SKILLS
INSTRUCT
INSTRUMENTS
CONSTRUCTION

Energy Skills Certification

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

D4.1 Demo 1

Energy Skills Certification

Dissemination Level: public
Lead Partner: RIL
Due date: 31.1.2023
Actual submission date:28.2.2023

Published in the framework of:

Evidence-based market and policy instruments implementation across EU to increase the demand for energy skills across construction sector value chain.

Authors:

Janne Tähtikunnas, RIL
Ville Raasakka, RIL

Revision and history chart

Version	Date	Editors	Comment
Version 1	11.01.2023	Janne Tähtikunnas	
Version 2	30.01.2023	Janne Tähtikunnas	
Version 3	17.02.2023	Tarja Mäkeläinen	Reviewers comments
Version 4	17.02.2023	Janne Tähtikunnas	Final version

Disclaimer:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Glossary

Acronym	Full name
CA	Consortium Agreement
EC	European Commission
EASME	The Executive Agency for Small and Medium-sized Enterprises
GA	Grant Agreement
PC	Project Coordinator
WP	Work Package
TL	Task Leader
DoA	Description of Action
PSC	Project Steering Committee
SQM	Scientific and Quality Manager
DEC	Dissemination and Exploitation Committee
KOM	Kick-off meeting
ASM	ASM – Market Research and Analysis Centre
VTT	Technical Research Centre of Finland
LIST	Luxembourg Institute of Science and Technology
RIL	Finnish Association of Civil Engineers
CU	Cardiff University
R2M	Research to Market Solution France
DTTN	Distretto Tecnologico Trentino
ENEFFECT	Center for Energy Efficiency EnEffect
GER	General Exploitable Result
AB	Advisory Board
PM	Person month
M	Month

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Table of contents

List of figures:

List of tables:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Links:

RIL Finnish association of Civil Engineers https://www.ril.fi/en/ril.html
RKL (Finnish association of Building site Managers and Engineers) https://www.rkl.fi/
RIA (Finnish association of Building Engineers and Architects) https://www.ria.fi/
SAFA (Finnish association of Architects) https://www.safa.fi/en/
HVAC Association of Finnish (SuLVI). https://sulvi.fi/suomen-lvi-liitto/in-english/
Civil Engineers magazine „Rakennustekniikka" Article is available online: https://view.taiqa.com/ril/rakennusteknikka-2-2022#/page=42
Instruct seminar held in Helsinki 24.8.2022 https://www.youtube.com/watch?v=VOM9cowWr_0

All links referred on the 10.2.2023.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

1. Demo target objective

This task focuses on increasing Energy skills certification and the demand for certification. First Energy Efficiency schemes are designed together with local cluster including FISE Finnish Certification body, Ministry of Environment, City of Tampere (building owner), Energy Authority and Finnish Association of Architects and Finnish Association of Civil Engineers. After design of EE schemes the EE schemes will be implemented in EE courses to enable certification.

The task includes the testing of EE as a part of project management certification. The local actors involved are: FISE, Finnish Certification body, Ministry of Environment (responsible for building energy efficiency legislation), City of Helsinki, Energy Authority, ATL (Finnish Association of Architect companies), RIL (Finnish Association of Civil Engineers)

2. Connection to other tasks

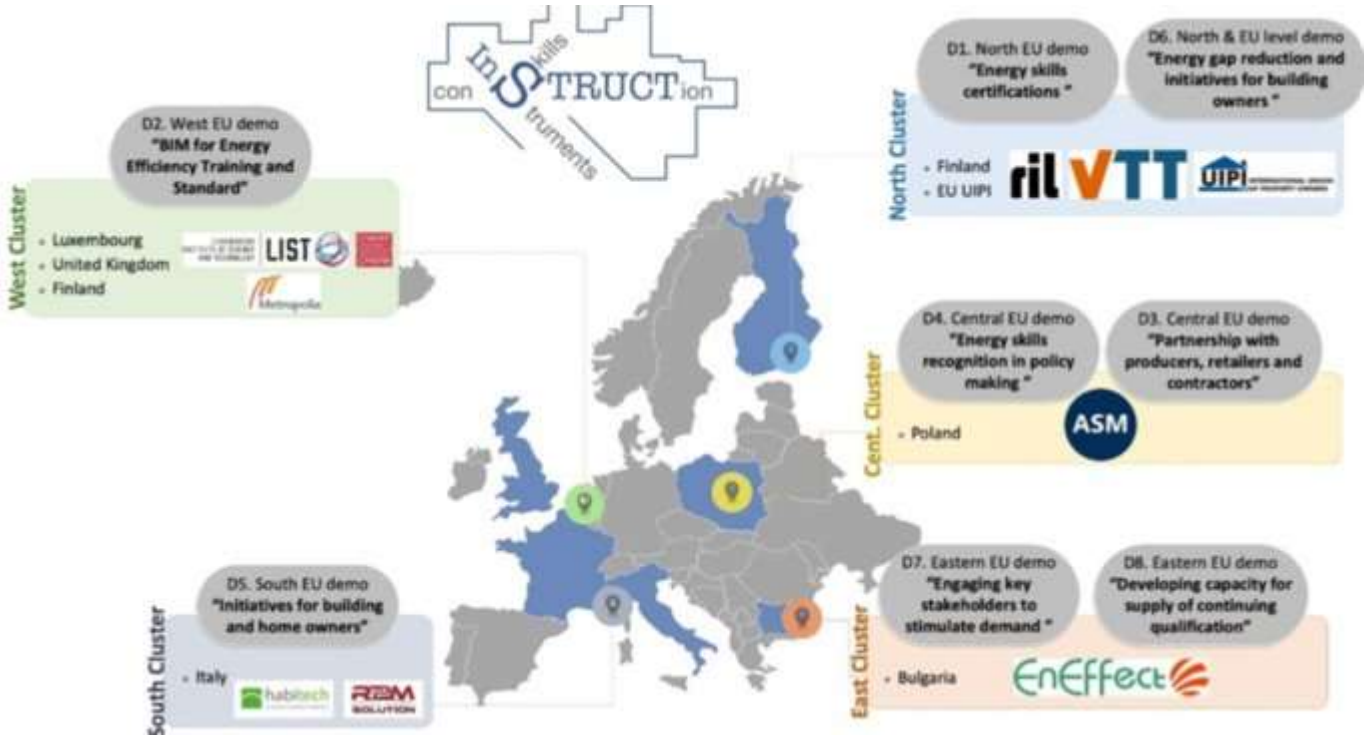

Figure 1. Overview of the demonstration pilots (Source: INSTRUCT, 2021)

2 pilots are held in the North (RIL, VTT) Energy skills certification and Energy gap reduction and initiatives for building owners.

