SKILLS
INSTRUCT
INSTRUMENTS
CONSTRUCTION

Refinement of the WP3 solutions based on pilot demonstratrators results

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

D4.9 Refinement of the WP3 solutions based on pilot demonstrators results

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In addition all demonstration leaders have contributed to the deliverable.

Revision and history chart

Version	Date	Editors	Comment
Version 1	6.2.2023	Janne Tähtikunnas	Structure of the deliverable, first draft
Version 2	09.02.2023	Janne Tähtikunnas	Points added to the structure of the deliverable
Version 3	17.2.2023	Janne Tähtikunnas	Added demo results to the file.
Version 4	27.2.2023	Janne Tähtikunnas	Added D4.7 results to the file.
Version 5	27.2.2023	Marcello Cursi	Reviewer from DTTN

Disclaimer:

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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

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Executive summary

The present document is an output of Task 4.9. Refinement of the WP3 solutions based on the pilot results and provides information and practices for project impacts regarding the INSTRUCT project. This document is addressed to the INSTRUCT consortium and aims at establishing a functional flow to guarantee the maximum impact of the project. This document also supports the project management plan.

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Introduction

1. Impacts monitoring methodology

The objective of the monitoring in INSTRUCT is to assess the impact of the INSTRUCT project. The monitoring process ensures that the goals and the long-term strategy are reviewed on a regular basis. In addition, it measures and keeps track of the progress, and it reveals potential shortcomings and deviations related to the targets. The impact assessment of the project's envisioned impacts, against the established baselines, evaluates also the potential of the proposed solutions at wider perspective and in the long run.

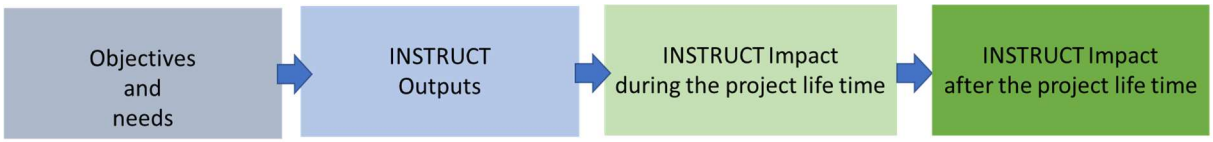

Figure 1 The schematic picture of the project methodology for INSTRCUT impacts during the project time and the long terms impacts

1.1. Continuous monitoring frame in INSTRUCT

To achieve the expected impact a monitoring scheme is followed. The monitoring scheme is using performance indicators to make it easy to follow the progress.

In INSTRUCT, the project lifetime impact is evaluated in the demonstration works (WP4). The demonstrations are different in nature and thus, different indicators are needed. Some of the impacts can be show in measurable units like energy savings in kWh/m2, year, but some of the expected impact are different in nature. For example, increased collaboration and understanding across different trades and professional groups cannot be measured directly in number but can be measured indirectly e.g. by increased collaborative workshops or increased number of project meetings between different stakeholders.

INSTRUCT has 8 demonstrations. The demonstrations have been defined according to best knowledge during the project preparation phase. After the project kick-off the demonstrations are defined more in detail.

The INSTRUCT impact assessment is based on monitoring framework and KPIs. Since there are already many good existing frameworks and KPIs, INSTRUCT is using those existing ones as a base line and then check the demonstration specific indicators and data availability to guarantee the indicator validity for the impact assessment monitoring, presented in Figure 2.

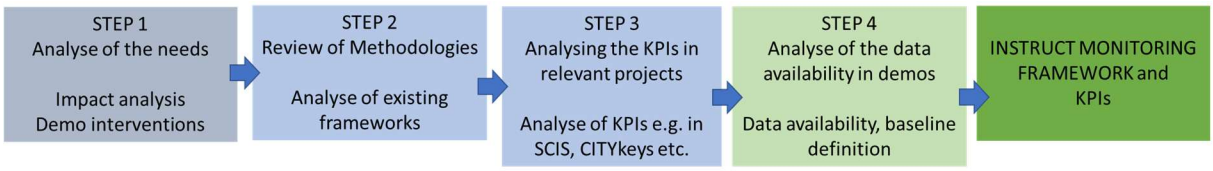

Figure 2 Schematic picture of INSTRUCT monitoring framework, KPS and baseline definition

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1.2. Definition of Key Performance indicators

Key Performance Indicators (KPIs) are specific measurements used to monitor the performance and evaluate the effectiveness of a process. In addition to performance assessment, the purpose of key performance indicators is to facilitate decision-making and to give early warnings to prevent setbacks.

