at the national level.[78] Noailly (2012) pointed out that since 2006 European regulation of the building sector has become more harmonized.[79] Similarly, Papadopoulos (2016) also highlighted as a "(r)evolution" all the changes in the building sector for the previous forty years.[80]

2.3.1 A closer look at the amendment Directives (the Energy Efficiency Directive and the Building Directive)

The previous subchapter gives a brief overview of vital European documents shaping energy efficiency in the building sector legislation over the decades. In turn, this subchapter will conduct a legal analysis of two essential milestones for current European policies in this sector - the EED[81] and the Directive on the energy performance of buildings (the EPBD).[82]

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[77] COM(2005) 265 final. Green paper on energy efficiency or doing more with less. European Commissio [2005].

[78] Einchhammer and Schlomann 1999, p.

[79] Noally 2012, p. 796.

[80] Papadopoulos 2016, p.951.

[81] Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency [2018] OJ L 328/210

[82] Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency [2018] OJ L156/75

The EED was issued in 2012, and in 2018 it was amended as a part of the Clean Energy for all Europeans package.[83] The amendment EED set a vital energy efficiency target - reaching 32.5% of energy efficiency in the EU by the year 2030.

Besides general provisions and targets, the EED has a few vital articles relevant to the building sector's performance. Article 5 of the EED poses obligations on the performances to the continuous renovation of the building stock. Articles 9, 10, and 11 of the EED contain mandatory conditions for metering and billing in the building stock. In turn, articles 14 and 15 of the EED promote energy savings in heating and cooling systems. Last but not least, articles 19 and 20 show essential tools for performances to encourage energy efficiency, including specific tools for the building sector.

Scholars attempted to examine the importance of the EED for promoting energy efficiency in the building sector. For example, Economidou et al. (2020) highlighted that the EED as a legal framework provides new tools for developing energy performances in the Member States compared to previous fragmented European legislation.[84] As noted by Zangheri et al. (2019) the EED Directive (2012) is supplemented by promoting energy efficiency in the building sector.[85]

However, some scholars critically appraise the EED Directive. For example, in his exciting analysis, Trotta (2011) stressed that the target of 32.5 % of the EED is based on theoretical data, which excludes many vital factors.[86]

Following the EED, the EPBD was issued in 2010. In the same vein as the EED, the EPBD was amended after introducing new environmental legal acts in 2018. Compared to the broad framework of the EED, the EPBD specifically addresses the building sector in the EU.

Article 2a of the EPBD provides legal ground for the long-term renovation strategy of the national stock of residential and non-residential buildings by the year 2050 (for reaching the energy and climate targets of the EU). Articles 4 and 5 of the Directive set up minimum energy performance standards for buildings. Here it is vital to take into account that article 4 makes a distinction between old and new stock and climate conditions. Article 9 of the EPBD

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[83] The European Commission, "Energy efficiency directive" (2021) <https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive_en#content-heading-0> (last access 14 April 2022).

[84] Economidou and et. 2020, p. 14-15.

[85] Zangheri et al 2019, p. 12.

[86] Trotta 2019, p. 1886.

provides an essential target—nearly-zero energy buildings. In accordance with Article 2(2), nearly zero energy buildings are buildings with high energy performance, or energy-efficient buildings, powered primarily by renewable sources of energy. Articles 14, 15, 16, 17, and 18 provide an additional legal tool for the Member States—legal inspections of heating and air-conditioning systems.

The academic literature on the EPBD has revealed the emergence of several contrasting themes. In their fascinating analysis of the EPBD Directive Gatt et al. (2020) identify an essential insight—the Member States could successfully reach their energy (and climate) goals only if they have precise data on the state of the building stock. The EPBD gives fundamental tools to the Member States to deal with their building stock.[87] In turn, Magrini et al. (2020) found that introducing the EPBD has important consequences, such as building more efficiently than forty years ago.[88]

Here it is vital to keep in mind that both directives, the EED and the EPBD, are addressed to the Member States, and that their transpositions are mandatory for the Member States.

2.4 Climate targets of the European Union and how they are deal with the energy efficiency

Following the research questions of the current thesis, it is also essential to examine the climate targets of the EU, their relation to the energy goals of the EU, and to what extent they influence the national policies of the Member States.

It is crucial to keep in mind that on the international level, climate targets were introduced at the beginning of the 90s in connection with the introduction of the United Nations Framework Convention on Climate Change (the UNFCCC).[89]

According to Bertoldi (2020), the EU has taken the "*climate leadership*" stance since climate targets have first appeared on the international agenda.[90] What is more, after examining EU climate governance, von Homeyer et al. (2021) concluded that existing European policies still widely support European global climate leadership. For example, there are trends such as the strengthening governance policies, development of legislation,posing

[87] Gatt et al 2020, p. 1.

[88] Magrini et al 2020, p. 3.

[89] Bertoldi 2020, p. 467.

[90] Oberthür and Dupont 2021, p. 1095-1096.

more control over the actions of the Member States, and a robust premature reduction in GHG emissions.[91]

However, a detailed analysis of developing European climate targets is not in the scope of this paper, so in this subchapter, only the relevant energy efficiency current climate targets and goals will be discussed.

To date, within the EU's legal framework there are several legal acts in force related to the climate targets (that are interconnected with energy efficiency):

1. The Energy Union Strategy;
2. Clean energy for all Europeans package;
3. The European Green Deal.

The Energy Union Strategy was published in 2015. The main aim of this strategy is to transform the whole energy system in the EU. *Inter alia*, every European is supposed to have access to affordable and sustainable energy. Achievement of the goals set by the Strategy occurs as a consequence of the application of fifteen action points, including action point ten which directly addresses the problem of efficient use of heating and cooling systems in buildings.[92]

In 2019, the clean energy for all Europeans package was introduced to address the Paris Agreement's goals in more detail.[93] As a part of the Clean Energy for all Europeans package, each Member State introduced National Energy and Climate Plans. Both Finland and Ireland have their national climate and energy plans for 2030.

In 2019, the Finnish Government presented Finland's integrated Energy and Climate Plan. According to this Plan, Finland's main targets are carbon neutrality by 2035, being a fossil-free country, and developing its carbon sinks. The first aim is to become almost

[91] von Homeyer et all 2021, p. 961-963.

[92] COM(2015) 80 final COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK

[93] The European Commission, "National Energy and Climate Plans" (2022). <https://ec.europa.eu/info/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en> (last access 11 April 2022).

emission-free by the end of 2030. As a long-term aim—GHG reduction of 80-95 % by 2050.[94]

According to the 2019 Irish National Energy and Climate Plane, the Republic's main target is to achieve net zero emissions by 2050. To reach this target, the necessary aim for the next decade is GHG reduction of 30% by 2030 (compared to 2005).[95]

In 2020, the European Commission published the European Green Deal—a package of policies to reach a carbon-neutral economy by 2050. As a part of the European Green deal, Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 established the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999—The European Climate Law—was issued in 2021.[96] The European Green Deal includes targets for "renovated, energy-efficient buildings."[97] The first set of proposals is to decrease GHG emissions by at least 55% by the year 2030.[98]

Przyborowicz (2021) pointed out that The European Climate Law becomes fundamental for the EU's climate legal framework. The reason for this is that prior to issuing The European Climate Law, European climate legislation was fragmented.[99]

A brief analysis of the European Climate Targets has shown that they are directly connected to the energy efficiency problem. In other words, it is impossible to reach a carbon-neutral society and other ambitious goals of the EU without energy efficiency, especially without an energy-efficient building sector.

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[94] The European Commission. "Finland's Integrated Energy and Climate Plan" (2019) <https://energy.ec.europa.eu/system/files/2020-01/fi_final_necp_main_en_0.pdf> (last access 23 April 2022), p. 11-12.

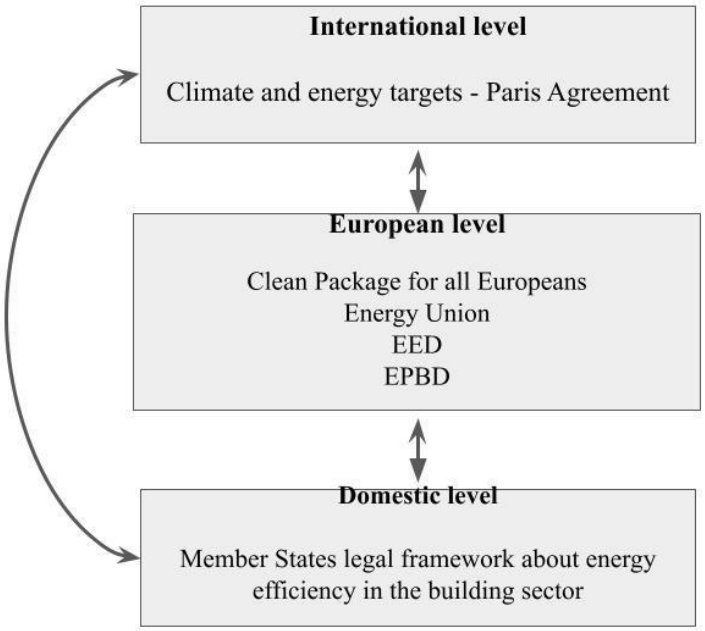
[95] The European Commission. "National Energy and Climate Plan 2021-2030" (2019) <https://energy.ec.europa.eu/system/files/2020-08/ie_final_necp_main_en_0.pdf> (last access 23 April 2022), p. 11.

[96] Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 established the framework for achieving climate neutrality by amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') [2021] OJ L 243/1.

[97] COM/2019/640 final COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS The European Green Deal [2019]

[98] The European Commission, "A European Green Deal" (2022) <https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en> (last access 112 April 2022).

[99] Przyborowicz 2021, p. 50.



Scheme 1. interconnections between climate targets, energy targets, and energy efficiency in the building sector.

Chapter 3. The Republic of Finland: energy efficiency measures in the building sector

3.1 Finland: facts that matter

With regard to the main research question of this thesis, it is vital to keep in mind specific features of the target country relevant to understanding patterns of the energy efficiency in the household sector in Finland.