2 pilots are held in Central Europe (ASM, ASM) Partnership with producers, retailers and contractors and policy making for energy skills

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

2 pilots are held in the East (Eneffect) Learning skills and stimulate demand for energy skills.

1 pilot is held in the West (LIST) BIM training+standards

1 pilot is held in the South (DTTN) Building and homeowners.

Table 1. Pilots

Demo number	Location	Tools for energy skills recognition	Initiatives for building and homeowners	Support to public authorities (legislative frameworks, public procurement)	Partnership with producers and retailers	Initiatives reinforcing the link between skills and energy performance	How many professionals addressed (e.g. designers, construction companies, professionals, manufacturers)
1	North	x		x			++++ BUILDUP incl.
2	Cent/West	x		x		x	++++
3	Cent/East				x		+
4	Cent/East	x		x	x	x	++++ BUILDUP incl.
5	South		x	x	x	x	+++++
6	Europe and North		x	x		x	+++
7	South East	x	x	x		x	**++++ BUILDUP incl.**
8	South East	x		x	x	x	**++++ BUILDUP incl.**

Demo 1 got input from:

- WP 2 Eliciting requirements to increase the demand for skills in Energy Efficiency
  - Skills and Learning outcomes matrix
  - Correlation between training and energy efficiency
  - Requirements for new instruments
- WP3
  - Deploy and adapt the tools for facilitating energy skills registers
  - Identifying and promoting new legislative frameworks,

This Task gives input to:

- WP 5 Dissemination
- WP6 Exploitation and replication

Co-operation with the demo 6 has been done in order to gain more attendees. Information about the attendees are shared and same locations are used in seminars.

3. Methodologies used

In the project we have used targeted survey for known experts in the energy sector in Finland. Before the first seminars we had one-to-one interviews with the key stakeholders like

- **FISE, Finnish Certification body**
- **Ministry of Environment (responsible for building energy efficiency legislation)**
- **City of Helsinki**
- **Energy Authority**
- **ATL (Finnish Association of Architect companies)**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

First seminars were about collecting the data and presenting the goals of the project. Detailed information was collected from the discussion. Data collection was based on WP2 matrix.

When the results were analysed, we moved to phase 2.

Phase 2 was about spreading the information needed and real local case project findings in the field of Energy efficiency and in the energy efficiency certification.

Phase 3 was collecting feedback from the participants and sharing the information with other project tasks.

4. Process/Tasks/Events

Results Phase 1

The insights found during the first seminars are based on previous experience and stakeholders' interviews. The first seminars were held on 1.6.2021 and 2.6.2021. Seminars had 39 participants.

Based on the stakeholders interviews and seminars discussions following information was collected.

The tables were received from the WP2.3. All the information was examined and filled based on the Finnish point of view during the process. Each of the groups consists of 4 - 14 learning outcomes that clarify and supplement the required qualifications. Tables 2 - 8 present the European level learning outcomes for the following roles along with the related EQF levels:

WP2.3 used the European level learning outcomes for the following roles along with the related EQF levels:

- Client & Clients advisors, specifically: Client, Project manager, Energy manager, Energy coordinator, Briefing consultant (Table 2)
- Architectural design roles, specifically: Architectural Design and Energy Coordinator, Chief Designer, Architect, Assistant designer (Table 3)
- Structural design roles, specifically: Structural design and Energy coordinator (structural), Assistant designer (Table 4)
- Building services design roles, specifically: HVAC and Energy design and Energy coordinator (HVAC), Assistant designer (Table 5)
- Construction work roles, specifically: Site manager, construction site workers and installers (Table 6 and Table 7)
- Maintenance work roles, specifically: Maintenance operator, property manager, care taker (Table 8)

Learning outcomes are defined in specific order forming eight groups:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

- Group 1 (LO1) Basic general knowledge of sustainable energy interventions and principlesand their application across lifecycle and supply-chains
- Group 2 (LO2) Basic factual knowledge of sustainable and energy-efficient buildings and building performance.
- Group 3 (LO3) Knowledge of facts, principles, processes and general concepts on building energy efficiency
- Group 4 (LO4) Factual and theoretical knowledge on energy efficiency, sustainability and building performance
- Group 5 (LO5) Comprehensive, specialised, factual and theoretical knowledge on energy efficiency, sustainability and building performance
- Group 6 (LO6) Advanced knowledge in energy efficiency, involving a critical understanding of theories and principles
- Group 7 (LO7) Highly specialised knowledge in energy efficiency.
- Group 8 (LO8) Knowledge at the most advanced frontier of energy efficiency and at the interface between related disciplines

Table 2: European EE learning outcome matrix for Client & Client advisors i.e. Client & Project manager, manager, coordinator, briefing consultant.

