RINNO

RINNO PROJECT
Report

Transforming energy efficiency in European building stock through technology-enabled deep energy renovation

Deliverable 1.3: European & National Legislation, Standards & Initiation of the Legal Renovation Procedures
Work Package 1: RINNO Augmented Intelligence Renovation Framework

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Executive Summary

This report introduces a review of the national policy initiatives and legislative limitations for each of the pilot countries. It focuses in particular on the legislative aspects directly linked to RINNO project goals and expected impacts for the implementation of the developed technologies and solutions in the pilots.

The main objective of RINNO is to help drastically accelerate the rate of deep renovation of energy inefficient buildings and thereby contribute to Europe's medium-term ambition of a 3,5% yearly renovation rate of its building stock.

In order to reach these objectives, Task 1.2 "Decoding the Regulatory Environment of Buildings Renovation" (M1-M4, leader REGENERA, participants RINA-C, EGC, BOUYGUES, HPHI, NAPE) aims at providing an overview of the existing and expected national policy initiatives, legislative limitations and standardization activities in the pilot countries. Within this task, the legal renovation procedures for each pilot has been collected and classified in order to enable the implementation of the solutions in the demo buildings of RINNO project.

For a correct implementation of RINNO project objectives, retrofitting solutions will take into consideration the underpinning EU and national legislations and standards. The mandatory legislation related to architectural renovation has been checked and the associated most up to date legislation requirements, as those of Directive (EU) 2018/844 amending Directive 2010/31/EU on the Energy Performance of Buildings and Directive 2012/27/EU on Energy Efficiency. The use of smart technologies and digital solutions in buildings, as proposed by the revised EPBD (OJ L 156/75, 19.6.2018), to help promote the smart readiness of buildings and to streamline the existing rules, has been included in the analysis as well.

In order to develop this legislative review, the following main activities were conducted:

- Identification of the national policy initiatives and legislative limitations in each pilot country;
- Selection of the most relevant specific pieces of legislation to be considered during RINNO project;
- Collection of information on the provisions of the selected services in each of the 4 case study countries (France, Denmark, Greece and Poland) by means of a detailed questionnaires
- Description and comparison of the national mechanisms based on the analysis of the information collected within the previous steps and complemented with information collected through a literature survey.

The present document is organised as follows:

In Section 1, RINNO project is introduced including its aims and objectives. In addition, the scope of this Deliverable and associated Task is described considering the main objectives to be achieved and the methodology that has been followed. Lastly, a summary of all the regulations consulted for the preparation of this document is reported.

Section 2 includes some introductive summaries of the pilot sites and RINNO technologies

and processes. The different renovation technologies are detailed and related to each demo-site and to the regulatory frameworks that may be involved in their implementation.

Finally, from Section 3 to Section 10, the reference regulation and legislation for each of the pilot countries are detailed and compared in different tables, considering the following areas: architecture limitations, lighting requirements, air conditioning regulation, parking and electro mobility, smart building, energy efficiency requirements, tariff regulation and financing options.

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Abbreviations List

BIPV	Building Integrated Photovoltaic
BRP	Building Renovation Passport
DHW	De-centralized Hot Water
EC	European Commission
EE	Energy Efficiency
EPBD	Energy Performance of Buildings Directive
EPDM	Ethylene Propylene Diene Monomer
HVAC	Heating, Ventilating, Air Conditioned
KPI	Key Performance Indicator
LON	Local Operating Network
PV	Photovoltaic
RES	Renewable Energy Systems
VAV	Variable Air Volume
WP	Work Package

1. Introduction

The present report is a public deliverable (Deliverable 1.3 - European & National Legislation, Standards & Initiation of the Legal Renovation Procedures) of the RINNO H2020 funded European project under grant agreement No 892071.

1.1 RINNO project

The European Commission estimates that a renovation rate of 3% annually would be needed to accomplish the Union's energy efficiency (EE) and environmental ambitions in a cost-effective manner, but with current renovation rates (0.4-1.2% depending on the country) it will take more than 100 years to renovate all the European Union building stock. [1, 2]

The main objective of RINNO is to help drastically accelerate the rate of deep renovation of energy inefficient buildings and thereby contribute to Europe's medium-term ambition of a 3,5% yearly renovation rate of its building stock.

To carry out this ambitious project, major technical and socio-economic factors has to be considered, and as a result these factors will offer a portfolio of:

(a) Innovative technologies (building envelope solutions, RES, hybrid and storage solutions).

(b) Processes (off-site/ on-site industrialization, optimization, facilitation).

(c) Business models (based on crowd-equity/ crowd-lending, collaborative financing, energy performance contracting).

The proposed solution will comprise an augmented intelligence framework by enhancing human intelligence through a '1 + 1 > 2' approach on human-machine interaction and by introducing cognitive building capabilities. This combination will stimulate occupants' engagement and will enable optimum and dynamic renovation planning, design, execution and post-renovation operational support. It will also facilitate dynamic energy, environmental and economic assessment of the buildings aligned with the concept of Building Renovation Passports (BRPs).

Through the revised Energy Performance of Buildings Directive (EPBD), the EC aims to establish long-term renovation strategies in order to provide a long-term, step-by-step renovation roadmap, creating new incentives for building renovation.

All these solutions will be demonstrated during RINNO in four demo-sites around Europe, which are already committed for deep-energy renovation. These pilots are summarised in 2.1.

1.2 Objectives and scope of Deliverable 1.3

The information contained in D1.3 will be used as input in different aspects and tasks in the RINNO project. The short-term outputs of D1.3 will feed task 1.5 RINNO Renovation Framework, System Architecture & Integration Roadmap. Deliverable 1.3 also will feed the legislative and normative aspects in WP7, especially in the Business Models definition (T7.3) and in the investment and financing frameworks for buildings renovation (T7.5).

The purpose of Deliverable 1.3. is to decode the Regulatory Environment of Building Renovation. This deliverable corresponds with the Task 1.2 of RINNO project. This has been carried out by completing the following objectives:

- The recompilation and study of the existing and expected national policy initiatives,

legislative limitations and standardization activities for each of RINNO's pilot countries and, specially, those which affect the pilots.

- Retrofitting solutions taking into consideration the underpinning EU and national legislations and standards.
- The mandatory legislation related to architectural renovation has been checked and the associated most up to date legislation requirements, as those of Directive (EU) 2018/844 amending Directive 2010/31/EU on the Energy Performance of Buildings and Directive 2012/27/EU on Energy Efficiency, has been considered.
- The use of smart technologies and digital solutions in buildings, as proposed by the revised EPBD (OJ L 156/75, 19/6/2018), to help promote the smart readiness of buildings and to streamline the existing rules, has been included in the analysis.
- The legal renovation procedures for each pilot has been clarified, in order to enable the RINNO solutions to be applied at demo buildings.

1.3 Methodology

RINNO project activities are broken down into 9 work packages (WPs) and are implemented within 48 months (4 years); a duration which is considered appropriate taking into account the time required for the design, development, validation and evaluation of the RINNO Solution.

Deliverable 1.3 is included in WP1, which focuses on the definition of system requirements and the use cases, considering and integrating knowledge coming from past experience in and out of the project partners. It also includes the definition of a building renovation relevant list of KPIs for the RINNO evaluation and impact assessment in technical, economic, environmental and social terms as well as the overall RINNO architecture.

The objectives of this work plan are:

- Definition of requirements in terms of installation time, EE, occupants' comfort, carbon footprint etc.
- Clarification of legal renovation procedures.
- Identification of pilot special needs and existing infrastructures of pilot premises through on-site pilot surveys.
- Definition of RINNO's KPIs regarding efficiency, eco-friendliness, smart readiness, thermal comfort and cost effectiveness.
- Definition of the functional and technical specifications of the RINNO Suite Architecture and integration roadmap.

The methodology applied consists of the following steps:

1. Identification of the national policy initiatives and legislative limitations of each pilot country.
2. Selection of the most relevant specific legislation to be considered during RINNO project.
3. Collection of information by means of a detailed questionnaire on the provision of the selected services in each of the 4 case study countries (France, Denmark, Greece and Poland).
4. Description and comparison of the national mechanisms based on the analysis of the collected information at the previous step and complemented with information collected through a literature survey.

1.4 Summary of normative

The following directives at EU level have been taken into account:

- Directive (EU) 2018/844 amending Directive 2010/31/EU on the Energy Performance of Buildings
- Directive 2012/27/EU on Energy Efficiency.
- The revised EPBD (OJ L 156/75, 19.6.2018).

Each EU country has implemented the above directives into their local regulations; for the purpose of RINNO, regulations will be analysed taking into account the following aspects, that are relevant for the technologies installation/processes implementation:

- Architecture limitations
- Lighting regulations
- Air conditioning regulations
- Parking lots and electro mobility
- Smart buildings
- Energy efficiency requirements
- Tariffs regulations
- Financing options

Below, a summary of the norms analysed for each country is reported.