To begin with, the Republic of Finland is located in Northern Europe. What is more, one-third of the country is in the Arctic Circle. Finland is also one of the biggest European countries by area, with 338,424 km^2.[100] What can be clearly seen in Image 1, the Finnish landscape is mostly flat. The majority of Finland's land area (73.7 %) is covered by

[100] Nordic co-operation. "Facts about Finland" (2022) <https://www.norden.org/en/information/facts-about-finland> (last access 21 June 2022).

Image 1. Map of Finland. Source: worldatlas.co

forests.[101] According to the updated Köpper climate map,[102] the climate of Finland is Dfc - Subarctic, and Dfb - Humid continental climate.[103] According to scientific findings, Finland also has a low chance in facing climate or disaster risks.[104] Finland is sparsely populated. As of March 2022, the population of Finland is approximately 5 549 136 million.[105] It is followed by the fact that the majority of the population lives in the southern part of the country.[106] In turn, according to statistical data, more than 72% of Finnes live in urban areas.[107] Here it is

[101] The World Bank, "Forest Area (% of land area) - Finland" (2020) <https://data.worldbank.org/indicator/AG.LND.FRST.ZS?locations=FI> (last access 01 May 2022).

[102] Köpper climate map is the most world-wide used climate classification. This classification is based on vegetation system of each region.

[103] Grieser et al 2006

[104] Pilli-Sihvola et al. 2018, p. 1272.

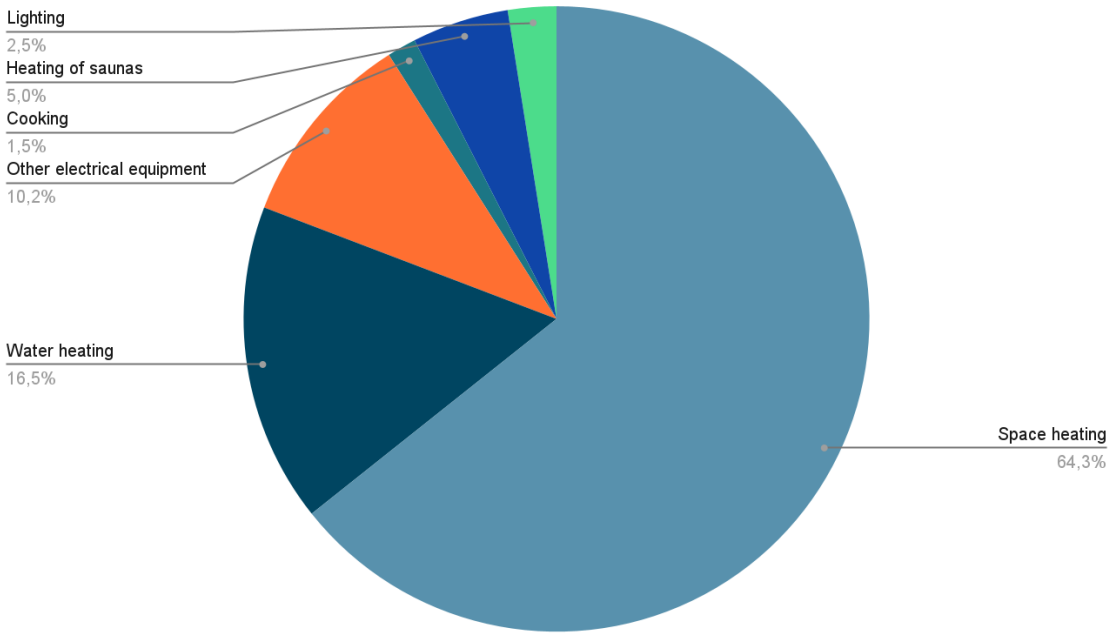
[105] Statistics Finland" (2022) < https://www.stat.fi/index_en.html> (last access 01 May 2022).

[106] IBID

[107] Finnish Environmental Institute. "Updated urban-rural classification: Finland's degree of urbanization currently at over 72 percent" (May 2020)

vital to point out that the northern part of Lappland Province is also a homeland of the indigenous people of Finland—Sámi.

According to data from the Finnish statistical agency, in 2021, Finnish final energy consumption was 376 615 GWh. In turn, the agriculture and household sectors account for



Scheme 2. Household energy consumption in Finland in 2019. Source: Statistics Finland.[108]

28,3 % of the total amount. What is more, in 2021, 34.7 million t CO2 was emitted.[109] Data from the IEA indicates a consistent reduction in the amount of final energy consumption (from 2018) and CO2 emissions (from 2010) in Finland.[110] According to statistical data, household energy consumption in Finland in 2019 is distributed as follows in Scheme 2.

3.2 Challenges that make it hard to reach energy efficiency in the building sector in Finland

<https://www.syke.fi/en-US/Current/Updated_urbanrural_classification_Finlan(57443)> (Last access 09 May 2022).

[108] Statistics Finland. "Finland in figures. Energy. Household energy consumption, 2019" (2022) <https://www.stat.fi/tup/suoluk/suoluk_energia_en.html> (last access 01 May 2022).

[109] Statistics Finland. Energy in Finland. 2021 (2021), <https://www.stat.fi/tup/suoluk/suoluk_energia_en.html#Total%20energy%20consumption> (last access 02 May 2022).

[110] The IEA. "Finland" (2022) <https://www.iea.org/countries/finland> (last access 02 May 2022).

On the question of energy efficiency policies in the building sector, it is also crucial to understand the energy challenges that Finland is currently facing. As discussed above, a brief overview of the Republic will help better examine these challenges.

As for 2022, the most significant challenges Finland faces in energy efficiency in the household sector are:

1. Geographical challenges
    - heating households in a cold season (including saunas);
    - cooling households in a warm season.
2. Economic challenges
    - affordability of the energy prices;
    - cutting energy export;
    - energy poverty.
3. Social and environmental challenges
    - developing of using renewable energy sources instead of non-renewable energy sources;
    - usage of oil-based heating systems;
    - conflicts with overlapping Sami stakeholders' rights;

It is vital to keep in mind that all challenges are interconnected and overlap each other.

3.2.1 Geographical challenges

What stands out in Scheme 2 is that more than a third of the household energy's final consumption covers heating space (64,3 %), water heating (16,5 %), and heating saunas (5,0 %). The total energy spent on heating was 85,8 % in 2021. These numbers could be defined by the geographical location of the country and its Subarctic climate. However, cold winters are not the only climate issue. Here it is also vital to remember that according to climate scientists, the higher the latitude, the more substantial are the effects of global warming.[111] According to Mikkonen et al. (2015), since the 60s, the warming in Finland amounted to "0.2 and 0.4 °C/decade."[112] These changes bring new issues—and now Finns are also having to cool households during warm seasons as a new challenge.

3.2.2 Economic challenges

Considering economic challenges are of high value for achieving energy efficiency in the household sector. For example, Li et al. (2021) found a direct link between energy poverty

[111] Mikkonen et al. 2015, p. 1529.

[112] Ibid, p. 1528.

and energy efficiency levels in the State.[113] Energy prices also are one of the most robust criteria when it comes to making a choice.[114] In a study conducted by Junttila et al. (2018), it was shown that Finnish electricity prices were superior to other Nordic countries.[115] Another economic challenge that Finland is facing is that of energy poverty. According to the EU's Energy Poverty Dashboard, 2,2 % of the Finnish population is incapable of keeping their homes warm.[116] It follows data from the Eurostat Statistical Agency—as of 2012, 25,2 % of households in Finland are unable to be adequately cooled during the summer.[117]

Currently, Finland is facing quite an important challenge of cutting the export of energy from the neighboring countries. According to Statistics Finland, in 2019 Finland's energy dependence was 42%, with major imports from Russia, Sweden, and Norway.[118]

3.2.3 Social and environmental challenges

Replacing energy sources from fuel-based to green is another Finnish challenge. According to the Finnish Energy Agency data, in 2020, 86,5 % of energy sources for district heating were fuel-based (including 46,5 % of biofuel), while 13,5 % belonged to heat-recovery sources. In turn, fuel energy consumption decreased by 13,3 % compared to 2019.[119] However, scholars are cautious about following changes in energy sources. Khosravi et al. (2020) note that eradicating coal will cause an increase in electricity prices, and it will especially affect heating bills.[120] Conversely, Aslani et al. (2014) argue that the development of renewable sources will stabilize energy prices and will prevent unjustified price increases.[121] What can be seen in Image 1 is that Finland is rich in water and forest resources.

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[113] Li et al. 2021, p. 9.

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[115] Juntila et al. 2018, p. 235.

[116] The Energy Poverty Dashboard: Mitigation Energy Poverty in Europe's Private Rented Sector. (2022) <https://www.energypoverty.info> (last access 02 May 2022).

[117] The Eurostat. "share of population living in a dwelling not comfortably cool in summer" (last access 02 May 2022). (08.02.2021) <https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_hcmp03&lang=en> (last access 03 May 2022).

[118]Statistics Finland. Energy in Finland. 2021 (2021), <https://www.tilastokeskus.fi/tup/julkaisut/tiedostot/julkaisuluettelo/yene_efp_202100_2021_23713_net.pdf> (last access 13 May 2022), p. 48

[119] Energiateollisuus. "District heating in Finland 2020" (2022) <https://energia.fi/files/6805/District_Heating_in_Finland_2020.pdf> (last access 02 May 2022), p. 3.

[120] Khosravi et al 2020, p. 15.

[121] Aslani et al. 2014, p. 758.

In turn, Holma et al. (2018) highlighted that there are possibilities to develop forest, wind, hydro, geothermal, biogas, and even solar energy in Finland without severe risks to the environment and the economy.[122]

The northern part of Finland is the homeland of the indigenous Sámi people. Currently, multiple wind plants are expected to be built in the North of Finland.[123] However, building a new wind farm in the North will cause conflicts with overlapping Sámi stakeholders' rights. According to scientific research, representatives of the Sámi community residing in the Sámi homeland are against building renewable energy plants.[124]

3.3. Official Finnish authorities in charge of energy efficiency in the building sector: what should we know about them?

Having given a brief overview of Finland, determining the challenges they are facing in introducing energy efficiency in the building sector in Finland, the current subchapter 3.3. will discuss official Finnish authorities responsible for energy efficiency in the building sector.