No	Country specific learning outcome and qualifications	EQF LEVEL			
Client & Client advisors **Client & Project manager** *(C),* Energy manager *(EM),* Energy coordinator *(BC),* briefing consultant *(Bc)*		*C*	*EM*	*EC*	*Bc*
LO 1	**Learner is able to explain the fundamentals of energy interventions and the underlying principles of uses with respect to building life-cycle.**	**4**	**5**	**5**	**5**
1.1	Recall essential contents, summarize and give examples of energy interventions terminologies, definitions and standards.	4	5	5	4
1.2	Explain added value of sustainable energy efficient practices and sustainable projects.	2	3	3	3
1.3	Explain the potentials of different energy-compatible assessment, simulation and optimization tools in achieving good energy and building performance. 0	3	3	3	3
LO 2	**Learner is able to explain the fundamentals of energy sustainability and energy-efficient buildings and building performance.**	**5**	**6**	**6**	**6**
2.1	Explain and give examples of aspects and terminology related to energy interventions and building energy performance.	2	3	2	2

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

2.2	Describe the aspects (financial and environmental) and energy related indicators and building performance.	2	4	4	2
2.3	Explain relations between life-cycle costs, energy performance and building performance.	2	3	3	2
LO 3	**Learner is able to prepare energy efficiency execution plan and explain essential aspects in setting strategic and project based energy targets.**	**2**	**2**	**2**	**2**
3.1	Learner is able to use relevant energy target-setting tools.	2	2	2	2
LO 4	**Learner is able to explain the procedures and importance of setting energy targets for sustainability and building performance.**	**2**	**3**	**3**	**2**
4.1	Explain the importance and illustrate processes of collecting energy targets for buildings, indoor environments and energy performance.	2	3	3	2
LO 5	**Learner is able to explain and use energy based collaboration methods for energy management and processes.**	**2**	**3**	**3**	**2**
5.1	Learner is able to explain and use energy production/consumption methods.	3	4	4	3
LO 6	**Learner is able to explain, implement and supervise quality compliant energy management procedures in building project to achieve set targets.**	**2**	**2**	**2**	**2**
6.1	Learner is able to use tools such as energy management software.	2	2	2	2

Table 3: European EE learning outcome matrix for Architectural design roles i.e. Architectural design and Coordinator (arch), Chief designer (CD), Architect (ARCH), Assistant designer (ASS)

No	Country specific learning outcome and qualifications	EQF LEVEL		
Architectural design roles Architectural design and Energy Coordinator (arch), Chief designer *(CD),* Architect *(ARCH),* Assistant designer *(ASS)*		*CD*	*ARCH*	*ASS*
LO1	**Learner is able to explain the fundamentals of energy interventions and the underlying principles of uses with respect to building life-cycle.**	**6**	**6**	**6**
1.1	Recall essential contents, summarize and give examples of energy interventions terminologies, definitions and standards.	6	6	5
1.2	Explain added value of sustainable energy efficient practices and sustainable projects.	6	6	5
1.3	Summarize the ideas of digital space and asset management.	6	6	6
1.4	Explain the European and national concepts of sustainable energy building rating and certification systems.	4	4	3

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

LO2	**Learner is able to explain the fundamentals of energy sustainability and energy-efficient buildings and building performance.**	**6**	**5**	**5**
2.1	Explain and give examples of aspects and terminology related to energy interventions and building energy performance.	6	5	5
2.2	Distinguish the level of passive performance	6	6	6
2.3	Understand and know the 4 performance criteria	6	6	6
LO3	**Learner is able to prepare energy efficiency execution plan and explain essential aspects in setting strategic and project based energy targets.**	**5**	**5**	**4**
3.1	Learner is able to understand and describe how to capitalize on passive energy gains.	5	5	4
LO4	**Learner is able to explain the procedures and importance of setting energy targets for sustainability and building performance.**	**4**	**4**	**3**
4.1	Learner is able to use relevant energy target-setting tools.	4	4	3
LO5	**Learner is able to explain and use energy based collaboration methods for energy management and processes.**	**6**	**6**	**5**
5.1	Learner is able to explain and use energy production/consumption methods.	6	5	5
LO6	**Learner is able to explain, implement and supervise quality compliant energy management procedures in building project to achieve set targets.**	**6**	**6**	**6**
6.1	Identify the services, methodologies (BIM) and people to constitute an operational team	6	6	6
LO7	**Learner is able to use different relevant energy software and interfaces between relevant software.**	**6**	**6**	**6**
7.1	Master the technical principles (insulation, thermal bridges, airtightness, heat recovery) within the relevant software.	6	6	6
LO8	**Learner is able to use different energy tools for solving complex problems at the interface between domains.**	3	3	2
8.1	Understand how to drastically reduce the losses of buildings. (sounds like a complex problem-but not sure)	6	5	5

Table 4 European wide EE learning outcome matrix for structural design roles i.e. Structural design and coordinator (structural), Assistant designer

No	Country specific learning outcome and qualifications	EQF Level

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Structural design roles Structural engineering design Magister *(SED), Construction Management* (Bachelor), *Project Management in Construction (Master)*		*SED*	*CM*	*PM C*
LO1	**Learner is able to explain the fundamentals of energy interventions and the underlying principles of uses with respect to building life-cycle.**	**-**	**-**	**-**
1.1	Recall essential contents, summarize and give examples of energy interventions terminologies, definitions and standards.	4	4	5
1.2	Explain added value of sustainable energy efficient practices and sustainable projects.	3	4	5
1.3	Summarize the ideas of digital space and asset management.	2	2	2
1.4	Explain the added value of using energy model open file formats to ensure interoperability.	2	2	2
1.6	Explain the main contents and apply relevant parts of national energy guidelines.	3	3	4
LO2	**Learner is able to explain the fundamentals of energy sustainability and energy-efficient buildings and building performance.**	**-**	**-**	**-**
2.1	Explain and give examples of aspects and terminology related to energy interventions and building energy performance.	4	5	6
2.2	Describe the aspects (financial and environmental) and energy related indicators and building performance.	4	5	6
2.3	Explain relations between life-cycle costs, energy performance and building performance.	5	5	6
2.4	Summarize and illustrate the potentials of renewable energy sources including district-scale solutions.	4	4	5
2.5	List and explain the core concepts of sustainable energy building rating and certification systems.	3	3	4
2.6	Explain the potentials of different energy-compatible assessment, simulation and optimization tools in achieving good energy and building performance.	3	4	5
LO3	**Learner is able to prepare energy efficiency execution plan and explain essential aspects in setting strategic and project based energy targets.**	**-**	**-**	**-**
3.1	Explain the overall design process for energy-efficient building.	3	4	5
3.2	Assist client to set realistic and achievable energy and building performance target.	3	4	5
3.3	Perform preliminary energy analysis in the early project stages for both new and renovation projects to add value for the decision making.	4	4	5
3.4	Assist the client to set and specify information requirements.	4	4	5