Architecture limitations:

- France:
  - Local Urban Plan (PLU).
  - Declaration of Intent to Begin Work or DICT.
  - Act on architecture, Law No. 77-2, 03/01/1977, Legislation of the French republic, https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000522423/?isSuggest=true

- Denmark:
  - City and Local urban plans
  - Municipal guides that promote “good architecture” taking the local conditions into consideration.
  - Act on building protection and preservation of buildings and urban environments, LBK No. 219, 06/03/2018, Ministry of Culture, https://www.retsinformation.dk/eli/lta/2018/219

- Greece:
  - Local plans.
  - Ratification of the Convention for the Protection of the Architectural Heritage of Europe, Law 2039/1992, Government Gazette 61/A,13/04/1992, https://www.e-nomothesia.gr/kat-arxaiotites/nomos-2039-1992-phek-61a-13-4-1992.html

- For the protection of Antiquities and Cultural Heritage in general, Law 3028/2002, Government Gazette A-153, 28/06/2002, https://www.e-nomothesia.gr/kat-arxaiotites/n-3028-2002.html
- General Building Regulation (G.O.K), Law 1577/1985, Government Gazette 210/A, 18/12/1985, https://www.e-nomothesia.gr/kat-periballon/oikodomes/n-1577-1985.html?q=15771985

- Poland:
  - Local zoning plan (Jabłonna commune zoning plan concerning part of the village of Rajszew ZP).

Lighting requirements:

- France:
  - The French standard NF C 15-100 regulates low voltage electrical installations in France.

- Denmark:
  - Act on authorization of companies in the field of electricity, plumbing and sewer installation, LBK No. 30, 11/01/2019, Ministry of Trade and Industry, https://www.retsinformation.dk/eli/lta/2019/30

- Greece:
  - Internal electrical installations, Article 30, General Building Regulation, http://portal.tee.gr/portal/page/portal/teelar/NOMOTHESIA/KTIRIOOIKODOMIKOS%20KSNONISMOS/097620FC1F5F1F54E0440003BA2D133C

- Poland:
  - Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020 - Journal of Laws of the Republic of Poland 2020 item 1608).

Air conditioning regulation:

- France:
  - RT2012: Thermal regulation (for new construction), https://www.e-rt2012.fr/explications/
  - Article R 1334-31 from the Public health code. https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000006910538/2021-02-23/#:~:text=Aucun%20bruit%20particulier%20ne%20doit,la%20garde%20ou%20d'un
  - Article 15/16 of the Directive 2018/844/EU: Maintenance of heating systems, https://www.ecologie.gouv.fr/entretien-et-inspection-des-chaudieres-appareils-chauffage-et-systemes-climatisation, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.156.01.0075.01.ENG

- Denmark:

- Energy Efficiency of Buildings, Directive 91/2002 / EC of the European Parliament and of the Council.
- Danish Building regulations, Thermal indoor climate and installations for heating and cooling systems BR18 (385-392), The Danish Transport, Building and Housing Agency, https://bygningsreglementet.dk/Tekniske-bestemmelser/19/Krav
- Danish Building regulations, Ventilation BR18 (420-452), The Danish Transport, Building and Housing Agency, https://bygningsreglementet.dk/Tekniske-bestemmelser/22/Krav

- Greece:
  - Regulation of indoor climate.
  - The requirements for building products are determined partly in EU rules and standards and partly in national legislation (Building Regulations). The requirements in the Building Regulations must ensure that a construction is carried out and arranged so that it is satisfactory in terms of both fire, safety and health. 91/2002 / EC "On the Energy Efficiency of Buildings".
  - Measures to reduce the Energy Consumption of Buildings and other provisions, Law 3661/2008, Government Gazette AD 89.

- Poland:
  - Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020 - Journal of Laws of the Republic of Poland 2020 item 1608).

Parking:

- France:
  - Car parks accessible to the public, Rules of suitability for the function - Design and sizing, NF P91-100, 05/1994, Legislation of the French republic, https://normalisation.afnor.org/thematiques/parcs-de-stationnement/
  - Dimensions of buildings, Private car parks - Minimum dimensions of spaces and lanes, NF P91-120, 04/1996, Legislation of the French republic, https://normalisation.afnor.org/thematiques/parcs-de-stationnement/

- Denmark:
  - Danish Building regulations, Undeveloped areas at buildings BR18 (393-402), The Danish Transport, Building and Housing Agency, https://bygningsreglementet.dk/Tekniske-bestemmelser/20/Krav

- Greece:
  - On the imposition of obligations for the creation of car parks for the service of buildings and the regulation of related issues, Law 960/1979, Government Gazette 194 / A, 25/08/1979, https://www.e-nomothesia.gr/kat-periballon/oikodomes/n-960-1979.html

- Poland:
  - Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location.
  - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further

amendments (latest amendment from September 16th, 2020.
- Journal of Laws of the Republic of Poland 2020 item 1608).

Smart buildings:

- France:
  - Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises, ANSI/BICSI 007-2020, https://www.bicsi.org/standards/available-standards-store/single-purchase/bicsi-007-iot-intelligent-building

- Denmark:
  - There is no legislation that deals with intelligent buildings in a comprehensive way.

- Greece:
  - There is no legislation that deals with intelligent buildings in a comprehensive way.

- Poland:
  - There is no legislation that deals with intelligent buildings in a comprehensive way.

Energy efficiency requirements:

- France:
  - Thermal regulation RT2012.

- Denmark:
  - Executive Order on energy labelling of buildings, BEK No. 793, 07/08/2019, Ministry of Climate, Energy and Supply, https://www.retsinformation.dk/eli/lta/2019/793

- Greece:
  - Regulation for the Energy Efficiency of Buildings (KENAK), Government Gazzette 2367B, 12-07-2017.
  - National Regulation of Buildings Energy Performance.

- Poland:
  - Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020 - Journal of Laws of the Republic of Poland 2020 item 1608).

Tariff regulation:

- France:
  - Energy Code, Articles L.337-4 to L.337-9, Legislation of the French republic, https://www.cre.fr/Electricite/marche-de-detail-de-l-electricite
  - Energy Code, Articles R.337-18, Legislation of the French republic,

https://www.cre.fr/Electricite/marche-de-detail-de-l-electricite
- Energy and climate (LEC), Article 64 of Law No. 2019-1147, 08/11/2019, Legislation of the French republic, https://www.cre.fr/Electricite/marche-de-detail-de-l-electricite
- Legislation of the French republic, Order of February 23, 2018 relating to the technical and safety rules applicable to fuel gas installations in individual or collective housing buildings, including common areas.
- Legislation of the French republic, NF E39-004, Urban heating. https://www.boutique.afnor.org/norme/nf-e39-004/chauffage-urbain-reseaux-de-transport-et-de-distribution-de-chaleur-ou-de-froid-particularites-d-installation/article/639492/fa140637
- Legislation of the French republic, NF EN 13941-1, District heating pipes.
- Legislation of the French republic, Law n°78-17 of January 6, 1978 relating to data processing, the files and freedoms.
- Legislation of the French republic, Law n°2000-1208 of December 13, 2000 relating to Solidarity and Urban Renewal.
- Legislation of the French republic, Law n°2008-776 of August 4, 2008 for the modernization of the economy (LME).
- Legislation of the French republic, Law n°2014-344 of March 17, 2014 relating to consumption.
- Legislation of the French republic, Decree n°2008-780 of August 13, 2008 relating to the procedure applicable in the event of unpaid electricity bills, gas, heat and water.
- Legislation of the French republic, Decree nº 2009-302 of March 18, 2009 implementing.
- Legislation of the French republic, Article L. 132-1 of the Consumer Code.
- Legislation of the French republic, Decree n°2012-1078 of September 24, 2012 relating to billing in the event of leaks in water pipes potable after meter.
- Legislation of the French republic, Order of July 10, 1996 relating to water distribution and water collection and treatment bills waste (modified by the decree of 22/02/2008).
- Legislation of the French republic, Order of August 6, 2007 relating to the definition of the methods for calculating the ceiling for the portion of the water bill not exceeding proportional to the volume of water consumed.
- Legislation of the French republic, Order of January 22, 2015 on the terms and conditions for exemption from charges related to the rejection of payment of an invoice of water.

- Denmark:
  - Electricity Supply Act, LBK No. 119, 06/02/2020, Ministry of Climate, Energy and Supply, https://www.retsinformation.dk/eli/lta/2020/119
  - Act on gas supply (natural gas) in Denmark - regulated by Act on Energy Supply for Heating in Denmark, 1989/1 LSF 60, Danish parliament, https://www.retsinformation.dk/eli/ft/198912K00060
  - Act on Energy Supply for Heating in Denmark. 1989/1 LSF 60, Danish parliament, https://www.retsinformation.dk/eli/ft/198912K00060
  - Act on water supply, etc., LBK No. 118, 22/02/2018, Ministry of the Environment and Food, https://www.retsinformation.dk/eli/lta/2018/118

- Greece:
  - Regulatory Authority for Energy (RAE) in Greece. http://www.rae.gr/site/portal.csp

- Management Code of the Hellenic Electricity Transmission System, http://www.rae.gr/site/file/system/docs/codes_and_regulations/kds/13032015_01
- Customer Procurement Code, http://www.rae.gr/site/file/categories_new/global_regulation/global_national/global_national_laws/FEK832_2013?p=file&i=0
- Operation of Energy Markets for Electricity and Natural Gas, Law 4001/2011, Government Gazette 179 / A , 22/08/2011, https://www.e-nomothesia.gr/energeia/n-4001-2011.html?q=4001
- On incentives for the establishment of Water Supply and Sewerage Companies, Law 1069/80, Government Gazette 191 / A , 23/08/1980, https://www.e-nomothesia.gr/autodioikese-demoi/nomos-1069-1980-fek-191a-23-8-1980.html?q=1069
- Regulation of the water supply network of E.YD.AP. SA http://www.rae.gr/site/el_GR/categories_new/global_regulation/codes.csp

- Poland:
  - Functioning of energy companies and energy tariffs are regulated under the Energy Law Act.
  - Gas tariffs are shaped on the basis of the principles set out in the Energy Law Act. The President of the Energy Regulatory Office approves the tariffs for households and distribution tariffs.
  - Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020 - Journal of Laws of the Republic of Poland 2020 item 1608).