To begin with, as was previously indicated, according to article 4 (2(i)) of the TFEU, energy issues are a shared competence of the EU and its Member States. It is vital to acknowledge that both the EU and Finland have a right to adopt legally binding acts regarding energy efficiency in the building sector.

In addition, at the national level all the policies regarding energy efficiency in the building sector are represented by a sophisticated multileveled hierarchical structure, which varies from other Member States' systems. No specific agency has full authority over energy efficiency in the building sector. What is more, competence surrounding energy efficiency in the building sector is spread between different institutions.[125]

The Ministry of Environment (Ympäristöministeriö) is the leading authority in Finland that directly responds to implementing the EPBD at the national level.[126] The Ministry of Environment is also responsible for Finnish climate policies.[127]

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[122] Holma et al. 2018, p. 1438-1439.

[123] Finnish Wind Plant Association. "Map" (March 2022).
<https://tuulivoimayhdistys.fi/en/wind-power-in-finland/map> (Last access 10 May 2022).

[124] Nysten-Haarala et al. 2021, p. 11.

[125] Talus et al. 2010, p. 22.

[126] Laitila and Forssell 2020, p. 5.

[127] Ministry of the Environment (2022) <https://ym.fi/en/> (Last access 10 May 2022).

The Housing Finance and Development Centre of Finland (ARA) is a governmental agency that works under the Ministry of Environment. The main aim of this agency is to implement housing policies. The Housing Finance and Development Centre of Finland is responsible for developing sustainable housing and improving existing housing. Nevertheless, the Agency also participates in research and innovation projects that deal with improving energy efficiency in buildings.[128]

In addition, energy efficiency issues are also related to energy efficiency in the building sector. In this case, a few more agencies are also involved. The Energy Authority (Energiavirasto) is the governmental authority whose main goal is to support achieving climate neutrality through promoting energy efficiency.[129] For this target, the Energy Authority conducts energy surveys (mandatory and volunteering) among energy companies and consumers, gives regional energy consultations to municipalities, energy companies, and consumers, and conducts research. The Energy Authority also monitors price changes in the electricity market.[130] Motiva Oy is another governmental agency whose aim is to adopt sustainable development through promoting energy efficiency, energy transition, and using efficient materials.[131] For consumers, Motiva Oy prepares accessible and understandable information on how to improve energy efficiency in their households, e.g., consulting on choosing a sustainable heating system.[132]

There are also government agencies that indirectly promote energy efficiency in the building sector. For example, VTT conducts research in different areas (including energy efficiency and sustainability).[133] It is followed by the FISE Qualification on Professionals in Building, HVAC, and real estate in Finland (FISE Oy) — a non-profit organization that, in addition to its core target, also collects a data bank of building defects to improve it later.[134] The Finnish HVAC Association (Suomen LVI-liitto SuLVI ry) is a trade union for workers in

[128] ARA. “About ARA” (June 2017) <https://www.ara.fi/en-US/About_ARA> (last access 04 May 2022).

[129] Energiavirasto. “ About us.” (2022) <https://energiavirasto.fi/en/energy-authority >(last access 05 May 2022).

[130] Energiavirasto. “ Energy efficiency” (2022) <https://energiavirasto.fi/en/energy-efficiency> (last access 05 May 2022).

[131] Motiva. “ Sustainable Development” (May 2021) < https://www.motiva.fi/en/sustainable_development> (the access 05 May 2022).

[132] Motiva. “Home and household” (August 2019) < https://www.motiva.fi/en/home_and_household> (last access 05 May 2022).

[133]VTT. “What is VTT.” (2022) <https://www.vttresearch.com/en/about-us/what-vtt> (last access 05 May 2022).

[134] Fise. Information on Fise. (2022) <https://fise.fi/en/information-on-fise/> (last access 04 May).

the HVAC field. This association promotes the development of energy efficiency in the building sector of Finland by providing education for professionals and supporting research in its working area.[135]

Scholars do not agree on the effectiveness of the existing system in Finland. For example, in their analysis, Kangas et al. (2019) found that implementation of regulation in the building sector is non-functional.[136] In the same vein, Pätäri et al. (2016) pointed out that the insufficiency of the current policies (lack of information or lack of financial support) becomes the main obstacle to reaching energy efficiency in the building sector.

3.4 Finnish legal frameworks on the energy efficiency in the building sector

As explained earlier, in subchapters 2.3 and 2.4, Finland, as a part of the EU, is supposed to integrate the EED and the EPBD into the domestic level. It is also vital to keep in mind that Finnish law has been codified differently from the majority of the Member States.[137] The Finnish legal system, as a part of the Nordic legal family, is a hybrid legal system. It consists of elements both from the common legal family and the civil legal family.[138] Finland, unlike other Member States, does not use the "copy-out technique" of transposing European Directives to the national level. In other words, Finland does not mirror Directives in the exact wording.[139] Indeed, Finland uses different order and structure, and often after issuing a new legal act, also amends existing legal acts.[140] Despite that, Finnish energy law nevertheless is intimately related to the EU's energy law.[141] These insights are vital to remember during the examination of the following subchapters.[142]

3.4.1 The Energy Efficiency Act (Energiatehokkuuslaki, 1429/2014)

The first act that will be examined is 2014, the Energy Efficiency Act (Energiatehokkuuslaki, 1429/2014), adopted by the Parliament to comply with the provisions of the EED.[143] According to §1 of the Energy Efficiency Act, the main aim of the Act is to

[135] Sulvi. (2022) <https://sulvi.fi/suomen-lvi-liitto/in-english/> (last access 04 May).

[136] Kangas et al 2018, p. 74.

[137] Talus et al. 2010, p. 17.

[138] Hytönen 2016, p. 230.

[139] Dimitrakopoulos 2001, p. 446.

[140] Halonen 2018, p. 67.

[141] Talus et al. 2010, p. 17.

[142] Here is crucial to mention that in June 2022 a new law comes into force in Finland, unfortunately, the text is not available on the date of writing the current thesis.

[143] Energiatehokkuuslaki, 1429/2014.

promote energy efficiency through introducing the following measures: energy audits, cost-benefit analysis of energy, decrease in the amount of used energy, and networking among energy operators.[144] The Energy Efficiency Act became a cornerstone act for energy efficiency issues in Finland — it introduced the concept of energy efficiency itself (§3), general principles (§1), and the scope of application of the legal act (§2). Chapters 2 and 3 of the Energy Efficiency Act regulate the process of energy audits and requirements for the performance of an audit. Chapter 4 governs the issue of the obligation of energy companies to provide an adequate competitive price for consumers.

3.4.2 Land use and building act (Maankäyttö- ja rakennuslaki 132/1999) and Land use and building Decree (Maankäyttö- ja rakennusasetus 895/1999)

Land use and building act (Maankäyttö- ja rakennuslaki 132/1999), or the national building code of Finland, was issued in 1999 with the main target of ensuring that the land use for building needs will be strongly connected with the promotion of sustainable usage (section 1). Section 117 states that all new buildings are supposed to meet mandatory building requirements, including those about energy savings. Section 117g is entirely devoted to energy efficiency in buildings. According to this section, building materials and techniques are supposed to promote the development of energy efficiency and following energy consumption monitoring. However, this section also makes several exceptions, for example, for buildings less than 50 m^2 or historical buildings. In turn, Section 117g also provides obligations for developing energy efficiency when repairing or remodeling a building, but only if it is "technically, functionally and economically feasible."[145]

Land use and building Decree (Maankäyttö- ja rakennusasetus 895/1999) was also issued in 1999. Section 1 of the Land use and building Decree poses an obligatory impact assessment of the economical usage of energy. §55 of the Land use and building Decree poses an obligation to consider the environmental impact of the building.[146]

As of 2022, the Land use and Building act is in the process of being amended with the main reason being to reach a carbon-neutral society and to improve the quality of the building process.[147] These ambitious goals are supposed to be achieved through introducing several

[144] IBID.

[145]Maankäyttö- ja rakennuslaki 132/1999.

[146] Maankäyttö- ja rakennusasetus 895/1999

[147] Valtioneuvosto."MRL-kokonaisuudistus" (2022) <https://valtioneuvosto.fi/hanke?tunnus=YM014:00/2018> (last access 08 May 2022).

important innovations such as greater public involvement.[148] The draft bill has been under development since 2018.[149] What is more, the draft bill was identified by the official Finnish authorities in connection with the SDG goal 11.[150] However, after a long discussion with stakeholders, it was decided to introduce a new Building Act and withdraw the building section from the Land use and building act. [151] This draft bill will be introduced to the Parliament this autumn.[152]

3.4.3 Other relevant legal acts

Act on the Type Approval of Certain Construction Products (Laki eräiden rakennustuotteiden tuotehyväksynnästä 954/2012) is directly connected with the Land use and building act. According to §1, this Act establishes the verification procedure of compliance of construction products with the requirements set out in the Land use and building act. Act on energy certification of buildings (Laki rakennuksen energiatodistuksesta 18.1.2013/50) establishes the obligation of the owner of the building to obtain an energy certificate. According to §5 of the Act, the energy efficiency of the building is calculated when the energy certificate for a new building is obtained. The decree of the Ministry of the Environment on energy performance requirements for certain technical building systems (Ympäristöministeriön asetus eräiden rakennuksen teknisten järjestelmien energiatehokkuuden vaatimuksista 718/2020). Under the scope of this regulation are automated equipment, building automation, and control systems, and local power generation systems.

The decree of the Ministry of the Environment on the energy performance of new buildings (Ympäristöministeriön asetus uuden rakennuksen energiatehokkuudesta 1010/2017)

[148] Maankäyttö- Ja Rakennuslaki Uudistuu. "Lakiuudistuksen kuulumiset keväällä 2022" (April 2022) <https://mrluudistus.fi/2022/04/lakiuudistuksen-kuulumiset-kevaalla-2022/> (last access 08 May 2022).

[149]Ministry of the Environment. "MRL-kokonaisuudistus" (2022) <https://ym.fi/hankesivu?tunnus=YM014:00/2018> (last access 08 May 2022).