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

3.5	Explain how to support owner's effective decision-making and opinion formation of other stakeholders.	4	4	5
3.6	Illustrate how to direct the design towards set targets utilizing the capacity of different kinds of assessment methods relevant for building construction design.	5	5	6
3.7	Explain the flow of design teamwork and demonstrate how to prepare, compare and improve alternative concepts.	5	5	6
3.8	Lead / assist the tasks related to technical documents for the building authorities.	6	5	6
LO4	**Learner is able to explain the procedures and importance of setting energy targets for sustainability and building performance.**	**-**	**-**	**-**
4.1	Apply the set performance targets related to building design into BIM-based design process.	4	4	4
4.2	Iterate the design solutions to meet the set targets of building performance and energy efficiency.	4	4	4
4.3	Consider options of renewable energy and optimize its potentials.	3	3	4
	Design solutions upgradable to meet coming EE systems requirements (options for future EE improvements)	3	3	3
4.4	Create different energy efficient design concepts renewable energy systems.	3	4	4
4.5	Perform energy analyses including dynamic simulations.	2	2	2
4.6	Perform analyses of indoor air conditions with CFD (computational fluid dynamics), temperature conditions, comfort level, air quality, velocity, humidity and carbon dioxide level.	2	2	2
4.7	Perform lightning calculations, analyses and simulations.	2	2	2
4.8	Discuss and assess the effect of main building materials and main product type selections on energy performance and building performance and prepare alternative potential solutions to fulfil the set targets.	4	5	5
4.9	Use life cycle cost calculation including life-cycle studies changing influential design parameters.	5	4	5
4.10	Share the results of energy simulations, discuss the options and update domain BIMs.	4	3	4
LO5	**Learner is able to explain and use energy based collaboration methods for energy management and processes.**	**-**	**-**	**-**
5.1	Prepare the Construction engineer's domain model on the basis of set targets and definitions given in architect's domain model.	6	3	4
5.2	Create and update digital (BIM-linked) building specification with material and dimensional information to reflect owner's quality and performance requirements.	4	3	4

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

5.3	Explain essential issues of the needs of initial information and the potentials of different inventory surveys in refurbishment projects.	5	4	5
5.4	Support the process resulting in the publication of the merged model (As-Designed) together with all needed information.	4	4	4
5.5	Prepare/assist information needed for specific use cases such as bill of quantities.	6	5	6
5.6	Prepare/assist the domain model for simulation and assessment.	5	4	5
5.7	Prepare/assist models and information for planning authority and in required data format.	4	3	4
5.8	Prepare/assist models and information for procurement and construction.	5	4	5
5.9	Prepare models to fulfil quality and information requirements for quality control and assurance processes in construction.	5	4	5
5.10	Prepare models based on data and information requirements of sustainable care and maintenance processes.	4	4	5
5.11	Prepare information for As-Built Models and Maintenance model for utilization of client and building management.	4	4	5
5.12	Prepare/assist in the digital formulation of care maintenance instructions (maintenance manual) reflecting owner's energy and performance requirements.	5	4	5
LO6	**Learner is able to explain, implement and supervise quality compliant energy management procedures in building project to achieve set targets.**	**-**	**-**	**-**
6.1	Describe the essential parts of the procedure for BIM based collaboration.	4	4	5
6.2	Describe different collaborative interdisciplinary and open BIM working methods, tools and processes.	4	4	5
6.3	Demonstrate how to work collaboratively with the project stakeholders including the design team, client, users, manufacturers, construction site and building authorities.	4	4	5
6.4	Prepare relevant visualization models to enable information sharing, decision making and opinion formation.	5	4	5
6.5	Demonstrate the flow of design teamwork with use of void provision model together with architectural and structural design.	6	5	6
6.6	Collaborate with the help of communication platforms and processes.	6	5	6
LO7	**Learner is able to use different relevant energy software and interfaces between relevant software.**	**-**	**-**	**-**
7.1	Assist / participate in systematic modelling in own organization ensuring that all information is provided in right order, right format and on agreed schedule.	4	3	4

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

7.2	Validate and check compatibility of the domain model and manage and repair conflict.	4	3	4
7.3	Verify the achievement of the targets on the basis of the results received with the help of different kinds of assessment methods relevant for building construction design.	5	3	4
7.4	Participate in the verification of the achievement of the targeted result and undertake site inspections in construction site.	5	4	5
7.5	Comment product and system providers' designs and comment the contractor's equipment selection impacts on energy consumption to ensure the fulfillment of targets.	4	3	4
7.6	Instruct and audit contractors on construction site on critical points.	6	4	5
7.7	Describe and assess quality assurance methods for energy-efficient building solutions to verify achievement of set targets.	4	3	4
LO8	**Learner is able to use different energy tools for solving complex problems at the interface between domains (i.e. energy-water nexus)**	**-**	**-**	**-**
8.1	Use domain specific BIM authoring applications for building construction design and analysis.	6	4	4
8.2	Use relevant energy design calculations and assessment tools in different design phases.	2	3	3
8.3	Use different tools for BIM-based collaborative working.	5	4	5
8.4	Create combination model and use model checking tools for clash detection.	4	3	4
8.5	Extract energy information from BIM (MEP, ARCH and Structural model in different LOD-phases) to BEM for simulations and import results back to BIM.	3	3	4
8.6	Use relevant visualization tools for visualizing design solutions and output from energy simulations, calculations.	5	3	4
8.7	Prepare the domain model for simulation and assessments	4	3	4
8.8	Use tools for environmental impact analyses.	3	3	4
8.9	Use project data and file management systems.	5	4	5