2. Area of application

2.1 Summary of pilots.

RINNO solutions will be demonstrated in four real-life renovation projects to quantify and validate their impact throughout the whole renovation process. For this purpose, four demonstration sites have been selected in France, Denmark, Greece and Poland. These buildings are located in different climatic regions, comply with diverse building codes and regulations, have been built using very different construction components and tools and are equipped with different HVAC systems and other building amenities. A total 1.684 m^2 of floor area will be deep-renovated during RINNO, offering a sufficient test-bed to validate all aspects of RINNO concept. A summary of the characteristics of the demonstration sites is shown in the following table:

Table 1. Summary of pilots.

Pilot	Main characteristics of the renovation intervention	Renovation area	Funding
 France	Social multi-family residential building, consisting of 29 apartment of 36 m^2 each) and 1 apartment of 74 m^2. Reducing energy consumption and lowering costs (maintenance and renovation works), carbon emission and eco-friendly are the essential objectives of the renovation.	Gross surface area: 1.120 m^2. Pilot renovation area: 288 m^2 for RINNO product innovations and 1.120 m^2 for RINNO process innovations.	Lille Metropole Habitat (LMH)
 Denmark	Multi-family building with 464 flats. 7 flats are appointed as demo area. The scope of the renovation is to develop a showroom for the best possible energy renovation solutions to be replicated, including the development of a new façade module with integrated PV.	Gross surface area: 45.000 m^2. Pilot renovation area: 490 m^2.	EGC
 Greece	Multifamily building, part of a big social housing complex. The scope of the renovation is a deep Energy Renovation of the whole building. After completion, the building will be certified as the first EnerPHit Premium in SE Europe.	Gross surface area: 560 m^2. Pilot renovation area: 560 m^2.	HPHI
 Poland	Building consists of 5 flats, 2 floors and a cellar. It is owned and managed by Commune Jablonna. Complex modernization of the building envelope, ventilation system as well as the heating system is foreseen.	Gross surface area: 346 m^2. Pilot renovation area: 346 m^2.	Commune of Jablonna.

2.2 Summary of the technologies

A series of technologies and processes will be proposed within the RINNO project and implemented in the different demonstration sites summarised in the previous section in order to meet the project objectives.

Table 2. Summary of technologies.

Technology	Characteristics	Innovations/Advancements
 MicroVent - Façade integrated ventilation system.	The MicroVent-system consists of a minimum of two units working together; one unit removes air while the other supplies fresh air. The ventilation system is demand-controlled with variable air volume (VAV) based on CO_2, temperature and relative humidity.	- Wireless communication and controlling. - New BUS-system replacing the existing Local Operating Network (LON). - Noise reduction using the newest ventilator-technology. - Possible exploitation of wind pressure to implement a unique compact solution for hybrid ventilation - Employment of biobased materials.
 Kompro ment PV roof and façade solution	PV modules replaces ordinary roof and façade materials, and this makes it more economic than add-on PV solutions. Advantages: PV can be integrated with natural slate and other materials that are cradle to cradle certified, energy production using an integrated solar cell, a lightweight climate screen, an easy and quick assembly/disassembly time.	- Reduction of costs in assembly systems. - Optimization of ventilation solution. - Localization of better price / performance on solar cells.
 Isocell Cellulose Insulation.	90% bio-based material for insulating roofs, walls or ceilings, made of newspapers surplus upcycling. The product has a high thermal insulation value and a high thermal capacity, combined with high airflow resistivity. Isocell also has a great resistance to setting.	The main Innovation to be conducted in the course of RINNO will be to find the best way to exploit this versatility in renovation projects, both on-site and with regards to prefabricated elements.
 Bio-based materials	In order to reduce heat losses, damp the sound transmission and reduce drastically the installation time, the following products will be implemented: 1. Bio-based double layer panels. 2. Bio-based pipes and sheets. 3. K-BOX bio-based insulating system	- The new EPDM material realized with Biobased raw material and increased fire resistance properties, will be realized and demonstrated during the instalment of the various systems. - The new sandwich panel that will merge high thermal insulation properties with sound absorption and K-box is expected to achieve a reduction

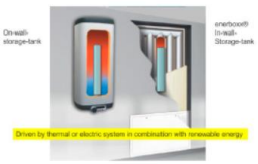
Technology	Characteristics	Innovations/Advancements
	for the pipes of HVAC systems, PVs and Solar Panels	of installation time by roughly 95 percent.
 Building integrated photovoltaic glass	They can be used in different applications such as roofs, façades and canopies. BIPV glass is installed the same way as conventional glasses. Advantages: - Significant savings in terms of renovation time, space needed and costs in comparison with utilizing conventional insulation and PV modules. - Ease of installation. - Reduced maintenance needs.	The main innovation to be conducted in the course of RINNO will be the creation of a prefabricated module that will incorporate BIPV glass along with vacuum insulation panels on the back so that a ready to install panel with PV production capabilities can be made along with the most advanced insulating capabilities.
 Thermochromic glass	It uses the sun heat to darken a glass pane in order to cut off all the harmful elements from entering a building. Advantages: - It creates a self-regulated building in terms of energy allowance and rejection. - It Increases solar heat performance. - Easy mounting and no need for maintenance. - Made of 100% recyclable materials. - No need for blinds.	The main innovation to be conducted in the course of RINNO is the inclusion of thermochromic glass in a residential building.
 De-centralized domestic hot water preparation	The proposed de-centralized DHW-solutions can be combined with the heating system and solar thermal, using a heat exchanger within the tank or separated from the heating system using a tank with a special electrical heating element, which can be integrated with PVs.	The main Innovation to be conducted in the course of RINNO is the inclusion of bio-based materials.

Table 3. Summary of processes.

	Process	Innovations/Administration
 Construction 4.0	On-site and Off-site assembling of prefabricated solutions by Cobots/Robots.	- Implementation of "data acquisition strategy" on the existing building by using automated drones equipped with 3D scanners and stereo cameras. - Use of a drone. - Application of a very developed decision-making tool, in order to select the most appropriate off site/on site fabrication strategy. - Implementation of a data platform to supervise and monitor the process of construction, material delivery and installation in real time.
	E-LOGISTICS platform for optimized logistics.	
	COCKPIT platform for automated progress, quality and security control by drones.	
	3D-printing.	

2.3 Link between technologies and pilots.

In the following table, the previously described technologies have been cross checked with the pilots where they will be applied (being numbered as follows: 1-France, 2-Denmark, 3-Greece and 4-Poland); the technology provider and the nature of energy performance improvement are reported as well for the reader convenience.

Considering that the different renovation technologies and solutions that will be promoted in each demo-site will be designed during the renovation process to be implemented in year 2, the following table has to be considered as indicative.

Table 4. Technologies to implement in each pilot.

Technology	Provider	Nature of energy performance improvement	Pilots application
MikroVent	EKOLAB	Constructive	2, 3
Kompro ment PV-Roof and Façade solutions	EKOLAB	Constructive	All
Isocell Cellulose Insulation	EKOLAB	Constructive	2
Bio-based double layer panels	K-FLEX	Constructive	1, 2, 4
Bio-based tubes and sheets	K-FLEX	Installation	2, 4
K-box bio-based insulating system for the pipes of HVAC systems, PVs, Solar Panels	K-FLEX	Installation	1, 3, 4

Technology	Provider	Nature of energy performance improvement	Pilots application
BUILDING INTEGRATED PHOTOVOLTAIC GLASS	GREENSTRUCT	Renewable energies	3
THERMOCHROMIC GLASS	GREENSTRUCT	Constructive	3
De-centralized domestic hot water preparation	PINK	Installation	3,4

Table 5. Processes to implement in each pilot.

Process	Provider	Nature of energy performance improvement	Pilots application
On-site and Off-site assembling of prefabricated solutions by Cobots/Robots	BOUYGUES	Construction innovation	1
E-LOGISTICS platform for optimized logistics	BOUYGUES	Home automation	1
COCKPIT platform for automated progress, quality and security control by drones	BOUYGUES	IT	1
3D-printing	BOUYGUES	Constructive	1

2.4 Regulatory aspects

The regulatory framework that may affect the implementation of RINNO technologies is described in sections 3-10. The following table relates each technology to the regulatory aspect that may be interested by its implementation:

Table 6. Regulatory framework of each technology.