[150]Valtioneuvosto. "Hiilineutraali ja luonnon monimuotoisuuden turvaava Suomi sekä asuntopolitiikka" (2022) <https://valtioneuvosto.fi/marinin-hallitus/hallitusohjelman-seuranta/toimintasuunnitelma/hiilineutraali-ja-luonnon-monimuotoisuuden-turvaava-suomi-seka-asuntopolitiikka#Uudistetaan-maankaytto-ja-rakennuslaki> (last access 08 May 2022).

[151] Maankäyttö- ja rakennusasetus 895/1999

[152] Ministry of the Environment. "Maankäyttö- ja rakennuslain uudistuksen jatkosta linjaus: uusi rakentamislaki sekä alueidenkäytön digitaalisuus eduskuntaan syksyllä" (March 2022) https://ym.fi/-/maankaytto-ja-rakennuslain-uudistuksen-jatkosta-linjaus-uusi-rakentamislaki-seka-alueidenkayton-digitaalisuus-eduskuntaan-syksylla?languageId=fi_FI (last access 08 May 2022).

is issued explicitly for calculating the energy efficiency of a building. This Decree has articles about minimum energy performance requirements for a building (§3), calculation formulas of energy efficiency (chapter 2), and heat losses formulas (chapter 3).

3.5 Finnish policies that promote energy efficiency in the building sector

As briefly discussed in the previous subchapter, Finland has an extensive network of various policies promoting and supporting energy efficiency measures in the building sector. All of the Finnish policies regarding energy efficiency in the building sector could be split into a few major groups:

1. Regulatory measures;
2. Economic measures;
3. Complementary measures.

2.5.1 Regulatory measures

The first group of Finnish policies that aim to promote energy efficiency that will be examined are regulatory measures. It is vital to keep in mind that all regulatory measures are legally binding and performed by governmental organizations.

It is necessary to obtain a building permit by Finnish law before starting construction. The permit application is supposed to contain various documents, including an energy report. This energy report should include compliance with energy standards, gross energy

Measure	Responsible authority	Type
Regulatory measures		
Permits, and certificates	ARA Regional Building Supervision Authority	Mandatory
Performing standards	The Ministry of Environment	Mandatory
Building inspections	City or municipal administrations	Mandatory
Economic measures		
Energy content, waste oil, and carbon taxation	Vero skatt	Mandatory

Measure	Responsible authority	Type
Energy grants	ARA	Volunteering
Energy Audits	Motiva Oy	Mandatory Volunteering
Pricing regulation	The Energy Authority	Mandatory
Cost-benefit analysis	Vero skatt	Mandatory
Green certificates	Motiva Oy	Volunteering
Feed-in-Tariff	The Energy Authority	Volunteering
Energy aid	Business Finland	Volunteering
Complementary measures		
Energy advises - consulting	The Energy Authority	Volunteering
Promoting information	FISE Oy	Mandatory
Research	The Energy Authority ARA VTT	Mandatory Volunteering

Table 1. Finnish policies on energy efficiency in the building sector

consumption and building energy certificates. Building Energy Certificates are also necessary for renting and selling houses. The Building Energy Certificate confirms that the house belongs to a particular energy class. In other words, it gives a brief overview of the energy efficiency of a specific building. [153]

Energy efficiency building inspections are another Finnish regulatory measure conducted by city or municipal administration to check if buildings fulfill mandatory conditions of the Building Code. However, Kangas et al. (2018) found that the city or municipal administration

[153]Motiva. "Energy Performance Certificate" (23 February 2018) <https://www.motiva.fi/en/home_and_household/building/energy_performance_certificate> (last access 14 May 2022).

level of government is not competent enough, which makes energy efficiency building inspections ineffective.[154]

2.5.2 Economic measures

The first economic measures are related to taxation. Currently, Finland is in charge of carbon, energy content, and waste oil taxation. Energy content taxes apply to all kinds of energy sources, but the price varies.[155] Thonipara et al. (2018) pointed out that carbon taxation in Finland is less effective compared to Sweden due to the fact that in Finland carbon taxation varies depending on the quantitative indicators (c/l or c/kg) of fuel. In other words, the usage of light fuel will receive less tax than coal. In terms of resources used to produce and consume energy, a resource like coal is not really used as opposed to light fuel.[156] This creates a paradox of underperformance of the carbon taxation in Finland.

Energy audits are another economic measure that promotes energy efficiency in households. According to the Energy Efficiency Act, currently, in Finland there are two types of audits: mandatory for big corporations and volunteer audits for all companies.[157] Motiva Oy performs audits to evaluate gross energy consumption and predicts possible ways to consume less energy. Legal scientists are optimistic about the value of energy audits for promoting energy efficiency. In their case study, Annunziata et al. (2014) pointed out that energy audits not just support the promotion of the energy efficiency measures but ease their development.[158]

The following economic measure is that of energy grants for homeowners (housing associations, homeowners, and individuals) issued by ARA. These grants are aimed at repaying part of the cost of the owner to renovate the building to improve its energy efficiency performance.[159] The size of the grant covers from 20 to 100% of the cost (depending on the

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[154] Kangas et al. 2018, p. 69.

[155]Vero. "Tax rates on electricity and certain fuels" (March 2022) <https://www.vero.fi/en/businesses-and-corporations/taxes-and-charges/excise-taxation/sahkovero/Tax-rates-on-electricity-and-certain-fuels/> last access 09 May 2022).

[156] Thonipara 2018, p.13.

[157] Motiva. "Energy Audits" (July 2019) <https://www.motiva.fi/en/solutions/energy_audits> (last access 09 May 2022).

[158] Annunziata et al 2014, p.340.

[159]ARA. "Energia-avustukset" (April 2021) <https://www.ara.fi/fi-FI/Lainat_ja_avustukset/Energiaavustus> (last access 09 May 2022).

type of reconstruction), but no more than 6,000 euros.[160] There are also special grants for elderly and disabled people and municipalities to switch from oil heating.[161]

Other relevant government funds for promoting green energy sources are market-based instruments. Energy aid is another suitable instrument allocated to investments to encourage the development of energy efficiency. Energy aid could be issued for a project that involves the implementation of new technologies (that have not been used in Finland before), such as heating plant systems.[162] Feed-in-tariffs contribute to promoting the expansion of the renewable energy sources market through holding a minimum guaranteed price for each Kw,[163] while green certificates prove the origin of green energy that is purchased.[164]

2.5.4 Complementary measures

The last, but not the least, types of measures in Finland are complementary measures. They are not directly connected with energy efficiency in the building sector. However, they positively influence it. These measures are volunteering and addressing both consumers and companies. These measures include giving energy advice, spreading relevant information about carbon-neutrality, climate change, and energy efficiency, promoting more efficient choices, and conducting research about energy efficiency in the building sector.

3.6 Discussion

This study has identified cornerstones that shape Finnish policies about energy efficiency in the building sector. Background information about the target country helped identify specific challenges that affect energy efficiency in the building sector. The examination was followed by an introduction of the official Finnish authority's responses to energy efficiency policies and legal framework. In the end, specific policies for energy efficiency in the building sector were identified.

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[160]ARA. "Avustettavat korjaukset ja avustuksen laskenta" (April 2021) https://www.ara.fi/fi-FI/Lainat_ja_avustukset/Energiaavustus/Avustettavat_toimenpiteet_ja_avustuksen_laskenta (last access 09 May 2022).

[161]ARA. "Avustus kunnille öljylämmityksestä luopumiseen" (December 2021) <https://www.ara.fi/fi-FI/Lainat_ja_avustukset/Avustus_kunnille_oljylammityksesta_luopumiseen> (last access 09 May 2022).

[162]Business Finland. "Replace the energy system with a low-carbon one" (2022)<https://www.businessfinland.fi/en/for-finnish-customers/services/funding/energy-aid> (last access 09 May 2022).

[163] Sijim 2002, p. 6.

[164] Cameron 2007, p. 266.

Finland not just implemented European Directives and aimed to reach its climate goals, but created even more ambitious targets - being the first ever carbon neutral society in the world.[165] A broad perspective was adopted by Pilpola and Lund (2018) who pointed out that reaching Finnish ambitious renewable targets are highly dependent on energy efficiency measures.[166] However, in their study about the effectiveness of building stock sustainability measures, Olkkonen et al. (2021) pointed out that the effectiveness of energy efficiency measures faces some barriers, especially when using biofuels. It could be hard to reach carbon-neutrality, because it will require more carbon sinks, and using biofuel could be hampered by this factor.[167] Some drawbacks also commented on the capability of carbon taxation, more specifically changes in energy efficiency are closely linked to the scope of carbon taxation.[168] As it was discussed before, the scope of Finnish carbon taxation is questionable.

It is also vital to mention that Finland has faced several challenges that impede the development of energy efficiency in the building sector. However, these challenges are pretty different and connected with other issues (such as energy poverty or using biofuels). Their resolution requires a holistic approach and a proper balance of interests.

One of the insights that emerge from these findings is also about Finnish information measures. Ruokamo et al. (2022) highlight the importance of consulting consumers about energy savings in their households — according to their study, adequate information could save up to 10 % of energy during the winter. The primary condition for this is functioning and well-designed energy policies.[169]

In general, therefore, it seems that Finnish energy efficiency in the building sector system is sophisticated and multileveled. Despite some critical reviews, the Finnish legal system is progressive and more importantly, is working. In turn, energy efficiency measures are also complimented by other Finnish institutions.[170]

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[165] The European Commission. "Finland's Integrated Energy and Climate Plan" (2019) <https://energy.ec.europa.eu/system/files/2020-01/fi_final_necp_main_en_0.pdf> (last access 23 April 2022), p. 11-12.

[166] Pilpola and Lund 2018, p. 332

[167] Olkkonen et al. 2021, p. 13.

[168] Thonipara 2018, p.17.

[169] Ruokamo et al. 2022, p. 10.

[170] Motiva. "Energy audits aided by the Ministry of Economic Affairs and Employment (01 December 2021) <https://www.motiva.fi/en/solutions/energy_audits/energy_audits_aided_by_the_ministry_of_economic_affairs_and_employment> (last acess 23 April 2022).