Table 5. European EE learning outcome matrix for building service design roles i.e. HVAC and energy design and coordinator (HVAC), assistant designer

No	Country specific learning outcome and qualifications	EQF Level	
Building services design roles		*HVAC +E*	*AS S*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

HVAC and energy design *(HVAC+E)* and Energy coordinator (HVAC), assistant designer *(ASS)*			
LO1	**Learner is able to explain the fundamentals of energy interventions and the underlying principles of uses with respect to building life-cycle.**	**6**	**5**
1.1	Know the sources of indoor pollutants, ventilation systems and air treatment.	7	7
1.2	Know the health and economic issues related to good IAQ.	7	7
LO2	**Learner is able to explain the fundamentals of energy sustainability and energy-efficient buildings and building performance.**	**6**	**6**
2.1	Know the regulations regarding IAQ and ventilation in buildings.	6	6
2.2	Know the rules for the design, sizing and implementation of a residential ventilation system.	6	6
2.3	Recognize the pathologies and implementation faults and know how to apprehend their impacts.	6	6
LO3	**Learner is able to prepare energy efficiency execution plan and explain essential aspects in setting strategic and project based energy targets.**	**4**	**3**
3.1	Know the keys to a successful ventilation and IAQ audit.	5	5
LO4	**Learner is able to explain the procedures and importance of setting energy targets for sustainability and building performance.**	**3**	**3**
4.1	Know the principles of measurement, methods of analysis, measurement protocols and sampling methods.	4	3
LO5	**Learner is able to explain and use energy based collaboration methods for energy management and processes.**	**3**	**2**
5.1	Find avenues for improving IAQ.	5	4
LO6	**Learner is able to explain, implement and supervise quality compliant energy management procedures in building project to achieve set targets.**	**2**	**2**
6.1	Know the methods of managing indoor air quality.	5	5

Table 6. European wide EE learning outcome matrix for Construction work roles i.e. Site manager, Construction site workers and installers

No	Country specific learning outcome and qualifications	EQF Level

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Construction work roles Site manager *(SM),* Construction site workers and installers *(CW)*		*SM*	*CW*
LO 1	**Learner is able to explain the fundamentals of energy interventions and the underlying principles of uses with respect to building life-cycle.**	**6**	**4**
1.1	Acquire the basics of efficient rehabilitation.	6	6
1.2	Know the keys to renovating an existing building at low consumption level.	5	5
LO 2	**Learner is able to explain the fundamentals of energy sustainability and energy-efficient buildings and building performance.**	**5**	**4**
2.1	Understand the importance of offering quality services, and of adjusting them to those, complementary, of other stakeholders.	5	5
2.2	Understand that there is a market to seize and record the elements that will help to find its place there.	5	5

Table 7. Country specific learning outcome and qualifications for Construction work roles i.e. Site manager, Construction site workers and installers

No	Country specific learning outcome and qualifications	EQF Level	
Construction work roles Site manager (SM), Construction site workers and installers (CW)		SM	CW
LO1	**Learner is able to explain the fundamentals of energy interventions and the underlying principles of uses with respect to building life-cycle.**	**6**	**5**
1.1	Acquire the basics of efficient rehabilitation.	6	6
1.2	Know the keys to renovating an existing building at low consumption level.	6	5
1.3	Recall essential contents, summarize and give examples of energy interventions terminologies, definitions and standards.	5	4
1.4	Explain added value of sustainable energy efficient practices and sustainable projects.	4	4
1.5	Explain the potentials of different energy-compatible assessment, simulation and optimization tools in achieving good energy and building performance.	3	2
1.6	Explain the main contents and apply relevant parts of national energy guidelines.	3	3

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

LO2	**Learner is able to explain the fundamentals of energy sustainability and energy-efficient buildings and building performance.**	**3**	**2**
2.1	Understand the importance of offering quality services, and of adjusting them to those, complementary, of other stakeholders.	5	5
2.2	Understand that there is a market to seize and record the elements that will help to find its place there.	5	4
2.3	Understand the benefits of effective rehabilitation and its opportunities for professionals.	5	5
2.4	Understanding and application of new working methods, regulations and outlooks on effective rehabilitation.	4	4
LO3	**Learner is able to explain the fundamentals of energy sustainability and energy-efficient buildings and building performance.**	**6**	**4**
3.1	Explain the importance efficient rehabilitation and low consumption level.	**5**	**5**
LO4	**Learner is able to explain the procedures and importance of setting energy targets for sustainability and building performance.**	**5**	**5**
4.1	Know the principles of measurement, methods of analysis of heat low from buildings. (LO6?)	**5**	**5**
4.2	Know the principles of organization of spaces, ventilation, air tightness and humidity management. (LO6?)	**5**	**5**
LO5	**Learner is able to explain and use energy-based collaboration methods for energy management and processes.**	**5**	**5**
5.1	Know the principles of wall insulation, thermal bridges and thermal comfort.	**5**	**5**
LO6	**Learner is able to explain, implement and supervise quality compliant energy management procedures in building project to achieve set targets.**	**4**	**4**
6.1	Know the principles of heating and domestic hot water and lighting and electrical equipment specifically in old houses.	**4**	**4**

Table 8. European EE learning outcome matrix for Maintenance work roles i.e. Maintenance operator, Property manager, Care taker