Technology	Regulatory aspects	Reason
MikroVent	Architecture limitations	Modifications to the façade
	Conditioning regulation	Ventilation system requirements
	Energy efficiency requirements	In order to meet those requirements
Kompro ment PV-Roof and Façade solutions	Architecture limitations	Modifications to the roof or the façade

Technology	Regulatory aspects	Reason
	Conditioning regulation	Ventilation system requirements
	Lightning requirements	In order to meet those requirements
	Energy efficiency requirements	In order to meet those requirements
Isocell Cellulose Insulation	Architecture limitations	Modifications to the roof or the façade
Bio-based materials	Architecture limitations	Modifications to the façade
	Energy efficiency requirements	Reduction of heat losses
Building integrated photovoltaic glass	Architecture limitations	Modifications to the façade
	Energy efficiency requirements	In order to meet those requirements
Thermochromic glass	Architecture limitations	Modifications to the roof or to the façade
	Energy efficiency requirements	In order to meet those requirements
De-centralized domestic hot water preparation	Energy efficiency requirements	In order to meet those requirements

3. Architecture limitations

Specific norms regulate the architecture of buildings in each of the pilot countries. Below, a summary of the regulations currently in force and to be applied in each of them is reported:

- **France Pilot**

Current regulation	- Local Urban Plan (PLU) allows to visualize the different zones distributed on the municipality of the construction project. It is then easy to distinguish the zones: urban; to be urbanized; agricultural; natural and forest areas. The PLU also mentions the architectural rules specifically applicable to certain zones. - Declaration of Intent to Begin Work or DICT plays an essential role. This administrative process is carried out in conjunction with the network operators so that building professionals have a better knowledge of the environment that awaits them. - Act on architecture, Law No. 77-2, 03/01/1997, Legislation of the French republic, https://www.legifrance.gouv.fr/loda/id/ [3]
Scope of application	For existing buildings, Act on saving of Cultural Heritage regulates. For new buildings there are municipal guides, promoting "good architecture" taking the local conditions into consideration. The municipalities have a possibility in local plans to dictate e.g., materials, hights etc.
Requirements	All building works concerning a listed building require permission from the Minister of Culture if the works go beyond ordinary maintenance.

- **Denmark Pilot**

Current regulation	- The municipal plan contains guidelines for securing the designated cultural environments and an overview of buildings worthy of preservation. - Local plans detail and elaborate on the considerations that apply to the individual cultural environments and buildings. A local plan is binding on the individual landowner, while the municipal plan is only binding on the municipal council and the municipal administration. - Municipal guides promote “good architecture” taking the local conditions into consideration. [4] - Act on Building Protection and Preservation of Buildings and Urban Environments, LBK No. 219, 06/03/2018, Ministry of Culture, protects cultural heritage. https://www.retsinformation.dk/eli/lta/2018/219 [5]

Scope of application	The concrete buildings from the 1970'ies are not considered Cultural Heritage. But there are architectural values, important to preserve e.g. a holistic city plan as in Avedøre, of which the pilot is part. The municipalities have a possibility of using the local urban plan to influence decisions on e.g., materials, colours, hights etc.
Requirements	Renovation works in the size of the pilot requires permission from the municipality.

- **Greece Pilot**

Current regulation	- Local plans - Ratification of the Convention for the Protection of the Architectural Heritage of Europe, Law 2039/1992, Government Gazette 61/A,13/04/1992, https://www.e-nomothesia.gr/kat-arxaiotites/nomos-2039-1992-phek-61a-13-4-1992.html [6] - For the protection of Antiquities and Cultural Heritage in general, Law 3028/2002, Government Gazette A-153, 28/06/2002, https://www.e-nomothesia.gr/kat-arxaiotites/n-3028-2002.html [7] - General Building Regulation (G.O.K), Law 1577/1985, Government Gazette 210/A, 18/12/1985, https://www.e-nomothesia.gr/kat-periballon/oikodomes/n-1577-1985.html?q=15771985 [8]
Scope of application	- Settlements or parts of cities or zones of particular beauty, natural formations, protection zones of traditional sets and areas in need of special protection and shall be carried out by a P.D. issued on a proposal from the Ministry of Foreign Affairs. - Buildings, parts of buildings, complexes of buildings, individual elements (e.g., courtyards, gardens, doors, wells, cobblestones, trees, etc.).
Requirements	All building works concerning a listed building require a small-scale building permission from the local Municipality.

- **Poland Pilot**

Current regulation	Local zoning plan (Jabłonna commune zoning plan concerning part of the village of Rajszew (ZP).
Scope of application	Local principles of protection and shaping of spatial order as well as parameters and indicators of shaping buildings and land development. [9]

Requirements	Limitations in the selection of materials and the colour of the façade and roof.

In order to select the most relevant provisions directly linked to the project goals and expected impacts related to architecture, a collection of information has been compiled for each pilot country, based on the specific features of the renovation intervention to be undertaken (as preliminary identified in Table 1). The following table shows a comparison between all of them.

Table 7. Architecture limitations.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Barriers				
Maximum height allowed in the pilot site (m)	According to Building Regulations - will not be changed in the renovation project	According to Building Regulations - will not be changed in the renovation project	According to Building Regulations - will not be changed in the renovation project	According to zoning plan max. height allowed is 9 m. Demo building is 9,5 m. The height of the building should remain the same during the renovation process.
Façade				
Special permissions needed to modify the façade	In the actual demo site, the architects aim at leading the façade back to what it was, when the building was built. Else, the municipalities have to approve any building project incl. the architecture, but they do not have but the guides to regulate by.	In the actual pilot, the architects aim at upgrading, but respecting the façade architecture. The municipalities have to approve the building renovation project.	The architects aim at leading the façade back to what it was, when the building was built. Else, the municipalities have to approve any building project including the architecture.	No
Installations in façade allowed	Yes	Yes	Yes	Yes

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Constructive elements that project beyond the façade are allowed?	Yes	No	No	Not specified
Any restriction in the colour/style/materials of the façade	If the building is in the perimeter of Heritage area, “Architecte des Bâtiments de France” approval is required.	The municipalities have a possibility in local plans to dictate e.g., materials, heights, colours etc.	The municipalities have a possibility in local plans to dictate e.g., materials, heights, colours etc.	• It is forbidden to use bright colours for façades: including blue, purple, orange, pink and red. • It is forbidden to use plastic and metal cladding façades and leave unfinished external wall with visible construction material. • It is necessary to harmonize the colours of the façades and finishing materials of all buildings located on the property.
Roof				
Minimum inclination allowed	It is important to know that certain roofing materials require a minimum slope, even if your house is ideally located: For a thatched roof: the minimum slope is 40%. For a shingle roof: the minimum slope is 20%.	Regulated in the Building Regulations (20 % inclination needed to be sure that water is lead away from the roof).	Regulated in the Building Regulations (20 % inclination needed to be sure that water is lead away from the roof).	According to zoning plan the roof inclination should be in range of 25ºC to 45ºC. The roof inclination of the demo building should remain the same during the renovation process.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
	For a tile roof: the minimum slope is 20%. In many cases (i.e., for exposed houses and/or houses located in zone 2 and 3), the minimum slope is between 30 and 40 %.			
Maximum inclination allowed	If the building is in the perimeter of Heritage area, “Architecte des Bâtiments de France” approval is required.	Can be regulated by the municipalities in the local plans.	Can be regulated by the municipalities in the local plans.	According to zoning plan the roof inclination should be in range of 25ºC to 45ºC. The roof inclination of the demo building should remain the same during the renovation process.
Installations in roof allowed?	Yes, if the local permit height is not exceeded and a building permit is required. If the building is in the perimeter of Heritage area, “Architecte des Bâtiments de France” approval is required.	Yes	Yes	Yes
Special permissions needed to modify the roof	Yes	No	No	Yes

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Any restriction in the colour/style/materials of the roof	The municipalities have a possibility in local plans to dictate e.g., materials, model, colours etc. If the building is in the perimeter of Heritage area, “Architecte des Bâtiments de France” approval is required.	The municipal local plans	The municipal local plans	• It is allowed to use only roofing materials in the form of tiles or materials similar in appearance to tiles. • It is allowed to use only colours of the roof in shades of red, brown and grey.

4. Lighting requirements

Lightning requirements are specified in normative for some of the pilots. The following tables resume the specific regulation for lightning:

- **France Pilot**

Current regulation	The French standard NF C 15-100 regulates low voltage electrical installations in France.[10]
Scope of application	An artificial lighting point adapted to each space is provided on the ceiling or wall-mounted in all rooms.
Requirements	An authorization is needed from the grid supplier in order to perform electric installations in buildings. Especially if local renewable energy is installed.[11]

- **Denmark Pilot**

Current regulation	Act on Authorization of Companies in the field of electricity, plumbing and sewer installation, LBK No. 30, 11/01/2019, Ministry of Trade and Industry, https://www.retsinformation.dk/eli/lta/2019/30 [12]
Scope of application	Electrical installations for high current and installation of non-high current control and regulation systems used for control of high current functions, and servicing of these installations and systems may only be performed by electrical installation companies that have obtained authorization or partial authorization for the work in question.
Requirements	An authorization is needed in order to perform electric installations in buildings. This is the case for both electricity, water and sour installations.

- **Greece Pilot**

Current regulation	Internal electrical installations, Article 30, General Building Regulation, http://portal.tee.gr/portal/page/portal/teelar/NOMOTHESIA/KTIRIOOIKODOMIKOS%20KSNONISMOS/097620FC1F5F1F54E0440003BA2D133C

Scope of application	1. Every building or part of a building, intended for the residence, work or stay of persons, must be constructed of an electrical installation, which provides the possibility of artificial lighting and the possibility of receiving electricity, regardless of whether this electrical installation is connected to a public electricity distribution network or another source of electricity supply. 2. These installations must be performed in accordance with the provisions of the regulation of internal electrical installations and the respective additions or amendments that are in force and meet the general requirements of this article. [13]
Requirements	For doing electric installations in buildings, an authorization is needed. This is the case for both electricity, water and sour installations. Lighting levels are determined by EN 12464-1 and cannot be exceeded of the average minimum level of general lighting (lx) more than 30% of this. For the minimum energy performance requirements of buildings the average minimum level of general lighting (lx) should not exceed more than 20% of this.