Basically, KPIs are answering the questions:

- Are we doing things right?
- Are we doing right things?

Key performance indicators can be divided to five types depending on what the indicator is measuring. The five types are following:

1. **Input Indicators**
   Understanding the human and capital resources used to produce the outputs and outcomes.

2. **Process Indicators**
   Understanding the intermediate steps in producing a product or service. In the area of training for example, a process measure could be the number of training courses completed as scheduled.

3. **Output Indicators**
   Measuring the product or service provided by the system or organization and delivered to customers. An example of a training output would be the number of people trained.

4. **Outcome indicators**
   Evaluating the expected, desired, or actual result to which the outputs of the activities of a service or organization have an intended effect. For example, the outcome of safety training might be improved safety performance as reflected in a reduced number of injuries and illnesses in the workforce. Establishing a direct cause and effect relationship between the output of the activity and its intended outcome, can be difficult.

5. **Impact Indicators**
   Measuring the direct or indirect effects or consequences resulting from achieving program goals. An example of an impact is the comparison of actual program outcomes with estimates of the outcomes that would have occurred in the absence of the program.

The indicators used in INSTRUCT are whenever possible same as created in CITYkeys and in SCIS. More information is provided under the links copied below:

- CITYkeys - http://www.citykeys-project.eu/citykeys/cities_and_regions/Performance-measurement-framework
- SCIS - https://smartcities-infosystem.eu/

INSTRUCT Key Performance indicators and baseline

The project key performance indicators are measuring the impact of the project during the project lifetime. The impacts and their typical measurement units are show in the list below.

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1 Primary Energy savings triggered by the project (GWh/year)
2 Measurable energy savings and/or renewables production resulting from improved skills (GWh/year)
3 Investments in sustainable energy triggered by the project (in million Euro)
4 Increased number of certification schemes for energy efficiency skills (n.o of certification schemes)
5 Improved mutual recognition of sustainable energy skills between Member States and neighbouring countries (n.o people)
6 Improved collaboration and understanding across different trades and professional groups (n.o people/clusters)
7 Increased market acceptance of sustainable energy skills in percentage)
8 Legislative changes stimulating the demand for energy skilled construction workers/professionals (citations, references etc.)
9 Demonstrated reduction in the gap between designed and actual energy performance through improved quality of construction (%, kWh/m2)
10 Additional impacts: Reduction of the greenhouse gases emissions (in tCO2-eq/year) and/or air pollutants (in kg/year) triggered by the project

Instruct key performance indicators and impact are defined by using both top-down and bottom up approaches. In the top-down method the KPIs and impact are estimated by using references from literature and previous similar projects. In the bottom-up approach the KPIs and impact is estimated by each of the unit of the output (e.g. energy saving) and multiplied by the number of the units that is expected to achieve.

In the top-down approach also baseline needs to be defined. This is for the definition of the impact of INSTRUCT project compared without the INSTRUCT project. e.g. how much energy is saved because of the actions in the INSTRUCT project are done.

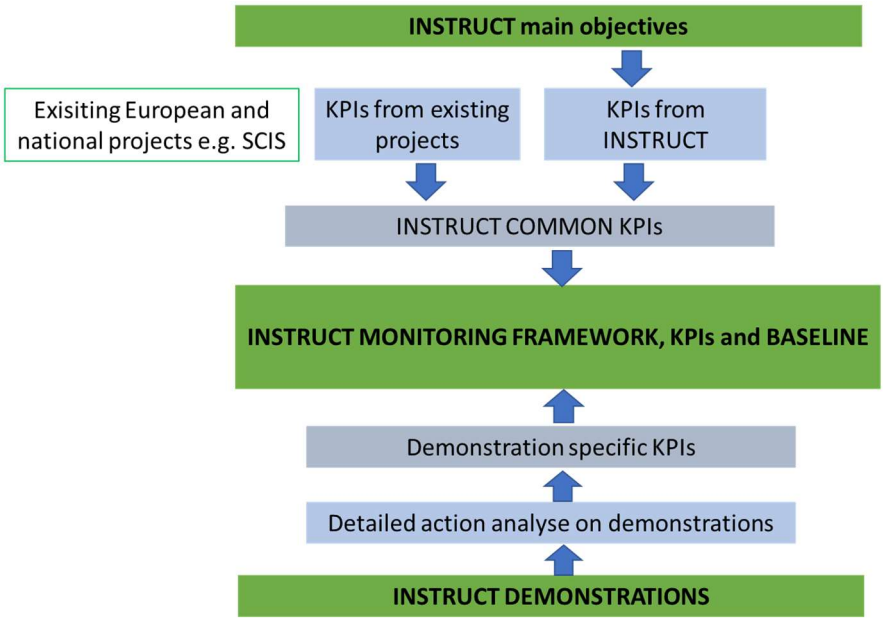

Figure 3 The monitoring framework and how KPIs are defined in INSTRUCT

1.3. INSTRUCT monitoring the impact during project lifetime

The impact is estimated based on actions and demonstration done in WP4. First the preconditions in the demonstrations are prepared, the data quality and availability are secured, and the demonstration is kicked off. To guarantee the impact the demonstration performance is continuously monitored. In the end of the demonstration the KPIs are calculated and thus the impact is confirmed.