No	Country specific learning outcome and qualifications	EQF Level

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Maintenance work roles Maintenance operator *(MO),* Property manager *(PM),* Care taker *(CT)*		*MO*	*PM*	*CT*
LO1	**Learner is able to explain the fundamentals of energy interventions and the underlying principles of uses with respect to building life-cycle.**	**6**	**6**	**6**
1.1	Knowing how to identify the needs and challenges of the co-ownership in terms of renovation.	6	6	5
1.2	Acquire the basics of renovation and energy performance.	6	6	5
1.3	Know the different stages of a renovation project.	6	5	5
LO2	**Learner is able to explain the fundamentals of energy sustainability and energy-efficient buildings and building performance.**	**6**	**6**	**6**
2.1	Evaluate the potential of the co-ownership and be able to unite around the issue of renovation.	5	4	4
2.2.1	To be able to collect the data necessary for the good start of the project	5	5	4
2.3	To know how to use an audit.			
2.4	Understand the different roles of each: Syndic, union council, AMO, …	6	6	5
2.4	Know how to order a quality project management.	6	6	5
LO3	**Learner is able to prepare energy efficiency execution plan and explain essential aspects in setting strategic and project based energy targets.**	**5**	**5**	**5**
3.1	Know the different types of financing and be able to express yourself on this subject.	5	5	4
LO4	**Learner is able to explain about the procedures and importance of setting energy targets for sustainability and building performance.**	**5**	**5**	**5**
4.1	Know how to mobilize before the general assembly.	5	5	5
4.2	Know the procedure to follow for a calm and legally unchallengeable vote on the work.	5	5	4
4.3	To be able to follow the work: understand the role of each person and ensure the proper conduct of the site.	5	5	4

Results Phase 2

In this section, the development of the Learning Outcomes Matrices and other updated EU Instruct material available was presented in hybrid-seminar held in Helsinki. After seminar updated material was presentented in various trainings held by Finnish construction professionals associations:
RIL (Finnish association of Civil Engineers) https://www.ril.fi/en/ril.html
RKL (Finnish association of Building site Managers and Engineers) https://www.rkl.fi/
RIA (Finnish association of Building Engineers and Architects) https://www.ria.fi/
SAFA (Finnish association of Architects) https://www.safa.fi/en/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Table 9. Trainings 2022

	Course	Location	Date	month	Distance participant	Onsite participants	Participant	Instruct materials shared
2	Main designer training: Pääsuunnittelija koulutus 21, 4. jakso	Webinaari	18.-19.1.2022	1	34		**34**	
3	Concrete supervisor: Betonityönjohtaja 4. jakso	Webinaari	18.-20.1.2022	1	88		**88**	
4	Constructor: Rakennuttajan pätevyyskoulutus 4. jakso	Webinaari	25.-26.1.2022	1	85		**85**	
5	Site manager: Rakennustyömaan vastaava työnjohtaja - ajankohtaispäivät	Webinaari	25.-26.1.2022	1	11		**11**	**11**
6	Main designer day: Pääsuunnittelijan ajankohtaispäivä	Webinaari	27.1.2022	1	52		**52**	**52**
9	Main designer training: Pääsuunnittelija koulutus 21, 5. jakso	Webinaari	8.-9.2.2022	2	34		**34**	**34**
10	Constructor: RAP koulutus 5. jakso	Webinaari	15.-16.2.2022	2	85		**85**	**85**
12	Site Manager: Rakennustyön vanhempi valvoja RAVS pätevyyskoulutus 1. jakso	Helsinki	8.-10.3.2022	3		16	**16**	**16**
15	Main designer training: Pääsuunnittelija koulutus 22, 1. jakso	Helsinki/ Webinaari	15.-16.3.2022	3	22	17	**39**	
17	Site supervisor day: Valvojapäivät	Helsinki/ Webinaari	17.-18.3.2022	3	47	3	**50**	**50**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

18	Site manager: Rakennustyömaan vastaava työnjohtaja 1. jakso	Helsinki	22.-24.3.2022	3		33	**33**	**33**
21	Site manager: Rakennustyön vanhempi valvoja RAVS pätevyyskoulutus 2. jakso	Helsinki	29.-31.3.2022	3		16	**16**	**16**
24	Main designer training: Pääsuunnittelija koulutus 22, 2. jakso	Helsinki / Webinaari	5.-6.4.2022	4	17	18	**35**	**35**
25	Site Engineer: Työmaainsinöörin pätevyyskoulutus, 1. jakso	Helsinki / Webinaari	20.-21.4.2022	4	8	5	**13**	**13**
32	Site Engineer: Työmaainsinöörin pätevyyskoulutus, 2. jakso	Helsinki / Webinaari	18.-19.5.2022	5	7	6	**13**	
33	Main designer training: Pääsuunnittelija koulutus 22, 3. jakso	Helsinki/ Webinaari	17.-18.5.2022	5	20	15	**35**	
34	New Main designers: Pätevyyskoulutus tavanomaisissa pääsuunnittelijat ehtävissä toimiville	Helsinki/ Webinaari	18.5.2022	5	2	1	**3**	**3**
37	Constructor: Rakennuttajan ajankohtaispäivä	Webinaari	31.5.2022	5	28	0	**28**	**28**
40	Main designer day: Pääsuunnittelijan ajankohtaispäivä	Webinaari	9.6.2022	6	29	0	**29**	**29**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