Chapter 4. The Republic of Ireland: energy efficiency measures in the building sector

4.1 Ireland: facts that matter

Subchapter 4.1 will mirror targets of the subchapter 3.1 in a way to help to understand better energy efficiency in the building sector in Ireland by introducing essential knowledge about the target country of the current research.

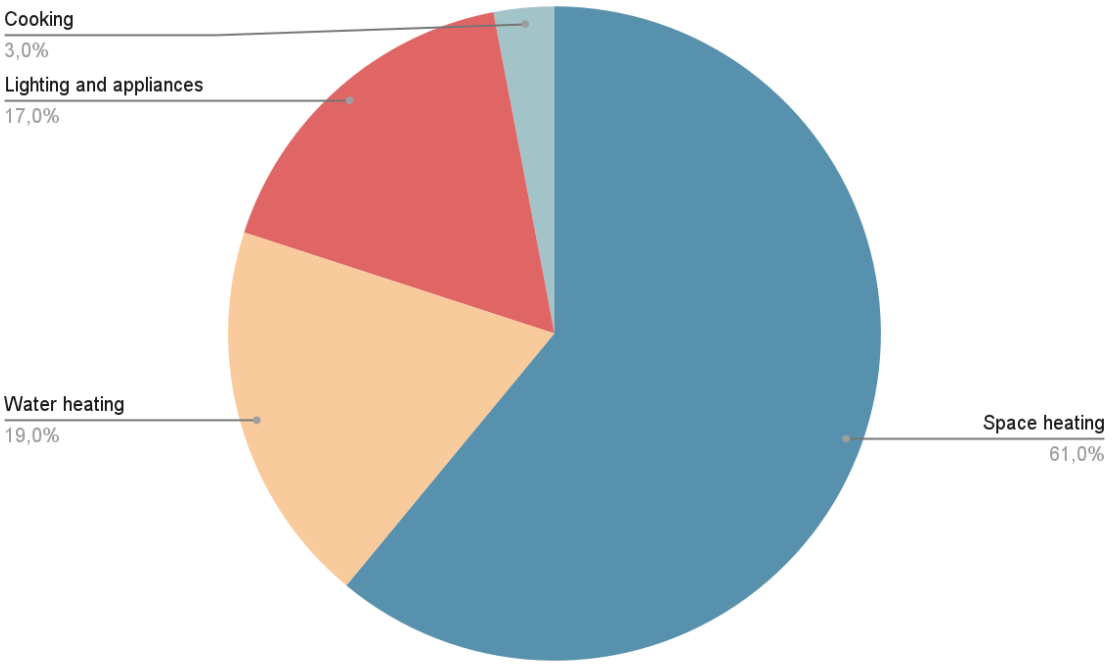
The Republic of Ireland is located in North-Western Europe on an island of the same name. The area of the Irish territory is 68, 890 km^2 - approximately 80% of the island; the rest of the island's territory is Northern Ireland (the United Kingdom).[171] As can be seen from Imagine 2, The Irish landscape is low central plains surrounded by a ring of coastal mountains. Data from the World Bank Agency has

Image 2 Map of Ireland. Source: worldatlas.com[172]

[171] The World Bank, " Land area (sq. km) - Ireland" (2021) <https://data.worldbank.org/indicator/AG.LND.TOTL.K2?locations=IE> (last access 07 June 2022).

[172] World Atlas. "Maps of Ireland" (2022) <https://www.worldatlas.com/maps/ireland> (last access 01 May 2022).

show that the percentage of forested area is 11,4 % of the total area of the country.[173] According to the updated Köpper climate map, the climate of Ireland is Cfb — Oceanic.[174] The data from the Irish climate study has shown that the island is characterized by heavy rainfall and frequent and strong wind gusts.[175] Ireland is moderately populated — by April 2021 the approximate population of Ireland is 5 000 100,[176] while 40,5 % of the total



Scheme 3. Household energy consumption in Ireland in 2016. Source: Sustainable Energy Authority of Ireland.[177]

[173] The World Bank, "Forest Area (% of land area) - Ireland" (2020) <https://data.worldbank.org/indicator/AG.LND.FRST.ZS?locations=IE> (last access 09 May 2022).

[174] Grieser et al 2006

[175] Walsh 2021, p. 6 and 10.

[176] Central Statistic Office (2022) < https://www.cso.ie/en/index.html > (last access 01 May 2022).

[177]Sustainable Energy Authority of Ireland. "Residential" (2022) <https://www.seai.ie/data-and-insights/seai-statistics/key-statistics/residential/> (last access 09 May 2022).

population lives in the capital city — Dublin.[178] According to statistical data, 80% of the Irish population belongs to the urban areas.[179]

Data from the Sustainable Energy Authority of Ireland has shown that in 2019 Irish final energy consumption was 9 898 GWh. In turn, the residential sector shares 28% of the total consumption.[180] It follows by the fact that in 2020 57.70 million tonnes of CO2 was produced, which is 3,6 % less than the previous year.[181] However, energy consumption and emissions have increased in the residential sector by 8.4 % and 6.2 %, respectively.[182]

4.2 Challenges that make it hard to reach energy efficiency in the building sector in Ireland.

Like the Republic of Finland, the Republic of Ireland also faces several challenges that impede the development of energy efficiency in the building sector. It is vital to keep in mind knowledge about Ireland from the previous subchapter because the following Irish challenges are strongly connected to them.

Irish challenges that disrupt the development of energy efficiency in the building sector could be split into the following groups:

1. Geographical challenges
    a. heating households in a cold season;
    b. cooling households in a warm season;
2. Economic challenges

[178]Dublin chair. "Economic profile of Dublin" (2022) <https://www.dublinchamber.ie/About-Us/Economic-Profile-of-Dublin> (last access 09 May 2022).

[179] Central Statistic Office. "Urban and Rural life in Ireland" (2019) <https://www.cso.ie/en/releasesandpublications/ep/p-urli/urbanandrurallifeinireland2019/agesexandgeographicaldistribution/> (last access 09 May 2022).

[180]SEAI. "Energy in Ireland 2021. Final Report" (December 2021) <https://www.seai.ie/publications/Energy-in-Ireland-2021_Final.pdfSEAI. "Energy in Ireland 2021. Final Report" (December 2021) <https://www.seai.ie/publications/Energy-in-Ireland-2021_Final.pdf> (last access 09 May 2022), p 22.

[181]Environmental Protection Agency. "Latest Emissions Data" (2022) <https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/latest-emissions-data/> (last access 09 May 2022).

[182] SEAI. "Energy in Ireland 2021. Final Report" (December 2021) <https://www.seai.ie/publications/Energy-in-Ireland-2021_Final.pdfSEAI. "Energy in Ireland 2021. Final Report" (December 2021) <https://www.seai.ie/publications/Energy-in-Ireland-2021_Final.pdf> (last access 09 May 2022), p 22. p. 4.

a. affordability of the energy prices;
b. energy poverty;
c. energy security.

3. Social and environmental challenges
    a. investment in using alternative renewable energy sources to offshore wind plants;
    b. switch to a district heating system or heat pumps;

4.2.1 Geographical challenges

The geographical features of Ireland, especially the amount of rainfall and the strength of the winds, have determined mainly geographical challenges. What is striking in Scheme 4 is that 80 % of household energy consumption was spent on heating needs — 19% on water heating and 61% on space heating. As was noted by Sweeney (2020), the average temperature in Ireland from the 60s increased by 0,5 %.[183] Climate change also brings new issues, such as the enhanced probability of floods in winter and summer droughting.[184]

4.2.2 Economic challenges

Energy poverty is a severe Irish challenge. What is more, Ireland is one of the few first member states that recognized this problem on their political agenda.[185] In accordance with the EU's Energy Poverty Dashboard, 4,82 % of the Irish population is incapable of keeping their homes warm.[186] It follows data from the Eurostat Statistical Agency - as of 2012, 4,0 % of households are unable to cool enough during the summer.[187] Here it is crucial to keep in mind that for Ireland, the reasons for energy poverty lie not in the country's climate features, but are a result of overlapping low income and lack of energy efficiency in the household sector.[188] Affordable energy prices are another economic challenge that directly follows the

[183] Sweeney 2020, p.18.

[184] IBID , p.31.

[185] Kerr et al. 2019, p. 195.

[186] The Energy Poverty Dashboard: Mitigation Energy Poverty in Europe's Private Rented Sector. (2022) <https://www.energypoverty.info> (last access 02 May 2022).

[187] The Euorostat. "share of population living in a dwelling not comfortably cool in summer" (last access 02 May 2022). (08.02.2021) <https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_hcmp03&lang=en> (last access 03 May 2022).

[188] Streimikiene et al. 2020, p. 8.

energy poverty challenge. According to data from the Energy Report, between 2015 and 2020, energy prices in the Republic of Ireland grew by 4,6 %.[189]

Energy dependence is also on the grid of the day in Ireland. In 2018, Irish energy dependence on imports was 67 %, mainly from the EU and Norway. However, even though the numbers significantly fell between 2005 and 2018, this challenge is still on the agenda.[190]

4.2.3 Social and environmental challenges

Nowadays, an increased share of renewable energy sources instead of non-renewable sources is on the Irish agenda. Data from the energy report has shown that 42% of all energy in 2020 was generated by renewable sources, while 86% of renewable energy was generated by wind sources.[191] In their study, Assereto and Byrne (2021) identify that Ireland needs to invest in alternative renewable sources. In turn, they also identify the possibility of developing solar energy power plants.[192] In the same vein, Rourke et al. (2009), in their study, pointed out that Ireland has a potential for developing alternative renewable energy sources such as biomass, geothermal, wave, tidal, and hydro-energy.[193] Similarly, Yue et al. (2020) highlight that the development of renewable sources will not just reduce carbon emissions but reduce energy dependence on imports.[194]

Developing a district heating and cooling system in Ireland is currently one of the biggest challenges. According to data, only 1 % of all consumers are connected to the district heating system in Ireland.[195] While carrying out an investigation about the potential of a district heating system in Ireland, Mahom et al. (2021) found that the introduction of the district heating system will have the lowest impact on the environment and will help the country stay committed to producing renewable heat.[196]

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[189] Energy in Ireland. 2021 Report (December 2021)
<https://www.seai.ie/publications/Energy-in-Ireland-2021_Final.pdf> (last access 19 May 2022), p. 67.