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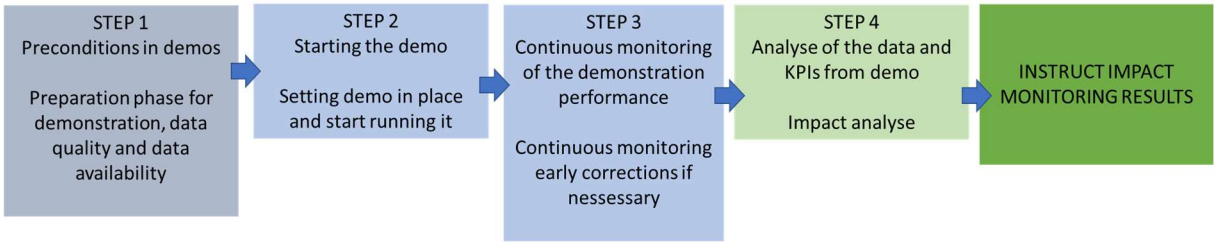

Figure 4 Schematic picture of the monitoring of the impact during the project lifetime

In INSTRUCT there are many demonstrations across Europe which are contributing e.g. to energy saving. The demonstration impact is calculated based on individual actions in the demonstrations and summed up as on impact. The impacts per tasks are estimated in Annex I and the estimated impacts calculated in project preparation phase are given in Annex II. Before the demonstrations are started there is a check point for each of the demonstrations if the estimated impacts are still valid and if not, the impacts are re-defined and the deviation is explained.

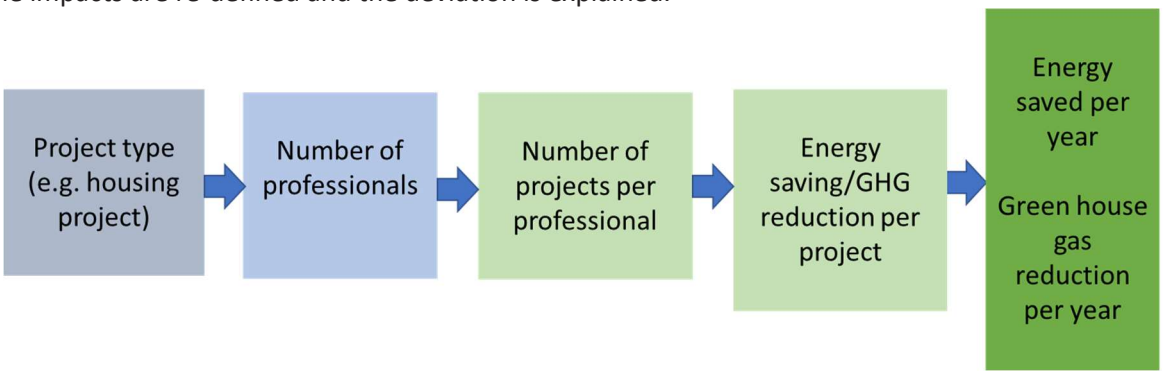

Figure 5 Schematic picture of energy saving calculations per one demonstration task (bottom-up approach)

In some of the demonstrations the impact is based on top-down approach. E.g. the impact is estimated based on impacts from previous projects or literature. There a base line needs to be defined where the impact is compared. Also, in this approach different previous projects/literature might give different impacts (e.g. energy saving between 14-25%). In these estimates the reference is defined as close as possible for the project type and for the country since building practices and climates are different, thus the impact for energy saving is also different.

To support the estimation of the demonstrations the Annex II is currently worked out to check the possible deviations. In addition to help to reach the impact in the demonstrations, the demonstration descriptions are defined according to current situation. The first iteration of the detailed description of demonstration cases will be finalized in M4 (end September) after third project meeting scheduled for 14/09/2020.