	Course	Location	Date	month	Distance participant	Onsite participants	Participant	Instruct materials shared
1	Main designer training: Pääsuunnittelija 4. jakso	Helsinki / Webinaari	16.-17.8.2022	8	13	23	**36**	
2	Main designer procurement: Suunnittelijan sopimuspäivä	Webinaari	30.8.2022	8	16	0	**16**	
3	Concrete supervisor: Betonityönjohtajien päivityskurssi	Helsinki / Webinaari	6.-7.9.2022	9	38	30	**68**	**68**
7	Site supervisor: Työpäällikön pätevyyskoulutus 1. jakso	Helsinki	20.-22.9.2022	9		12	**12**	**12**
8	Main designer training: Pääsuunnittelija 5. jakso	Helsinki	20.-21.9.2022	9	12	24	**36**	
10	Site Manager: Rakennustyönvalvojan RAV pätevyyskoulutus 1. jakso	Helsinki	27.-28.9.2022	9	16	23	**39**	**39**
12	Main designer training: Pääsuunnittelija koulutus 1. jakso	Helsinki	4.-5.10.2022	10	13	22	**35**	**35**
13	Main designer training: Pääsuunnittelijan ajankohtaispäivä	Webinaari	6.10.2022	10	15		**15**	**15**
15	Concrete supervisor: Betonityönjohtajan koulutus 1. jakso	Helsinki	11.-12.10.2022	10	53	48	**101**	**101**
16	Constructor: Rakennuttajan pätevyyskoulutus RAP 1. jakso	Helsinki	11.-12.10.2022	10	36	45	**81**	**81**
18	Site manager: Työpäällikön pätevyyskoulutus 2. jakso	Helsinki	18.-20.10.2022	10		12	**12**	**0**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

19	Site Manager: Rakennustyönvalvojan RAV pätevyyskoulutus 2. jakso	Helsinki / Webinaari	25.-26.10.2022	10	16	23	**39**	**0**
20	Constructor: Rakennuttajan pätevyyskoulutus RAP 2. jakso	Helsinki / webinaari	1.-2.11.2022	11	38	43	**81**	**0**
22	Main designer training: Pääsuunnittelija koulutus 2. jakso	Helsinki / webinaari	8.-9.11.2022	11	14	21	**35**	**0**
23	Concrete supervisor: Betonityönjohtajan koulutus 2. jakso	Helsinki / Webinaari	8.-9.11.2022	11	53	43	**96**	**0**
24	Concrete supervisor: Betonityönjohtajan koulutus 2. jakson 3. päivä	Helsinki / Webinaari	10.11.2022	11	9	10	**19**	**0**
26	Site manager: Työpäällikön pätevyyskoulutus 3. jakso	Helsinki	15.-17.11.2022	11		12	**12**	**0**
29	Main designer training: Pääsuunnittelija koulutus 3. jakso	Helsinki / webinaari	29.-30.11.2022	11	14	21	**35**	**0**
30	Constructor: Rakennuttajan pätevyyskoulutus RAP 3. jakso INFRA	Helsinki / Webinaari	30.11.-1.12.2022	11	11	17	**28**	**0**
32	Constructor: Rakennuttajan pätevyyskoulutus 3. jakso TALO	Helsinki / Webinaari	13.-15.12.2022	12	15	38	**53**	**0**
33	Concrete supervisor: Betonityönjohtajan pätevyyskoulutus 3. jakso	Helsinki / Webinaari	13.-15.12.2022	12	29	42	**71**	**0**
	Total				**980**	**639**	**1619**	**756**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Material was also included in the yearly training of energy calculation experts in Finland together with the HVAC Association of Finnish (SuLVI). https://sulvi.fi/suomen-lvi-liitto/in-english/
Concervative amout of energy experts contacted in yearly training is 70 persons.

Instruct article was published in the Civil Engineers magazine called Rakennustekniikka together with links to more detailed information. Article is also available online: https://view.taiqa.com/ril/rakennusteknikka-2-2022#/page=42
Magazine has over 6000 readers and online version is freely available to all interested parties. This is not calculated on the contacted experts.

Results Phase 3

In the final phase we did survey to participants about the findings of the first seminar and questionaire to be used in D2.3.

Final seminar was held in the 24th of August in Helsinki in the House of Estates.

The main topic of the seminar was “Towards carbon neutrality goals in 2035 with the help of energy efficiency management and competent operators”.

In seminar we gave information for energy efficiency experts and known civil engineering leaders about the findings and results of the Instruct project and findings. Intention was to spread deeper understanding and widen the general scope of known Energy efficiency potential.

Figure 2. EU Instruct seminar held in 24th August 2022.
The seminar had around 70 participants. The whole seminar was recorded and can be seen:

INSTRUCT-seminaari 24.8.2022 Helsingin Säätytalolla

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 894756.

5. Contributions to other tasks

Co-operation with the demo 6 has been done in order to gain more attendees to specific EU Instruct seminars. Information about the attendees are shared and same locations are used in seminars.
This Task gives input to:

- WP 5 Dissemination
- WP6 Exploitation and replication

Seminar findings and results were also shared with the WP2.3.

6. Further development

Material is finished. It should be continued to spread across the experts throughout the Europe. We have managed to collect very good package on energy efficiency. The energy efficiency has been hot topic around Europe the whole winter and will most likely stay on the headlines during the spring as well.

7. Impact

Primary Energy savings triggered by the demo

Table 10: Number of attendees 935 (designers and constructors) will result to energy saving of 114 GWh/year

	No. profess	No. project	Energy saved(kWh/year/build)	Energy saving (GWh/year)
Designers (homes)	110	5	7	3,85
Designers (commercial)	400	2	70	56
Construction (homes)	50	5	7	1,75
Construction (commercial)	375	2	70	52,50
Totals	**935**			**114.1**

Measurable energy savings and/or renewables production resulting from improved skills

Table 11: Number of attendees 935 (designers and constructors) will result to RES production of 1164 GWh/year

	No. profess	No. project	Increase in RES	RES (GWh/year)
Designers (homes)	110	5	1.25	0,69
Designers (commercial)	400	2	750	600
Construction (homes)	50	5	1.25	0,31
Construction (commercial)	375	2	750	563
Totals	**935**			**1 164**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Investments in sustainable energy triggered by the demo (in million Euro)

Table 12: Number of attendees 935 (designers and constructors) will result to 36. 600 M€

	No. profess	No. project	investment €/project	Investment (M€)
Designers (homes)	110	5	7000	3. 850
Designers (commercial)	400	2	20000	16.000
Construction (homes)	50	5	7000	1.750
Construction (commercial)	375	2	20000	15.000
Totals	**935**			**36.600**

Increased number of certification schemes for energy efficiency skills

Our project will initiative altogether **5 certification schemes or preparation of certification schemes** which will include the energy efficiency aspects in our 1 demonstration in Finland. The number of professionals in the schemes or planned schemes is **300.**

Improved mutual recognition of sustainable energy skills between Member States and neighbouring countries

INSTRUCT has 5 different geographical clusters, which are working and sharing experiences to increase the mutual recognition of skills. The list below shows the arenas where the mutual recognition work is done:

- North cluster (lead Finland): working with Nordic BuiltUp skills via MOTIVA and with Nordic Ministries of Environment via Ministry of Environment.