[190] Energy security in Ireland. 2020 Report (September 2020)
<https://www.seai.ie/publications/Energy-Security-in-Ireland-2020-.pdf> (last access 19 May 2022), p. 3.

[191] Energy in Ireland. 2021 Report (December 2021)
<https://www.seai.ie/publications/Energy-in-Ireland-2021_Final.pdf> (last access 19 May 2022), p. 3.

[192] Assereto and Byrn 2021, p. 8.

[193] Rourke et al. 2009, p. 1977-1982.

[194] Yue et al. 2020, p. 15.

[195] District heating and cooling. spatial analysis Of Infrastructure Costs and Potential in Ireland. (February 2022)
<https://www.seai.ie/publications/District-Heating-and-Cooling.pdf> (last access 19 May 2022), p. 1.

[196] Mahon et al. 2022, p. 13.

4.3. Official Irish authorities in charge of energy efficiency in the building sector: what should we know about them?

With respect to the main research question of the current work, following the logic of the paper and keeping in mind information that was introduced in subchapters 3.1 and 3.2, it is vital to determine official authorities that are responsible for government energy efficiency in the buildings sector in the Republic of Ireland.

It is crucial to keep in mind the discussion from subchapter 2.3 that according to 4 (2(i)) of the TFEU, energy issues are in shared competence between the EU and its Member States. Ireland, as a member state, has legally adopted binding legal acts regarding energy efficiency issues, and Ireland is within the scope of European Conventions.

It follows by the fact that the political system of Ireland is heavily centralized with a limited power of the local authorities and municipalities.[197] The system is multileveled with mostly state actors.

To begin with, energy efficiency issues are in the competence of the Department of Communications, Climate Action and Environment (DCCAE). In 2017 DCCAE issued the Public Sector Energy Efficiency Plan, which set fundamental changes in policies intended to achieve Irish ambitious climate targets, including reduction of carbon emissions.[198] The DCCAE is also in charge of promoting public information campaigns.[199] The Department of Housing, Local Government and Heritage (DEHELGH) is in charge of setting building standards, including setting standards and control over the energy performance of buildings.[200] In fact, this Department directly responds to implementing the EPBD in Ireland.[201]

The central government authority that is in response to energy efficiency issues is the Sustainable Energy Authority of Ireland (SEAI). The SEAI is the national authority with a

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[197] Dubuisson, p. 2.

[198] Public Sector Energy Efficiency Plan, p. 5.

[199] Government of Ireland. "'Reduce Your Use': Government launches nationwide campaign to encourage energy efficiency and highlight supports available for households and businesses" (28 April 2022) <https://www.gov.ie/en/press-release/7b221-reduce-your-use-government-launches-nationwide-campaign-to-encourage-energy-efficiency-and-highlight-supports-available-for-households-and-businesses/> (last access 20 May 2022).

[200] Government of Ireland. "Housing" (05 May 2020) <https://www.gov.ie/en/policy/aa076a-housing/> (last access 20 May 2022).

[201] Government of Ireland. "Energy Performance of Buildings" (29 October 2021) <https://www.gov.ie/en/publication/39fe4-energy-performance-of-buildings/> (last access 20 May 2022).

primary focus on sustainable energy for achieving Irish ambitious climate targets.[202] The SEAI has a wide range of powers, including giving grants to households for reaching more efficient energy usage,[203] providing information to households about possible ways to improve energy efficiency and reduce energy costs,[204] ranking households' energy performances,[205] conducting research,[206] and supporting the introduction of new energy technologies at all levels.[207] The SEAI also examines customers' behavior to stimulate continuous development of energy efficiency in the building sector in line with existing government policies.[208]

The District Heating Steering Group is another government committee that was founded for the promotion of the district heating system in Ireland. This committee is responsible for conducting research for the further improvement of the Irish market, Irish legislation, and funding system following the development of the district heating system.[209]

In conclusion, it is essential to mention non-state actors. The Commission of Regulation Utilities (CRU) is an independent regulator whose aim is to protect the interests of customers and to ensure efficient usage of energy.[210] The CRU also provides necessary information for customers that supplement the promotion of energy efficiency in households, such as energy savings advice to customers or general information about energy schemes and benefits.[211]

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[202] The SEAI. "Sustainable Energy Policy" (2022) <https://www.seai.ie/about/policies/> (last access 20 May 2022).

[203] The SEAI. "Home Energy Grants" (2022) <https://www.seai.ie/grants/home-energy-grants/> (last access 20 May 2022).

[204] The SEAI. "Home Energy" (2022) <https://www.seai.ie/home-energy/> (last access 20 May 2022).

[205] The SEAI. "Building Energy Rating BER" (2022) <https://www.seai.ie/home-energy/building-energy-rating-ber/> (last access 20 May 2022).

[206] The SEAI. "Data and Insights" (2022) <https://www.seai.ie/data-and-insights/> (last access 20 May 2022).

[207] The SEAI. "Technologies" (2022) < https://www.seai.ie/technologies/> (last access 20 May 2022).

[208] The SEAI. "Behavioral insights on energy efficiency in the residential sector" (2022) <Behavioural-insights-on-energy-efficiency-in-the-residential-sector.pdf> (last access 20 May 2022).

[209] Government of Ireland. "District Heating Steering Group." (05 May 2022) <https://www.gov.ie/en/publication/3f132-district-heating-steering-group/>(last access 20 May 2022).

[210]CRU. "What We Do." (2022) https://www.cru.ie/home/about-cru/what-we-do/ (last access 20 May 2022).

[211] CRU. "Energy" (2022) <https://www.cru.ie/home/customer-care/energy/> (last access 20 May 2022).

What is more, Irish energy companies are also included in promoting energy efficiency in residential houses. For example, Bord Gáis Energy [212]or Flo gas [213] companies.

4.4 Irish legal frameworks on energy efficiency in the building sector,

After conducting the legal analysis of specific Irish policies, it is vital to conduct legal research on current Irish legislation on energy efficiency in the building sector. However, before examining the Irish legal framework for energy efficiency in the building sector, it is vital to point out the specifics that shaped the Irish legal system.

The Irish law has four primary sources: the common law, the Constitution of Ireland, the European Convention on Human Rights, and the European Union law.[214] Hence, secondary law sources have been used to transport European Directives into the domestic legislation. Here it is crucial that during the transporting of European Directives, primarily law could be amended or even abolished.[215]

4.4.1 Energy Efficiency regulations

To comply with the European legislation in 2014, European Union (Energy Efficiency) Regulations were issued. This legal act consists of essential clauses that shaped energy efficiency in the republic. 2014 European Union (Energy Efficiency) Regulations provide a legal basis for energy audits (part 3), metering and billing (part 4), promotion of efficient heating and cooling (part 5), national assessment of energy efficiency (part 6), and regulating work of the SEAI (part 7).[216]

In the same year, European Union (Energy Efficiency Obligation Scheme) Regulations 2014 was also issued. Under the Energy Efficiency Act these regulations promote the development of energy efficiency relations in the Republic of Ireland. They provide a legal ground for the energy efficiency obligation scheme and energy saving obligations. [217]

4.4.2 The Building Regulations 1990-2019.

Irish building regulations could be split into two major groups: the National Building Code of Ireland — Building Control Act 1990 and Amendments to the Building Control Act.

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[212] Bord Gas. “Energy Efficiency” (2022) <https://www.bordgaisenergy.ie/services/energy-efficiency> (last access 21 May 2022).

[213] Flo Gas. “Energy Awareness” (2022) <https://www.flogas.ie/residential/energy-awareness/> (last access 21 May 2022).

[214] Binchy 2011, p, 151.

[215] Furlong 2014, p. 280-281.

[216] S.I. No. 426/2014 - European Union (Energy Efficiency) Regulations 2014.

[217] S.I. No. 131/2014 - European Union (Energy Efficiency Obligation Scheme) Regulations 2014.

The Building Control Act 1990 was issued in 1990. It provides the vital legal framework for all building issues in the Republic of Ireland, e.g., through defining building controlling authorities (section 2) or prohibition of using certain materials (section 13). Before the vital amendments, the Building Control Act did not have any specific provisions about energy efficiency related issues; however, sections 3 (c) and section 3(d) empower the Minister for the Environment to make necessary provisions regarding energy "in relation to buildings" and about efficient use of resources.[218]

However, further amendments to the Building code bring changes. Amendments to the Building Control Act 2002 insert part L to the Building code, which provides clauses about the conservation of fuel and energy.[219] Further amendments continued to make changes to this section. Amendments to the Building Control Act 2017 become a benchmark for energy efficiency measures in Ireland. Section L1 imposes obligations on constructors that all buildings are to be built in a way where their energy performance limits the amount of CO2 emissions and energy usage. In turn, section L2 gives an overview of how to ensure that existing buildings are in line with section L1, while section L3 gives standards for buildings under construction.[220]

The 2019 Amendment to the Building Control Act provides more detailed clauses about energy conservation measures in dwellings. Section 5 provides exemptions for sections for buildings (e.g., historical monuments) under the obligatory energy efficiency measures. This Amendment also specifies minimum technical requirements for existing buildings and new buildings (Nearly Zero Energy Buildings).[221] The following Amendment also provides essential changes to Section L: establishing renovation, giving exemptions for protected structures under the Planning and Development Act 2000, and providing a link to the EPBD.[222]

4.4.3 Technical Guidance Document L 2021: Conservation of Fuel and Energy – Buildings other than Dwellings

Technical Guidance Document L 2021 has been adopted in Ireland for supporting measures that were introduced by the Building Code throughout implementing necessary

[218]Building Control Act 1990.