- **Poland Pilot**

Current regulation	Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020 - Journal of Laws of the Republic of Poland 2020 item 1608).
Scope of application	1. The rooms intended for people and for general traffic (communication) should be provided with artificial lighting according to the utility needs. 2. Artificial lighting of rooms connected to each other intended for permanent stay of people and for general traffic (communication) should not show differences in intensity, causing glare at the passage between these rooms.
Requirements	Renovation and reconstruction of the electrical installation does not require a building permit or notification.

In order to select the most relevant provisions directly linked to the project goals and expected impacts related to lighting requirements, a collection of information has been compiled for each case study country, based on the specific features of the renovation intervention to be undertaken (as preliminary identified in Table 1).. The following table shows a comparison between all of them.

Table 8. Lighting requirements.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Parameters				
Name of the parameter	Reduce energy consumption and increase local renewable production	The Act focusses on the security in relation to electricity. The market regulates the use of e.g., energy saving bulbs.	In each room must be provided the lighting that ensures the visual comfort of the user and an environment with the required quantity and quality of lighting, which allows a pleasant stay without leading to visual discomfort and / or fatigue.	n/a
Method of calculation	As per the actual thermal regulation 2012 (RT 2012) and starting next year as per RE2020	n/a	As per the actual national lightning regulation T.O.T.E.E. 20701-1/2017	n/a
Limits per zone [illuminance]				
Recommended / Mandatory:	Recommended	Recommended	Recommended	Recommended
Common zones (lux)	Always energy saving bulbs	Always energy saving bulbs	200	Recommended 100 [14]
Parking (lux)	500	Often with PV	400	Recommended 100

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Kitchen (lux)	500	Private decision	200	Private decision
Office (lux)	500	Private decision	500	n/a
Bathroom (lux)	200	Private decision	200	Private decision
Bedrooms (lux)	500	Private decision	250	Private decision
Maximum power allowed (W/m²)	High efficiency: <2,5W/m²/100lux Efficient: 2,5W/m²/100lux<x<6 W/m²/100lux Low efficiency: 6W/m²/100lux<x<15 W/m²/100lux Inefficient: >15W/m²/100lux	The Building regulations set a maximum for energy use in housing (other limits for other buildings). For housing, dormitories, hotels and similar buildings, the building's total need for supplied energy for heating, ventilation, cooling and domestic hot water per m² heated floor area shall not exceed 30.0 kWh / m² per year added 1,000 kWh per year divided by the heated floor area.	For each thermal zone of the building, the several zones of artificial lighting, that are created by grouping the spaces of the building according to the required levels of artificial lighting determined by EN12464-1 depending on their use, are recorded. Each zone of artificial lighting corresponds to a specified percentage of coverage relative to the total area of each thermal zone of the building. The coverage rates then are correlated with the corresponding limits of the installed lighting power (W/m²) per thermal zone so as to create an average limit of installed lighting power (W/m²) that is unique for each thermal zone and building and correlated with the lighting needs of its spaces.	n/a

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Recommended / Mandatory:	Mandatory	Mandatory	Mandatory	n/a
Limits per zone [UGR (unified glare rate)]				
Recommended / Mandatory:	Recommended	Recommended	Recommended	Recommended
Common zones (%)	n/a	n/a	28	Recommended <25 [14]
Parking (%)	n/a	n/a	n/a	Recommended <25 [14]
Kitchen (%)	n/a	n/a	n/a	n/a
Office (%)	n/a	n/a	19	n/a
Bathroom (%)	n/a	n/a	25	n/a

5. Air conditioning regulation

Conditioning requirements related to air quality and energy efficiency are specified in normative in each of the pilots. The following tables resume the specific regulation for conditioning:

- **France Pilot**

Current regulation	- RT2012: Thermal regulation (for new construction), https://www.e-rt2012.fr/explications/ [15] - Article R 1334-31 from the Public health code. https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000006910538/2021-02-23/#:~:text=Aucun%20bruit%20particulier%20ne%20doit,la%20garde%20ou%20d'un [16] - Article 15/16 of the Directive 2018/844/EU: Maintenance of heating systems, https://www.ecologie.gouv.fr/entretien-et-inspection-des-chaudieres-appareils-chauffage-et-systemes-climatisation, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.156.01.0075.01.ENG [17]
Scope of application	There are only specs for the Noise criteria and Maintenance.
Requirements	The requirements for building products are determined partly in EU rules and standards and partly in national legislation (Building Regulations). The requirements in the Building Regulations must ensure that a construction is carried out and arranged so that it is satisfactory in terms of both fire, safety and health. [18,19]

- **Denmark Pilot**

Current regulation	- Energy Efficiency of Buildings, Directive 91/2002 / EC of the European Parliament and of the Council. - Building regulations of Denmark, Thermal indoor climate and installations for heating and cooling systems BR18 (385-392), The Danish Transport, Building and Housing Agency, https://bygningsreglementet.dk/Tekniske-bestemmelser/19/Krav [20] - Building regulations of Denmark, Ventilation BR18 (420-452), The Danish Transport, Building and Housing Agency, https://bygningsreglementet.dk/Tekniske-bestemmelser/22/Krav [21]

Scope of application	The building regulations apply to the following types of construction work: 1) Construction of new buildings. 2) Extension to buildings. 3) Reconstruction of and other changes in buildings that are significant in relation to the Building Act or the building regulations. 4) Changes in the use of buildings that are significant in in relation to the Building Act or the building regulations. 5) Demolition of buildings. 6) Maintenance construction work, conversions and other changes in existing buildings that are important for the energy consumption in the building.
Requirements	Must fulfil the energy regulation but is not relevant.

- **Greece Pilot**

Current regulation	- There is a regulation about the minimum energy class that can be applied in a new building to be provided with thermal comfort - Regulation of indoor climate. - The requirements for building products are determined partly in EU rules and standards and partly in national legislation (Building Regulations). The requirements in the Building Regulations must ensure that a construction is carried out and arranged so that it is satisfactory in terms of both fire, safety and health. 91/2002 / EC "On the Energy Efficiency of Buildings". - Measures to reduce the Energy Consumption of Buildings and other provisions, Law 3661/2008, Government Gazette AD 89. [22]
Scope of application	All new buildings since 2011 and all deep renovated buildings since 2013.
Requirements	New update by summer 2021.

- **Poland Pilot**

Current regulation	Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020 - Journal of Laws of the Republic of Poland 2020 item 1608).

Scope of application	Technical conditions to be met by buildings and their location contains design guidelines for buildings including conditioning in multifamily buildings. Local zoning law specify the details of heat supply options for buildings.
Requirements	The ventilation air volume flow in a residential building is determined by the sum of the exhaust air from the auxiliary rooms.

In order to select the most relevant provisions directly linked to the project goals and expected impacts related to conditioning regulation, a collection of information has been compiled for each case study country based on the specific features of the renovation intervention to be undertaken (as preliminary identified in Table 1).. The following table shows a comparison between all of them:

Table 9. Air conditioning regulation.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Production				
Any limitation in the number of heat producers	No	No	No	There is no connection to heating network; building at the moment is not connected to gas network, but gas connection is possible; fireplace heating is possible only as an additional source of heating; other environmentally friendly heating sources are allowed
Forbidden sources for heating	No - but oil boilers are being out phased	No - but oil boilers are being out phased	No	Not specified
Comfort				
Minimum temperature (ºC)	n/a	Recommended: 21 ºC in living rooms	Recommended: 20 ºC in living rooms	There are no requirements for staircase temperature, but it is recommended to keep it at min. 8ºC. According to the requirements, heating devices in dwellings should ensure the temperature at a minimum of 16 ºC. The recommended temperature that is used to calculate the heat load of the building is 20º C.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Maximum temperature (ºC)	n/a	n/a	Recommended: 26 ºC in living rooms	There are no requirements for maintaining air temperatures in living quarters. Recommended maximum temperature in living quarters is 26ºC.
Exemptions in comfort parameters (example, lower humidity in extreme conditions during short time periods)				
comfort parameters	n/a	n/a	n/a	n/a
Ventilation				
Voluntary / mandatory	Mandatory	Mandatory	Voluntary	Mandatory
Minimum of renovations (m^3/person, percentage, dm^3/s per m^2, etc.)	In residential buildings, there is a general requirement for a basic air change depending on the number and type of room. In bedrooms it varies from 35 to 135 m^3/h, in kitchens it varies from 20 to 165 m^3/h and in bathrooms from 15 to 30 m^3/h.	In residential buildings, there is a general requirement for a basic air change of 0.30 l / s per. m^2 heated floor area. The 0.30 l / s pr. m^2 corresponds at normal room height approximately to an air change of 0.5 / h (the pilot has not forced ventilation).	In residential buildings, there is a general requirement for a basic air change of 0.30 l / s per. m^2 heated floor area. The 0.30 l / s pr. m^2 corresponds at normal room height approximately to an air change of 0.5/h.	Minimum exhaust air streams are in kitchen from 30 to 70 m^3/h; in bathrooms 50 m^3/h; in WC 30 m^3/h; in an auxiliary room without windows 15 m^3/h.
Free cooling				

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Is it mandatory in some conditions? If yes, indicate which conditions	No	No	Yes, in non-residential buildings	No
Heat recovery				
Is it mandatory in some conditions? If it is, indicate which conditions	No	Yes. If no, dispensation from the Municipality is necessary.	Yes, in non-residential buildings over 50%	No
Efficiency				
Auto-regulation	n/a	n/a	n/a	No
Voluntary / mandatory (indicate conditions if necessary)	Voluntary	Voluntary	Voluntary	Voluntary
Zone system	n/a	n/a	Recommended	No
Voluntary / mandatory (indicate conditions if necessary)	Voluntary	Voluntary	Voluntary	Voluntary

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Thermal losses allowed	No	No	No	Since 2021 the heat transfer coefficients of partitions cannot be higher than: - External wall: 0,20 [W/(m^{2}K)] - Outer roof: 0.15 [W/(m^{2}K)] - Ceilings over unheated rooms: 0.25 [W/(m^{2}K)] - Windows: 0.9 [W/(m^{2}K)] Doors: 1.3 [W/(m^{2}K)]
Is monitoring of consumption mandatory?	No	Yes	No	No
Is the register of consumption mandatory?	Yes	Yes	No	No
Is time-of-use register mandatory?	No	No	No	No
Is it mandatory to register the number of starts?	No	No	No	No

The following parameters have been considered but not targeted, since they are not relevant for pilots:

- Penalties in heating/cold.
- Limitation in the number of cold producers.
- Forbidden sources of cold.
- Minimum and maximum relative humidity (%).
- Minimum, medium and maximum air speed (m/s).