Improved collaboration and understanding across different trades and professional groups

Demo 1 reached **directly** in courses, meetings and workshops **935 professionals** from different trades and disciplines (manufacturers, designers, architects, construction workers, building owners, municipalities) leading to better understanding and improved collaboration.

Demonstrations enabling the impact:

- Demo 1. 935 participants days for the courses targeting on multidiscipline understanding of aspects of factors affecting on energy efficiency. The participants for courses are at least from four different professional groups (architects, construction engineers, HVAC engineers, building owners) TOTAL 935 professionals. In addition, the information campaigns reached over 6000 professionals (RIL members via magazine and direct emails.)

Increased market acceptance of sustainable energy skills

The increased market acceptance is created in three main ways; firstly, the professionals (designers, architects and construction professionals) are giving education and certification leading better understanding and spreading the understanding and concrete benefits from energy efficiency. The estimated increase of market acceptance is estimated to increase by 20%

Secondly the building's owners are included in training courses and workshops. The estimated reach of the potential stakeholders is 60-70% and 40-60% of the projects are estimated to increase sustainability in the energy choses.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Thirdly the producers and manufacturer are already increasing the supply of energy efficient choses, resulting that 40% of the supply is more sustainable than previously.

This will result in average increase of market acceptance (20% +(65% x 50% x 0.9) + 40% x 0.8)/3 = 27%

The factor 0.9 corresponds to parallel projects where both factors from building owners and designers are onboard. The factor 0.8 corresponds to parallel projects with all above mentioned actions.

Legislative changes stimulating the demand for energy skilled construction workers/professionals

From INSTRUCT demonstrations 7 of the total 8 demonstrations are connected to the national and regional municipalities. This gives a direct link to the changes in legislation. Since the process to change the legislation is very slow, the impact is seen after the project lifetime.

The legislative changes include: 1) requirement for certified skills both in design and construction, 2) Requirement for public procurement, 3) Requirement for energy renovation 4) Requirement for sustainable energy skills

Demonstrations enabling the impact:

- Demo 1. Building designer and worker energy skills requirement (Ministry of Environment in Finland)

8. Annexes

Final surwey results passed to WP2.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

RIL's survey for the EU's INSTRUCT project: Insights into the development and status of energy efficiency?

RIL's survey for the EU's INSTRUCT project - background information

All survey participants are RIL (Finnish Association of Civil Engineers') member

I am working full-time 67%, part time or retired 33%

INSTRUCT survey: Insights into the development and status of energy efficiency?

Do you face any skill gaps in the delivery of energy-efficient and sustainable interventions? (All defendants)

Yes, it has been very difficult to find solutions to optimize the energy usage based for example on the electricity Spot - prises and delivery from solar panels.

Well

Well. The opposite. There have been for many years methods and technology to make energy use more efficient, but "customers" have not seen it profitable enough to make better use of these. Meaning they have not valued it enough to buy, because of "low" energy prices. It has not been a big advantage for businesses. Now the situation has changed dramatically.

Costs and Payback times are difficult to estimate at the moment

Currently, there are still gaps in goal setting and solutions RDI. Thus, gaps are inherent in these and everything that logically follows.

Use of new materials / techniques in renovation.

Can you elaborate on these skill gaps and the ways in which these are addressed on projects? (All defendants)

They are not well addressed, see above

Yes

We have access to a lot of data (energy usage, water consumption etc.) collected almost only for Charging purposes not for Guiding consumer's behavior . Now we need services for data platforms and ways to communicate directly and instantly to users. So that they could clearly see their actions' influence on consumption . And how they could save energy and money. For example: Water Charging once a year is not enough to get people to save water even though it is measured monthly.

The price level on the market varies and, for example, the latest technology of geothermal heat is a bit unclear

See my previous answer.

Are you satisfied with the training outcomes of your staff? (All defendants)

Yes

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

Yes

Yes.

Well, I haven't noticed very many educational events in this area

I can't say, yet. Our sector has to first determine training needs, then training aims, followed by training content.

Not always.

Have you relied on training to address these skill gaps by upskilling your staff? (All defendants)

- Yes
- Yes
- Well. Not only training. Sharing information and knowledge to each other regularly and following advancing of attitudes and skills .
- Well, in this area, our staff has not participated in training
- See my previous reply.
- Not in large scale .

What are the learning outcomes acquired by your staff which helped address the above skill gaps? (What are the skills (use of tools),

Knowledge (know-how of the content and theory), or autonomy/responsibility (ability to act at task level and apply skills and competence) (All defendants)

- Use of tools
- Open minded and curious attitude. Readiness to change.
- I cannot answer because there have been no such trainings
- See my previous replies.

Has the process of reducing energy skill gaps increased the profitability of your organization? (All defendants)

- Yes of course
- Yes
- Yes.
- I cannot answer because there have been no such trainings
- See my previous replies.
- There is some potential.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.

SKILLS
INSTRUCT
INSTRUMENTS
CONSTRUCTION

Evidence-based market and policy instruments implementation across the EU to increase the demand for energy skills across construction sector value chain.

ASM Market Research and Analysis Centre

R2M RESEARCH TO MARKET SOLUTION

ril

VTT

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

habitech
IL DISTRETTO ENERGIA AMBIENTE

EnEffect

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST

www.instructproject.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 894756.