[219] S.I. No. 284/2002

[220] S.I. No. 538 of 2017

[221] S.I. No. 183 of 2019

[222] S.I. No. 284/2002

technical standards for building under construction and renovations. It regulates areas such as building fabrics (1.4), HVAC systems (1.4.1 - 1.4.4), or lighting (1.4.6). This guidance has been amended a few times, and the last version was issued in 2021.[223]

4.5 Irish policies that promote energy efficiency in the building sector

Following the paper's logic and according to the main research question, this subchapter will present Irish policies for energy efficiency in the building sector. All existing measures could be split into the following groups:

1. Regulatory measures;
2. Economic measures;
3. Complementary measures.

Measure	Responsible authority	Type
Regulatory measures		
Building standards	Building Control Authority SEAI	Mandatory
Permits and certificates	Building Control Authority SEAI	Mandatory
Economic measures		
Carbon taxation	Tax Agency	Mandatory
Micro-generation support scheme	SEA	Volunteering
Clean Export Guarantee Support Scheme	CRU	Volunteering
Smart Meters National Programme	CRU	Mandatory
Better Energy Community	SEAI	Volunteering

[223] Technical Guidance Document L- Conservation of Fuel and Energy – Dwellings (2021).

Scheme		
Government Electricity Credit	CRU	Volunteering
Energy audits	SEAI	Mandatory
Energy Efficiency obligation scheme	SEAI	Volunteering
Complimentary measures		
Energy advice to consumers	SEAI CRU	Volunteering
Providing relevant information	DCCAE SEAI Companies	Volunteering
Conducting research	SEAI District Heating Steering Group	Volunteering Mandatory
Energy labeling of certain products	SEAI - promotion	Mandatory

Table 1. Irish policies on energy efficiency in the building sector

4.5.1 Regulatory measures

The first group of Irish measures that will be discussed is regulatory measures. Regulatory measures are legally binding and performed by state actors— governmental institutions.

To begin with, according to Irish legislation, it is necessary to obtain a building permit before starting the construction of a building or doing any construction work in existing structures. An application for a license must contain a list of necessary documents, including documents about the conservation of fuel and energy.[224] According to technical guidance documents about the preservation of fuel and energy, license applications are supposed to

[224] Irish Point of Single Contract. "Building requirements" (2022) <http://www.pointofsinglecontact.ie/establishing-a-place-of-business/planning-and-building-requirements.html> (last access 27 May 2022).

contain information about building fabrics, building services, and construction quality.[225] In turn, the building energy performance certificates appraise each building (under construction and already existing) according to the energy performance scale. Ranking based on the HVAC system, lighting, and heating water and space.[226]

It follows strict building standards that should be followed during the construction of a new building or reconstruction of an existing one.

4.5.2 Economic measures

In 2010 the Irish Government introduced carbon taxes for liquid and gaseous fuels that the European Emission Trading Scheme did not cover. The tax has been increased several times since its introduction.[227] Bercholz and Roantree, in their paper, pointed out that low-income households spend a vast amount of their income on carbon products, and carbon taxation could lower their standards of living.[228]

Supporting schemes for the promotion of using energy from renewable sources play a crucial role in promoting energy efficiency in the building sector. These schemes are Micro-Generator Support Scheme, Clean Export Guarantee, Better Energy Community Scheme, and Smart Metering. Micro-Generator Support Scheme and Clean Export Guarantee are brand new schemes that the Irish Government adopted in 2021.[229] Micro-Generator Support Scheme was introduced for buildings constructed before 2021 and do not meet energy standards. Home owners could apply for funding to install Solar Panels for further production of energy from renewable sources.[230] According to the Clean Export Guarantee scheme, electricity customers with their own renewable energy sources will be allowed to sell

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[225] Building Regulations Technical Guidance Document L 2021 Conservation of Fuel and Energy – Buildings other than Dwellings

[226] SEAI. "Understand a BER rating" (2022) <https://www.seai.ie/home-energy/building-energy-rating-ber/understand-a-ber-rating/> (last access 27 May 2022).

[227] Citizen Information. "Carbon Tax" (12 October 2021) <https://www.citizensinformation.ie/en/money_and_tax/tax/motor_carbon_other_taxes/carbon_tax.html> (last access 30 May 2022).

[228] Bercholz and Roantree 2019, p. 2.

[229] Government of Ireland. "Micro Generation" (17 February 2022) <https://www.gov.ie/en/publication/b1fbe-micro-generation/#micro-generation-support-scheme> (last access 30 May 2022).

[230] SEAI. "Solar Electricity Grant" (2022) <https://www.seai.ie/grants/home-energy-grants/solar-electricity-grant/> (last access 30 May 2022).

surplus energy produced to the energy network.[231] As for now, this scheme is non-legally binding. What is more, energy suppliers are adjustable in choosing the way for providing a back payment to electricity customers.[232]

The Smart National Programme is intended to make all buildings in Ireland have a smart meter device that will help to lower people's carbon footprint by providing a Time on Use Tariff (the price of energy depends on the time of the usage) by 2024.[233] Installation of the smart meter is free of charge.[234] The Better Energy Community Scheme is a national program of modernizing building stock through the provision of grants to provide cost-effective approaches to households with low incomes.[235]

The Government Electricity Credit —a one-time fixed payment to consumer's electricity bills for specific households — is the next Irish measure.[236] These measures were presented to support customers due to the increase in energy prices.[237] Energy Audits are another mandatory Irish economic measure that are aimed at analyzing energy usage of a household to develop efficient usage of energy further and to calculate the profit that results from

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[231] CRU. "Remuneration of Renewables Self-consumers for exported electricity: Interim Clean Export Guarantee" (01 December 2021) <https://www.cru.ie/wp-content/uploads/2021/12/CRU21131-Interim-Clean-Export-Guarantee-Decision-Paper.pdf> (last access 30 May 2022), p. 1-3.

[232] CRU. "Non-binding Guidance to Electricity Suppliers on implementation aspects of Interim Clean Export Guarantee" (08 February 2022), p. 10. <https://www.cru.ie/wp-content/uploads/2022/02/CRU202207-CRU-Supplier-Guidance-on-Interim-Clean-Export-Guarantee-.pdf> (last access 30 May 2022), p. 10.

[233] CRU. "Smart Meters" (2022) <https://www.cru.ie/home/smart-meters/> (last access 30 May 2022).

[234] CRU. "National Smart Metering Program" (2022) (https://www.cru.ie/home/smart-meters/national-smart-metering-programme/ (last access 30 May 2022).

[235] The SEAI. "BEC Application Guide" (2022) <https://www.seai.ie/grants/community-grants/project-criteria-and-funding/Communities-Grant-Guidelines-2022.pdf> (last access 30 May 2022).

[236] Citizens Information. "Electricity Account Credit" (16 March 2022) <https://www.citizensinformation.ie/en/consumer/utilities/electricity_account_credit.html> (last access 30 May 2022).

[237] Government of Ireland. "Ministers McGrath and Donohoe announce €505 million package in measures to mitigate the cost of living" (11 February 2022) <https://www.gov.ie/en/press-release/2e239-ministers-mcgrath-and-donohoe-announce-505-million-package-in-measures-to-mitigate-the-cost-of-living/> (last access 30 May 2022).

introducing renewable energy sources.[238] The Energy Efficiency obligation scheme is an economic tool that helps achieve energy efficiency in the building sector. For households, the Irish Government provides financial and technical support to the project for insulation, heating, glazing, and information areas.[239]

4.5.3 Complementary measures

Complementary measures are the last group of measures in the Republic of Ireland to promote energy efficiency in the building sector. These measures include giving energy advice to consumers, providing relevant information about energy efficiency in buildings, climate change, and carbon neutrality goals, and conducting research about developing energy efficiency in the building sector. Another measure is energy labeling to promote more green choices.[240] These measures are not legally binding. However, they are vital instruments in developing energy efficiency because they target people's opinions and knowledge, which in turn help to make more efficient choices.

4.6 Discussion

Chapter 4 provides essential information about Irish benchmarks for energy efficiency in the building sector. It has shown a brief overview of the country and the challenges Ireland is facing nowadays that hinder the development of energy efficiency in the building sector. Further examination identifies official authorities that regulate energy efficiency issues and the Irish legal framework. Then, Irish national policies for energy efficiency in the building sector were presented.

As well as Finland, Ireland has introduced its climate goals. However, they are not as ambitious as the Finnish goals. The Irish goals are more similar to the European Union's climate goals. In general, therefore, it seems that the existing Irish system on energy efficiency in the building sector is in line with the country's targets. However, researchers argue that some changes are still needed to reach them. Ahern and Norton (2019) highlighted that even if the existing grant system for customers is good enough, it still needs to be

[238] The SEAI. "Energy Audit Handbook" (2022) <https://www.seai.ie/publications/SEAI-Energy-Audit-Handbook.pdf> (last access 30 May 2022), p. 6.

[239] SEAI. "Energy Efficiency Obligation Scheme" (2022) <https://www.seai.ie/business-and-public-sector/business-grants-and-supports/energy-efficiency-obligation-scheme/> (last access 07 June 2022).

[240] The SEAI. "Energy Labelling" (2022) <https://www.seai.ie/home-energy/energy-labelling-and-ecodesign/energy-labelling/> (last access 07 June 2022).

improved.[241] It is followed by the fact that the national Irish legal framework for energy efficiency in the building sector is complicated and multileveled.[242]

It is also vital to keep in mind that Ireland has faced several challenges that could disrupt the promotion of energy efficiency in the building sector. For example, Moran et al. (2020) found that to properly promote energy efficiency, the problem of having gas-heating systems in houses is supposed to be solved.[243] Moreover, these challenges are interrelated, and their resolution will need an introduction of a holistic approach.

The results in this chapter indicate that overall national Irish policies in energy efficiency in the building sector are favorable. Notwithstanding some drawbacks, it seems that they nevertheless lead to achieving Ireland's climate goals.

Chapter 5. Discussion

So far, this paper has presented focused discussions about energy efficiency in the building sector in general with a brief overview of the EU's legislation and a more detailed comparative examination of current policies between Finland and Ireland. Keeping all the insights from previous chapters in mind, this chapter discusses supplemented sub-questions along with the research question of the thesis.

Subquestion 1: What is energy efficiency? How is energy efficiency determined by the European legislation and linked to the European climate goals?