6. Parking lots and electro-mobility

Parking places reserved and dimensions of parking places are specified in normative for some of the pilots. The following tables resume the specific regulation for parking:

- **France Pilot**

Current regulation	- Car parks accessible to the public, Rules of suitability for the function - Design and sizing, NF P91-100, 05/1994, Legislation of the French republic, https://normalisation.afnor.org/thematiques/parcs-de-stationnement/ [23] - Dimensions of buildings, Private car parks - Minimum dimensions of spaces and lanes, NF P91-120, 04/1996, Legislation of the French republic, https://normalisation.afnor.org/thematiques/parcs-de-stationnement/ [24]
Scope of application	The NF P91-100 and NF P91-120 standards specify the dimensions to be observed for a car park. [25, 26]
Requirements	Publicly accessible parking lot for vehicles less than 3.5 t and less than 1.90 m high on the one hand, and on the other hand the minimum dimensions for private parking spaces.

- **Denmark Pilot**

Current regulation	Danish Building Regulations, Undeveloped areas by buildings BR18 (393-402), The Danish Transport, Building and Housing Agency, https://bygningsreglementet.dk/Tekniske-bestemmelser/20/Krav [27]
Scope of application	The building regulations apply to the following types of construction work: 1) Construction of new buildings. 2) Extension to buildings. 3) Reconstruction of and other changes in buildings that are significant in relation to the Building Act or the building regulations. 4) Changes in the use of buildings that are significant in in relation to the Building Act or the building regulations. 5) Demolition of buildings. 6) Maintenance construction work, conversions and other changes in existing buildings that are important for the energy consumption in the building.
Requirements	Sufficient space must be laid out on the territory of the property for

	parking cars, motorcycles, mopeds and bicycles, etc. in relation to the use of the building. The parking areas must be accessible by the residents of the building, the persons employed in the building, visitors, customers and suppliers, etc.

- **Greece Pilot**

Current regulation	On the imposition of obligations for the creation of car parks for the service of buildings and the regulation of related issues, Law 960/1979, Government Gazette 194 / A, 25/08/1979, https://www.e-nomothesia.gr/kat-periballon/oikodomes/n-960-1979.html [28]
Scope of application	Parking in buildings
Requirements	Sufficient space must be laid out on the territory of the property for parking cars, motorcycles, mopeds and bicycles, etc. in relation to the use of the building. The parking areas must be able to be used by the residents of the building.

- **Poland Pilot**

Current regulation	- Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location. - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020. - Journal of Laws of the Republic of Poland 2020 item 1608).
Scope of application	Parking in buildings.
Requirements	The above regulation only stipulates that parking spaces must be arranged in accordance with purpose of the buildings. There are some specific requirements, but none regarding the number of parking spaces required. Here the regulation refers to the zoning plan. The development plan for this area does not assume the construction of multi-family buildings, so there are no requirements for parking places near multi-family buildings.

In order to select the most relevant legislation directly linked to the project goals and expected impacts related to parking, a collection of information has been compiled for each case study country. The following table shows a comparison between all of them:

Table 10. Parking.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Outside				
Number of parking places for EV (per area or per number of places)	Zero as for now	Zero as for now	At least 1	Not applicable for the pilot
Voluntary / mandatory / just pre-installation	Voluntary	Voluntary	Mandatory	Mandatory
Renewable energy contribution	Zero as for now	Solar thermal plant + PV at the façade	n/a	n/a
Voluntary/mandatory	Voluntary	Voluntary	Voluntary	Voluntary
Number of parking spot for handicapped persons	2% of the total parking slots	Regulated by the Building Regulations - see table below	Regulated by the Building Regulations	n/a
Indoor				
Number of parking places for EV (per area or per number of places)	Zero as for now	Zero as for now	1 in 10	n/a

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Renewable energy contribution	Zero as for now	Zero as for now	n/a	n/a
Number of parking spot for handicapped persons	2% of the total parking slots	Sufficient. To be regulated by the Municipality.	n/a	n/a
Needs of ventilation	Yes	Yes	0.2 ach	n/a

7. Smart buildings

Smart buildings normative is specified for some of the pilots. The following tables resume the specific regulation:

- **France Pilot**

Current regulation	Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises, ANSI/BICSI 007-2020, https://www.bicsi.org/standards/available-standards-store/single-purchase/bicsi-007-iot-intelligent-building [29]
Scope of application	ANSI/BICSI 007-2020 serves as the seminal standard for the design and implementation of ICT infrastructure necessary for all network enabled building systems, from traditional, smart, IoT, emerging and everything in between. [30]
Requirements	The standard also includes specific design recommendations for the building power distribution, building management system and converged network applications that ensure the building is flexible enough to accommodate changes in technology and the needs of its occupants.

- **Denmark Pilot**

Current regulation	There is no legislation that deals with intelligent buildings in a comprehensive way. Some aspects (about Smart meters) are covered by Energy Law Act.
Scope of application	The building regulations apply to the following types of construction work: 1) Construction of new buildings. 2) Extension to buildings. 3) Reconstruction of and other changes in buildings that are significant in relation to the Building Act or the building regulations. 4) Changes in the use of buildings that are significant in in relation to the Building Act or the building regulations. 5) Demolition of buildings. 6) Maintenance construction work, conversions and other changes in existing buildings that are important for the energy consumption in the building.
Requirements	The Building Regulations (BR) states max energy use, getting close to the "Passive House Standard" (15 kWh/m^2).

- **Greece Pilot**

Current regulation	No existing regulation for Smart Buildings in Greece. Expecting new regulation this year.
Scope of application	No existing regulation for Smart Buildings in Greece.
Requirements	No existing regulation for Smart Buildings in Greece.

- **Poland Pilot**

Current regulation	There is no legislation that deals with intelligent buildings in a comprehensive way. Some aspects (about Smart Counter meters) are covered by Energy Law Act.
Scope of application	No existing regulation for Smart Buildings in Poland.
Requirements	No existing regulation for Smart Buildings in Poland.

In order to select the most relevant legislation directly linked to the project goals and expected impacts related to smart buildings, a collection of information has been compiled for each case study country. The following table shows a comparison between all of them:

Table 11. Smart buildings.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Energy Systems				
Are EMS (Energy Monitoring System) voluntary/mandatory?	Mandatory	Mandatory	Voluntary	Voluntary
Are BMS (Building Management System) voluntary/mandatory?	Voluntary	Voluntary	Voluntary	Voluntary
Are Smart Counter meters/telemetering voluntary/mandatory?	Mandatory	Mandatory	Voluntary	Mandatory
Energy Programs				
Is DRM (Demand Response Management) allowed?	No	No	No	No
Is aggregation allowed?	Perhaps not prohibited, but as the supply systems are managed partly by public authorities (heating and also some parts of the water supply) and partly by private companies (electricity) it is difficult to do in practice.			n/a
Methodology				

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Does it exist a standard methodology for Smart Buildings implementation?	No	No	No	No

8. Energy efficiency requirements

Normative about energy efficiency requirements can be found for some of the pilots:

- **France Pilot**

Current regulation	Thermal regulation RT2012.
Scope of application	RT 2012 is applicable to all new buildings for residential use (individual or semi-detached houses, collective housing, university residences, hostels for young workers).[31]
Requirements	A building will only be regulatory if it simultaneously meets the following three performance requirements: - Bbio ≤ Bbiomax. This minimum energy efficiency requirement of the building enhances the level of insulation (airtightness, bioclimatic design, joint ownership). - Tic ≤ Ticréf. This summer comfort requirement requires that the interior temperature reached in the building be lower than a reference temperature during the 5 hottest days of the year.

- **Denmark Pilot**

Current regulation	Executive Order on energy labelling of buildings, BEK No. 793, 07/08/2019, Ministry of Climate, Energy and Supply, https://www.retsinformation.dk/eli/lta/2019/793 [32]
Scope of application	All buildings where energy is used to regulate the indoor climate must be energy labelled in accordance with the rules, unless they are exempted. [33]
Requirements	Before commissioning or completion of a new building, the owner must have an energy label prepared for the building, unless an energy label has been made for project sales. Energy labelling of new construction is carried out on the basis of a building inspection.