1.4. INSTRUCT impact in the long term

The long-term impacts (after 5 years of the project end) are expressed in a range. The minimum impact of the range is estimated based on direct attribute of the project impact. This can be e.g. energy certification scheme/program which is used in stakeholders involved in INSTRUCT. The maximum impact calculated by assuming that the activities done is INSTRUCT is replicated in other regions/countries/stakeholders. The long-term impacts are estimated against baseline (how would the situation be without INSTRUCT project).

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1.5. INSTRUCT impact final quality check

In addition to the continuous monitoring of the impacts and quality, the impact quality check is done also in the end of the project. The long-term impacts are compared to the short-term impacts by focusing if it is realistic to assume the long-term impacts. E.g., what is the replication potential etc. In addition, the relative impact ratios are checked. E.g. is the energy saving impacts realistic compared to GHG emissions. In addition, the long-term impacts especially the maximum impacts are checked that they are realistic compared to European wide impact. E.g. energy savings must be realistic compared to the energy use in relevant sectors.

2. Impacts in each of the demonstration tasks

2.1. Impacts in each of the demonstration tasks

WP/ Task	Indicator	Indicator	Indicator	Indicator	Impact
All	n.o Clusters working	n.o cluster meetings/workshops/ exchange of information and n.o. attendees			5 Mutual recognition of energy skills between countries
T4.1	n.o.professionals attending in courses	n.o projects	energy saved per project	investment in RES per project	1 Primary energy savings triggered by the project 2 Energy savings from improved skills 2 Renewable from improved skills 3 Investments for RES
	n.o.professionals attending in courses			n.o certification schemes	4 Certification schemes
	n.o.professionals from different diciplines attending in courses and in wider networks				6 Collaboration and understanding across different trades and professional groups
	Building requirements for designers and workers E skills	Discussions, guidelines, recommendatios, schedule for legislation etc.			8 Legislative changes
				CO2 emissions from energy	Additional: Reduction of CO2 emissions (calculated from previous impacts)
T.4.2	n.o.professionals attending in courses	n.o projects	energy saved per project	investment in RES per project	1 Primary energy savings triggered by the project 2 Energy savings from improved skills 2 Renewable from improved skills 3 Investments for RES
	n.o.professionals attending in courses			n.o certification schemes	4 Certification schemes
	n.o.professionals from different				6 Collaboration and understanding across different trades and professional groups

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	diciplines attending in courses and in wider networks				
				CO2 emissions from energy	Additional: Reduction of CO2 emissions (calculated from previous impacts)
T.4.3	n.o.professionals attending in courses	n.o projects	energy saved per project	investment in RES per project	1 Primary energy savings triggered by the project 2 Energy savings from improved skills 2 Renewable from improved skills 3 Investments for RES
	n.o.professionals from different diciplines attending in courses and in wider networks				6 Collaboration and understanding across different trades and professional groups
	Requirement for E certification of products	Discussions, guidelines, recommendatios, schedule for legislation etc.			8 Legislative changes
				CO2 emissions from energy	Additional: Reduction of CO2 emissions (calculated from previous impacts)
T.4.4	n.o.professionals attending in courses			n.o certification schemes	4 Certification schemes
	Energy certification of skills	Discussions, guidelines, recommendatios, schedule for legislation etc.			8 Legislative changes
T4.5	n.o.professionals attending in courses	n.o projects	energy saved per project	investment in RES per project	1 Primary energy savings triggered by the project 2 Energy savings from improved skills 2 Renewable from improved skills 3 Investments for RES
	n.o.professionals attending in courses			n.o certification schemes	4 Certification schemes
	n.o.professionals from different diciplines attending in courses and in wider networks				6 Collaboration and understanding across different trades and professional groups
	EE renovation requirements	Discussions, guidelines, recommendatios, schedule for legislation etc.			8 Legislative changes
	Energy consumption	Energy consumption before renovation	Energy consumption after renovation		9 Reduction of the gap between designed and actual energy performance
				CO2 emissions from energy	Additional: Reduction of CO2 emissions (calculated from previous impacts)