Comparing the findings with those of other studies confirms that energy efficiency itself is a broad term, and it lies beyond the legal science, which in turn requires using a holistic approach to determination. However, thus far, the thesis has argued that neither legal scholars nor scholars from other fields have agreed on what energy efficiency is. What is more, researchers are also arguing about possible ways to count energy efficiency. It follows that European Legislation also brings no clarification — as discussed in section 2.1, European lawmakers define energy efficiency differently in different legal acts. However, while various definitions of the term energy efficiency have been suggested, the current thesis describes energy efficiency as "using less energy to achieve the same amount of necessary performance or service or energy."

[241] Ahern and Norton 2019, p. 12.

[242] Debusson, p. 3.

[243] Moran et al 2020, p. 13.

It was also found in chapter 2 that European legislation and climate goals are closely intertwined. More specifically, the research has shown the development of the European Energy Efficiency legislation alongside the increasing awareness of policies on climate change issues. More specifically, in section 1.5 it was determined that developing energy efficiency and achieving climate goals are closely linked, which was discovered through the analysis of a few essential EU legal acts. According to data, it can be inferred that it is impossible to reach ambitious goals such as carbon neutrality, zero emissions, and keeping the global temperature above 2.5 degrees without proper promotion and development of the energy efficiency issues (and precisely energy efficiency in the building sector).

It follows that European legislation about energy efficiency in the building sector is akin to European climate goals. As discussed before, household energy usage is one of the most significant sources of carbon emissions.

Subquestions 2 & 3: Are current Finnish/Irish legislation about energy efficiency in buildings sufficient enough to reach Finnish/Irish climate goals? What are the pros and cons of both of these EU nations?

The present study was designed to determine the sufficiency of the current Finnish and Irish legislation regarding energy efficiency in the building sector. In turn, chapters 3 and 4 cover Finnish and Irish legislation and policies about energy efficiency in the building sector.

Following the present results, the recent research work suggests the following chart about the advantages and disadvantages of current Finnish and Irish legislation regarding energy efficiency in the building sector.

	Finland	**Ireland**
Benefits	Wide support of the development of energy efficiency in the building sector on all levels, including mandatory solid economic measures (e.g. taxes), legally-binding standards (using certain materials), non-binding measures (e.g. volunteering energy audits), and various amount of economic benefits (e.g. grants)	
	Strong promotion of the green movement, country's climate goals, energy savings through spreading knowledge among population and provides necessary every day usage tips	

<table>
<tr><td></td><td colspan="2">Conducting research studies about developing energy efficiency in the building sector on all levels (from understanding people's opinion to developing new renewable energy sources)</td></tr>
<tr><td></td><td colspan="2">Multileveled complicated and holistic structure of state and non-state actors that widely cover all necessary areas</td></tr>
<tr><td></td><td colspan="2">Promoting "side" issues that overall will positively affect developing energy efficiency in the building sector (increasing energy security, invest into renewable energy sources, labeling certain products)</td></tr>
<tr><td></td><td colspan="2">Equal focus on new building, buildings under reconstructions, and on existing building stock</td></tr>
<tr><td></td><td colspan="2">Including non-state actors for promotion of energy efficiency in the building sector</td></tr>
<tr><td></td><td>Setting more ambitious climate targets than required by the EU</td><td rowspan="2">Having one specific agency dealing with energy efficiency in the building sector</td></tr>
<tr><td></td><td>Easy access to information about state policies and legislation, information available in two state languages and in English</td></tr>
<tr><td>Drawbacks</td><td colspan="2">Challenges that countries are currently facing that is impeding the development of energy efficiency in the building sector (energy poverty, energy security, use of renewable energy sources)</td></tr>
<tr><td></td><td colspan="2">Solving some challenges (such as energy security) will potentially raise the level of energy poverty, that in turn will negatively affect the development of energy efficiency</td></tr>
<tr><td></td><td>Not having one specific agency that works with energy efficiency in the building sector</td><td>Not having one consolidated version of existing legal acts about energy efficiency regulations</td></tr>
</table>

	Ambitious goals lead to conflicts with Sámi community	Ambitious goals impeded by lack of district heating system
	Non-effective system of charging carbon taxes	Not easy access to information

Table 3. Advantages and disadvantages of current Finnish and Irish legislation regarding energy efficiency in the building sector

Overall, this study, within its limitations, has identified that current Finnish and Irish policies are more positive in the way they promote the development of energy efficiency in the building sector.

It is vital to mention that both countries have a number of constraints that may adversely affect the achievement of their climate goals in the most sustainable way. However, there are ways where these challenges can be addressed suitably. This thesis suggests some recommendations in subquestion 5.

Subquestion 4 What are the similarities and differences between current Irish and Finnish legislation regarding energy efficiency in the building sector?

This sub question focuses on the differences and similarities between Finland and Ireland in implementing energy-efficient measures in the building sector.

	Finland	**Ireland**
Specific agency about energy efficiency issues in the building sector	No	Yes
Implementing European Directives	Yes	Yes
Direct using of wording of European Directives in their domestic legislation	No	No
Fragmented legislation regulates energy efficiency in the building sector	Yes	Yes
Wide range of domestic policies (including non-binding measures such as research)	Yes	Yes
Measures that are focusing on a renovation of building	Yes	Yes

stock		
Measures that are focusing on constructing new buildings	Yes	Yes
Measures that are focusing on existing building stock	Yes	Yes
Potential of developing renewable sources	Yes	Yes
Decreasing amount of CO2 emissions	Yes	Yes

Table 4. Similarities and differences between current Irish and Finnish legislation regarding energy efficiency in the building sector

Overall, it can be seen from the previous chapter and from the comparative summary in Table 4, both countries of the current research, in general, follow the same trends, however, differences are caused by the different backgrounds (including differences in the inner-workings of their respective legal systems), specific challenges that countries are facing nowadays, and different approaches that they use in reaching their climate targets.

Subquestion 5 How can current legislation in Ireland and Finland regarding energy efficiency in the building sector be improved in a way that reaches their climate targets?

The present research conducts in-depth research about energy efficiency in the building sector in Finland and Ireland. The analysis of each country includes background and general information, challenges, administrative authorities dealing with energy efficiency in the building sector, related legal framework analysis, and specific measures in relation to the legal framework of the EU's, overall, give some valuable insights.

These results suggest the following recommendations about how target countries of current research work could improve their domestic legislation to enhance it to reach their climate targets.

General recommendations for Finland and Ireland

1. More complex multileveled work with challenges that countries are facing now and that impede the development of energy efficiency in the building sector.

   It was found that both countries are currently suffering from several challenges. In fact, these challenges (sections 3.2 and 4.2) are severe obstacles to developing energy efficiency and, consequently, barriers to reaching countries' climate goals. It is vital to keep in mind that finding a proper balance of interests is essential due to interrelated challenges affecting the interests of different social groups and areas.

2. Continuous development in national legislation in the energy efficiency sector that should line with European legislation.

   As was discussed, Finland and Ireland are positive about implementing EU legislation. However, it is vital to maintain consistency in the same direction.

3. Mutual learnings.

   It was found that Ireland and Finland hardly pay any attention to what the other Member States are introducing. However, it is vital to look and learn from other countries' experiences and implementation processes.

4. Continuous development of the promotion of energy efficiency in the building sector among occupants.

   In their study, Harputlugil and de Wilde (2021) pointed out that lack of knowledge about occupants' behavior becomes a significant shortcoming in the improvement of energy efficiency due to lack of data or disuse of a holistic approach.[244] Del Mar Solà et al. (2021) argue about the importance of promoting energy efficiency in the household sector among occupants.[245] This suggests, that the possibility to have access to necessary information plays a vital role.

5. Continuous development of national policies in energy efficiency in the building sector.

   According to the Report on Progress of the Member States in implementing the EPBD, one of the critical solutions for the Member States is to envelop their national measures. For example, a more detailed focus on the renovation of building stocks, introducing more smart-house systems, or enhancing information tools.[246] What is more, already existing policies should/must be amended and this requires reforms.

Specific recommendations to Ireland

1. Provide easy access to information to the public.
2. More focus on developing renewable energy sources.

Specific recommendations to Finland

1. Developing one particular agency for dealing with energy efficiency issues in the building sector.
2. Review the current carbon tax.

[244] Harputlugil and de Wilde 2021, p. 12.

[245] del Mar Solà et al. 2021, p. 17.

[246] Zangheri et al. 2021, p. 35.

6. Conclusion

This essay has discussed whether the current domestic legislation of Ireland and Finland, in conjunction with the EU regulations, helps to ensure energy efficiency in buildings and meet countries' climate goals.

It is unfortunate that the results of this study are subject to certain limitations. For instance, this thesis was limited in conducting an in-depth examination of energy efficiency in the building sector in Finland and Ireland due to the allocation of a limited period, research methodology, resources, and work in the field. Notwithstanding, the research involved performing a literature review of Finland and Ireland's current European legal framework and domestic legislations. The findings reported here shed new light on vital insights about challenges both countries are going through, their legal framework, specific authorities that regulate energy efficiency in the building sector, and specific domestic measures. These insights were gained in connection with specific features and backgrounds of each country and the European legal framework. What is more, the results of this investigation provide a comprehensive comparative analysis of each country by presenting a detailed analysis of each country's systems and their existing mechanisms.

The research conducted in this thesis contributes and enhances the understanding of the effectiveness of energy efficiency policies in the building sector in Ireland and Finland to achieve their climate goals as member states of the EU.

Considerable work needs to be done to provide more detailed results, preferably fieldwork. Based on what was found and presented here, it is possible that an on-ground analysis will determine more challenges and concerns. Here it is vital to keep in mind that climate goals cannot be achieved without challenges.

However, the findings of this thesis have several practical implications, such as helping analyze the legal system that could apply to the other Member States on the basis of criteria represented in the current study.

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7.3.2 Finnish legislation

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Maankäyttö- ja rakennusasetus 895/1999

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7.3.3 Irish legislation

Building Control Act 1990.

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SI 538 of 2017 - Building Regulations (Part L Amendment) Regulations 2017.

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S.I. No. 284/2002 - Building Regulations (Amendment) Regulations 2002.

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Technical Guidance Document L- Conservation of Fuel and Energy – Dwellings (2021).

7.4 Guidelines

2016 UNEP Guide for Energy Efficiency and Renewable Energy Laws