- **Greece Pilot**

Current regulation	- Regulation for the Energy Efficiency of Buildings (KENAK), Government Gazzette 2367B, 12-07-2017 [34] - National Regulation of Buildings Energy Performance [35, 36]
Scope of application	Setting the minimum requirements for the energy efficiency of buildings and building elements. Setting the obligation for a Building Energy Certificate for any new and deep renovated building to be sold or rented out.
Requirements	Minimum requirements on energy efficiency of buildings are set based on the specific climatic zone. In terms of deep renovation, the existing building must reach the B+ Class of the National Energy Performance Regulation (KENAK). The goal of this project is to reach the highest-class A+.

- **Poland Pilot**

Current regulation	Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020 - Journal of Laws of the Republic of Poland 2020 item 1608).
Scope of application	New buildings must meet two conditions. Maximum value of annual non-renewable primary energy demand indicator and minimum thermal insulation of external partitions and technical equipment.
Requirements	Max. value of the annual non-renewable primary energy demand indicator for new multifamily buildings: EP = 75 kWh/(m^2/year). In case of a building undergoing reconstruction, it is sufficient to meet the requirements of thermal insulation of partitions only.

In order to select the most relevant legislation directly linked to the project goals and expected impacts related to energy efficiency requirements, a collection of information has been compiled for each case study country. The following table shows a comparison between all of them:

Table 12. Energy efficiency requirements.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Energy certification				
Is it mandatory for private houses?	Yes, for new construction	Yes, during sale process	Yes	Yes, for new construction and during sale process.
Is it mandatory for multi-family buildings?		Yes, every 10 years	Yes	
Energy audit				
Is it mandatory for private houses?	Yes	Yes, during sale process	No	No
Is it mandatory for multi-family buildings?	Yes	Yes, every 10 years	No	No

9. Tariffs regulation

In order to select the most relevant legislation directly linked to the project goals and expected impacts related to tariffs regulation (electricity, gas, district heating/cooling and drinking water supply), a collection of information has been compiled for each case study country. The following table shows a comparison between all of them:

9.1 Electricity

- **France Pilot**

Current regulation	- Energy Code, Articles L.337-4 to L.337-9, Legislation of the French republic, https://www.cre.fr/Electricite/marche-de-detail-de-l-electricite [37] - Energy Code, Articles R.337-18, Legislation of the French republic, https://www.cre.fr/Electricite/marche-de-detail-de-l-electricite [38] - Energy and climate (LEC), Article 64 of Law No. 2019-1147, 08/11/2019, Legislation of the French republic, https://www.cre.fr/Electricite/marche-de-detail-de-l-electricite [39]
Scope of application	Only the following can benefit from regulated electricity sales tariffs: - Domestic final consumers, including sole owners and syndicates of co-owners of a single building for residential use; - Non-domestic end consumers who employ less than ten people and whose annual turnover, income or balance sheet total does not exceed 2 million euros.
Requirements	Sites subscribing to a power less than or equal to 36 kilovolt amperes.

- **Denmark Pilot**

Current regulation	Electricity Supply Act, LBK No. 119, 06/02/2020, Ministry of Climate, Energy and Supply, https://www.retsinformation.dk/eli/lta/2020/119 [40]
Scope of application	The Act applies to the production, transport, trade and supply of electricity.
Requirements	Supply of electricity to an electricity consumer presupposes an agreement to this effect between the electricity consumer and an electricity trading company. An electricity consumer is free to choose an electricity trading company and electricity product.

- **Greece Pilot**

Current regulation	- Regulatory Authority for Energy (RAE) in Greece. http://www.rae.gr/site/portal.csp [41] - Management Code of the Hellenic Electricity Transmission System, http://www.rae.gr/site/file/system/docs/codes_and_regulations/kds/13032015_01 [42] - Customer Procurement Code, http://www.rae.gr/site/file/categories_new/global_regulation/global_national/global_national_laws/FEK832_2013?p=file&i=0 [43]
Scope of application	The code apply to the production, transport, trade and supply of electricity.
Requirements	Supply of electricity to an electricity consumer presupposes an agreement to this effect between the electricity consumer and an electricity trading company. An electricity consumer is free to choose an electricity trading company and electricity product. When changing electricity trading business, the electricity consumer must not be charged a fee.

- **Poland Pilot**

Current regulation	Functioning of energy companies and energy tariffs are regulated under the Energy Law Act.
Scope of application	The building has apartments that must be serviced by one of the G tariffs. Common parts must be serviced by the C tariff (Currently - C12a tariff). It is possible to change the energy supplier and choose a single-zone or multi-zone tariff.
Requirements	Household energy tariffs belong to tariff group G. Possible tariffs: G11 - single-zone tariff G12 - two-zone fare (day/night) G12W - two-zone (day/night) + weekend Common areas in a multi-family building (including staircase lighting or circulation pump drives) belong to C group tariff. These are tariffs for small and medium-sized enterprises powered from low voltage networks. Those are: C11- single-zone tariff (contracted power less than 40 kW) C12a - two-zone fare (peak and off-peak hours, contracted capacity

	less than 40 kW) C12b - two-zone tariff (daytime and night hours, contracted capacity less than 40 kW) C21 - single-zone tariff (contracted capacity greater than 40 kW) C22a - two-zone tariff (peak and off-peak hours, contracted capacity greater than 40 kW) C22b - two-zone tariff (daytime and night hours, contracted capacity greater than 40 kW) The price of electricity consists of the fee for energy distribution (a fixed component which depends on the distributor serving the area) and the fee for electricity (a component which is influenced by the choice of the electricity seller).

9.2 Gas

- **France Pilot**

Current regulation	Legislation of the French republic, Order of February 23, 2018 relating to the technical and safety rules applicable to fuel gas installations in individual or collective housing buildings, including common areas.
Scope of application	This decree sets the technical and safety rules applicable to fuel gas installations located inside individual or collective residential buildings, inside their outbuildings or outside and near them, the whole forming a functional whole. [44,45]
Requirements	- To check the primary energy consumption per year and per m². - To check the installation, maintenance of gas installation. - To check the gas tariff regulation.

- **Denmark Pilot**

Current regulation	Act on Gas Supply (natural gas) in Denmark - regulated by Act on Energy Supply for Heating in Denmark, 1989/1 LSF 60, Danish parliament, https://www.retsinformation.dk/eli/ft/198912K00060 [46]
Scope of application	Not relevant
Requirements	Not relevant

- **Greece Pilot**

Current regulation	Operation of Energy Markets for Electricity and Natural Gas, Law 4001/2011, Government Gazette 179 / A , 22/08/2011, https://www.e-nomothesia.gr/energeia/n-4001-2011.html?q=4001 [47]
Scope of application	The code apply to the production, transport, trade and supply of gas.
Requirements	- To check the primary energy consumption per year and per m² - To check the installation, maintenance of gas installation - To check the gas tariff regulation

- **Poland Pilot**

Current regulation	Gas tariffs are shaped on the basis of the principles set out in the Energy Law Act. The President of the Energy Regulatory Office approves the tariffs for households and distribution tariffs.
Scope of application	The building is currently not connected to the gas network. Due to the proximity of the gas network, this connection is possible and is planned.
Requirements	The recipients are assigned to the tariff group on the basis of annual fuel consumption, place of fuel offtake and type of fuel off taken. Possible tariffs for households: W-1: gas consumption up to 3,350 kWh/year. W-2: gas consumption in the range of 3,350 kWh/year - 13,350 kWh/year. W-3: gas consumption in the range of 13,350 kWh/year - 88,900 kWh/year. W-4: gas consumption over 88,900 kWh/year.

9.3 District heating/cooling

- **France Pilot**

Current regulation	- Legislation of the French republic, NF E39-004, Urban heating. https://www.boutique.afnor.org/norme/nf-e39-004/chauffage-urbain-reseaux-de-transport-et-de-distribution-de-chaleur-ou-de-froid-particularites-d-installation/article/639492/fa140637

	- Legislation of the French republic, NF EN 13941-1, District heating pipes. [48,49,50,51,52,53]
Scope of application	Heat or cold transport and distribution networks. Design and installation of pre-insulated pipe systems for underground hot water systems.
Requirements	For larger pipes and pressures below 25 bar, thicknesses than those specified in EN 253 may be required for straight pipes, bends and tees. The principles of this standard may be applied to pre-insulated pipe systems with pressures above 25 bar, provided special attention is paid to the effects of pressure. Adjacent pipes belonging to the system (e.g. gutter pipes, valve chambers, overhead road crossings, etc.) may be designed and installed in accordance with this standard.

- **Denmark Pilot**

Current regulation	Act on Energy Supply for Heating in Denmark. 1989/1 LSF 60, Danish parliament, https://www.retsinformation.dk/eli/ft/198912K00060 [54]
Scope of application	The area is supplied by district heating.
Requirements	Connection to the local district heating system is mandatory.

- **Greece Pilot**

Current regulation	On incentives for the establishment of Water Supply and Sewerage Companies, Law 1069/80, Government Gazette 191 / A , 23/08/1980, https://www.e-nomothesia.gr/autodioikese-demoi/nomos-1069-1980-fek-191a-23-8-1980.html?q=1069 [55]
Scope of application	Not very common - Limited application only in areas located near the main thermal power plant of Greece. [56]
Requirements	n/a

- **Poland Pilot**

Current regulation	n/a

Scope of application	n/a
Requirements	n/a

9.4 Drinking water supply

- **France Pilot**

Current regulation	- Legislation of the French republic, Law n°78-17 of January 6, 1978 relating to data processing, the files and freedoms. - Legislation of the French republic, Law n°2000-1208 of December 13, 2000 relating to Solidarity and Urban Renewal. - Legislation of the French republic, Law n°2008-776 of August 4, 2008 for the modernization of the economy (LME). - Legislation of the French republic, Law n°2014-344 of March 17, 2014 relating to consumption. - Legislation of the French republic, Decree n°2008-780 of August 13, 2008 relating to the procedure applicable in the event of unpaid electricity bills, gas, heat and water. - Legislation of the French republic, Decree nº 2009-302 of March 18, 2009 implementing. - Legislation of the French republic, Article L. 132-1 of the Consumer Code. - Legislation of the French republic, Decree n°2012-1078 of September 24, 2012 relating to billing in the event of leaks in water pipes potable after meter. - Legislation of the French republic, Order of July 10, 1996 relating to water distribution and water collection and treatment bills waste (modified by the decree of 22/02/2008). - Legislation of the French republic, Order of August 6, 2007 relating to the definition of the methods for calculating the ceiling for the portion of the water bill not exceeding proportional to the volume of water consumed. - Legislation of the French republic, Order of January 22, 2015 on the terms and conditions for exemption from charges related to the rejection of payment of an invoice of water.
Scope of application	Municipalities and local authority groups must establish a service regulation for each water or sanitation service for which they are responsible, defining the services provided and the respective obligations of the operator and subscribers. [57, 58]
Requirements	- Water Quality - Monitoring of the consumption - Distribution network

- **Denmark Pilot**

Current regulation	Act on Water Supply, etc., LBK No. 118, 22/02/2018, Ministry of the Environment and Food, https://www.retsinformation.dk/eli/lta/2018/118 [59]
Scope of application	Municipality is responsible for the water supply.
Requirements	Connection is mandatory.

- **Greece Pilot**

Current regulation	Regulation of the water supply network of E.YD.AP. SA http://www.rae.gr/site/el_GR/categories_new/global_regulation/codes.csp [60,61]
Scope of application	E.YD.AP. SA owns the supply and its water meter. In the case of water meter installation of within a special construction, the E.YD.AP. has the supply to the outer flange of the valve inside the control well near of the road line as well as by the valve interruption of benefits, within the special construction up to the limit of indoor installations such as these described in Article 2.5.1 hereof.
Requirements	The owner of the watered property has an obligation to maintain good health of the well and its special construction installation of water meters as well as accessories of the supply contained in them.

- **Poland Pilot**

Current regulation	Regulation of the Minister of Infrastructure of April 12th, 2002 on technical conditions to be met by buildings and their location - Journal of Laws of the Republic of Poland 2002 No 75 item 690 with further amendments (latest amendment from September 16th, 2020 - Journal of Laws of the Republic of Poland 2020 item 1608).
Scope of application	Cold water in the building is supplied from a local well. There is no access to the water supply network.
Requirements	In terms of water supply, the regulation states that every building must be supplied with water for its intended purpose. It also describes guidelines for water pressure, installation security and metering.

10. Financing options

A study of the different financing options for energy efficiency improvement measures will be needed for the economic feasibility study. A summary of each pilot is presented below:

- **France Pilot**

Financing options	- Certificat d'économie d'énergie (CEE): In principle, the system consists of encouraging energy suppliers (called "obligated parties") to promote energy efficiency among their customers (households, local authorities or professionals...). To this end, a three-year obligation of "realization" is imposed on them of energy savings calculated based on the weight of each in the period to the residential and tertiary sectors. This obligation is quantified in kWh cumac2 (noted kWhc in the remainder of this report) of final energy, i.e. in kWh saved over the lifetime of the appliances and discounted at a rate of 4%. For each kWhc saved, the person who saved it gets 1 EEC. - Special regional and national subsidies (label effinergie ou passivhauss) if the renovation building achieves a high energy rating. (A, B)

- **Denmark Pilot**

Financing options	There are no general schemes for financing of energy efficiency. For social housing, the Landsbyggefonden (www.lbf.dk) offers support for maintenance. - For renovation, support from the state (administered by the municipalities) can be achieved.[62] - For private homeowners, the energy supply companies have a small support.

- **Greece Pilot**

Financing options	For renovation, support from the state (administered by the municipalities) can be achieved. See the program "Energy saving at Home" for Building Renovation in Greece[63] and the new one «save - autonomy» https://exoikonomo2020.gov.gr/ [64]

- **Poland Pilot**

Current regulation	Act of 21 November 2008 on supporting thermo-modernization and repairs - Journal of Laws of the Republic of Poland 2008 No 223 item 1459 with further amendments (latest amendment from January 23rd, 2020 - Journal of Laws of the Republic of Poland 2020 item 412). Journal of Laws 2008 No 223 item 1459 with further amendments.

In order to select the most relevant legislation directly linked to the project goals and expected impacts related to financial options, a collection of information has been compiled for each case study country. The following table shows a comparison between all of them:

Table 13. Financing options: possible founds.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
EXISTING GRANTS - National				
Entity	French Government	Danish government	Greek Government	Thermomodernisation and Repairs Fund [a]
Source of founds	Private source of funding	- The Urban Renewal Scheme (Immigration Integration and Housing Ministry.[b] - The Green Urban Renewal Scheme (Ministry of Traffic, Housing and Building.[c]	- Save at Home Subsidies - Supply of components by sponsors	Managed by Bank Gospodarstwa Krajowego (BGK), loans are granted by crediting banks that have signed an appropriate co-operation agreement with Bank Gospodarstwa Krajowego.
Competitive basis	No	No	No	No

a The Fund is a nationwide initiative targeting housing cooperatives, housing communities, private individuals and local governments. Its main goal is providing financial aid for investors engaged in thermo-modernisation and renovation initiatives as well as providing financial indemnifications for residential building owners.
b **The Urban Renewal Scheme** (Immigration Integration and Housing Ministry, 2018) grants subsidies to selected maintenance and improvement tasks in private rental housing (retrofitting) and provide support for the renewal of depressed urban areas as well as newer housing areas with social issues. The target group for this initiative include old and worn-down buildings, built before 1950, or buildings that are subjected to minimal modern heating systems or toilet facilities. In addition, targets include private rental housing with poor energy labels, which can apply for grants regard-less of age.
c **The Green Urban Renewal Scheme** (Ministry of Traffic, Housing and Building, 2019) creates the opportunity for private homeowners (or landlords) to negotiate rent increases beyond the ordinary rent increase process, which arise due to energy efficiency improvements, with the occupying tenants. A total of 50 million DKK has been allocated annually for the purposes of the green urban renewal for rental buildings.

	France Pilot	Denmark Pilot	Greece Pilot	Poland Pilot
Minimum percentage of energy savings	CEE: you have to cumulate kWh by renovation activity (insulation of façade, of roof, changing from a gas boiler to a heat pump, monitoring the consumption…) Regional/national subsidies: (label effinergie or passivhauss)	No	50%	25%
Maximum percentage of grant	No	No	80%	50%
Kind of fund (non-repayable grant, etc)	Grant	Combination of grants and loans	Grant	Non-repayable grant, mandatory 50% loan
Energy Audit needed (Yes/No)	Regional/national subsidies: Yes CEE: No (only the purchasing and installation bills)	Yes	Yes	Yes
Energy Certificate needed (Yes/No)	Regional/national subsidies: Yes CEE: No (only the purchasing and installation bills)	Yes	Yes	No

11. Conclusions

In this report, an accurate review of the normative and regulatory frameworks that may affect or may be affected by the implementation of RINNO technologies in demo sites has been carried out. It focuses in particular on the legislative aspects in terms of architecture limitations, lighting requirements, air conditioning regulation, parking and electro mobility, smart building, energy efficiency requirements, tariff regulation and financing options. All these aspects have been studied and classified by detailing the current legislation, scope of application and requirements for each pilot-site.

The information contained in D1.3 will be used as input for different activities in the RINNO project. The short-term outputs of D1.3 will feed T1.3 "Pilot Sites Surveys & Definition of Use Case Renovation Scenarios" and consequently also task 1.5 *RINNO "Renovation Framework, System Architecture & Integration Roadmap",* ensuring that the platform will work in compliance with currently in force regulations. In addition, data and information collected within task 1.2 (D1.3), along with tasks 1.1 and 1.3, contributes to the achievement of milestones *MS2 RINNO pilot sites surveys and use case scenarios available* and *MS3 RINNO architectural design available.* Moreover, the legislative information collected in D1.3 will be used in the validation of RINNO technologies in WP6 through the integration and implementation in the demonstration sites. Deliverable 1.3 will also feed the legislative and normative aspects in WP7, especially in the Business Models definition (T7.3) and in the investment and financing frameworks for buildings renovation (T7.5).

The Deliverable 1.3 is a public and open deliverable, this first version of D1.3. will be updated throughout the duration of the RINNO project, this updated version will occur in the following cases:

- Modification or update of the European or national legislation under study.
- Possible changes in RINNO technologies or demonstration sites.
- Technological or other aspects that require constant revising of content.

To conclude, D1.3 European & National Legislation, Standards & Initiation of the Legal Renovation Procedures will be used as a normative basis for all the actions to be developed in RINNO pilots.

ABOUT RINNO

RINNO is a four-year EU-funded research project that aspires to deliver greener, bio-based, less energy- intensive from a life cycle perspective and easily applicable building renovation elements and energy systems that will reduce the time and cost required for deep energy renovation, while improving the building energy performance. Its ultimate goal is to develop, validate and demonstrate an operational interface with augmented intelligence and an occupant-centered approach that will streamline and facilitate the whole lifecycle of building renovation.

For more information, please visit **https://rinno-h2020.eu/**

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