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T4.6	n.o.professionals attending in courses	n.o projects	energy saved per project	investment in RES per project	1 Primary energy savings triggered by the project 2 Energy savings from improved skills 2 Renewable from improved skills 3 Investments for RES
	n.o.professionals from different diciplines attending in courses and in wider networks				6 Collaboration and understanding across different trades and professional groups
	Sustainable energy skills	Discussions, guidelines, recommendatios, schedule for legislation etc.			8 Legislative changes
	Energy consumption	Energy consumption before renovation	Energy consumption after renovation		9 Reduction of the gap between designed and actual energy performance
				CO2 emissions from energy	Additional: Reduction of CO2 emissions (calculated from previous impacts)
T4.7	n.o.professionals attending in courses	n.o projects	energy saved per project	investment in RES per project	1 Primary energy savings triggered by the project 2 Energy savings from improved skills 2 Renewable from improved skills 3 Investments for RES
	n.o. professionals attending in courses			n.o certification schemes	4 Certification schemes
	n.o. professionals from different diciplines attending in courses and in wider networks				6 Collaboration and understanding across different trades and professional groups
	Public procurement requirements	Discussions, guidelines, recommendatios, schedule for legislation etc.			8 Legislative changes
				CO2 emissions from energy	Additional: Reduction of CO2 emissions (calculated from previous impacts)
T4.8	n.o.professionals attending in courses			n.o certification schemes	4 Certification schemes
	n.o. professionals from different diciplines attending in courses and in wider networks				6 Collaboration and understanding across different trades and professional groups
	Energy skills certification requirement	Discussions, guidelines, recommendatios, schedule for legislation etc.			8 Legislative changes

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	Energy consumption	Energy consumption before renovation	Energy consumption after renovation		9 Reduction of the gap between designed and actual energy performance
All	Clusters working, n.o information exchange/meetings				5 Mutual recognition of energy skills between countries
All	Courses, education, certification	n.o courses, education and certification (note this is estimate)			7 Increased market acceptance

Table 1 Indicators for different demonstrations

3. Estimated impacts in the project preparation phase

3.1. Primary Energy savings triggered by the project

Demo 1: Number of attendees 960 (designers and constructors) will result to energy saving of 117 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)	400	2	70	56
Totals	**960**			**117.6**

Table 2 Demo 1 Estimated energy saving

Demo 2: Number of attendees 700 (all construction process) will result in 315 GWh/year

	No. profess	No. project	Energy saved(kWh/year/build)	Energy saving (GWh/year)
Designers (commercial)	250	5	70	87,5
Construction (commercial)	250	5	70	87,5
Build,owners(comm/publ)	200	10	70	140
Totals	**700**			**315**

Table 3 Demo 2 Estimated energy saving

Demo 3 Number of attended 750 resulting in 140 GWh/year

	No. profess	No. project	Energy saved(kWh/year/build)	Energy saving (GWh/year)
Designers (commercial)	150	2	70	21
Construction (commercial)	500	2	70	70
Build,owners(comm/publ)	100	7	70	49
Totals	**750**			**140**

Table 4 Demo 3 Estimated energy saving

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Note in Demo 3 the expected savings are calculated based on estimated number of projects per professionals.

Demo 5: The demo consists in awareness courses for four different categories: homeowners, condominium managers, designers and contractors. The estimated energy saving is 5.4 GWh/year.

Attendees by category		No. of homes	Energy saving (MWh/yr/home)	effectiveness ratio (*)	Energy saving (MWh/yr)
category	No.				
Home owners	150	1	7	10%	105
Condominium manag.	150	20	7	10%	2100
Professionals	150	5	7	30%	1575
Contractors	150	5	7	30%	1575
Totals	**600**				**5355**

Table 5 Demo 5 Estimated energy saving

(*) Effectiveness ratio: percentage of attendees who perform the actions required to obtain the energy saving following the participation to the course.

Demo 6: The estimated energy savings are 144 GWh/year

	No. profess	No. project	Energy saved(kWh/year/build)	Energy saving (GWh/year)
Building owners (homes)	100	5	7	3.5
Build,owners(comm/publ)	200	10	70	140
Totals	**300**			**143.5**

Table 6 Demo 6 Estimated energy saving

Demo 7 The estimated energy savings are 57.7 GWh/year

	No. profess	No. project	Energy saving (kWh/year/build)	Energy sav(GWh/year)
Designers (homes and comm)	250	3	38.5	28.9
Construction professionals	250	3	38.5	28.9
Totals	**500**			**57.7**

Table 7 Demo 7 Estimated energy Saving

Note: in Demo 7 the estimated energy saving is average in commercial and homes since many professionals are doing both types of projects.

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

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Demo 1: Number of attendees 960 (designers and constructors) will result to RES production of 1201 GWh/year

	No. profess	No. project	Increase in RES	RES (GWh/year)
Designers (homes)	110	5	1.25	0,67
Designers (commercial)	400	2	750	600
Construction (homes)	50	5	1.25	0,31
Construction (commercial)	400	2	750	600
Totals	**960**			**1 201**

Table 8 Demo 1 Measurable energy savings

Demo 2: Number of attendees 700 (all construction process) will result in 3375 GWh/year

	No. profess	No. project	Increase in RES	RES (GWh/year)
Designers (commercial)	250	5	750	937,5
Construction (commercial)	250	5	750	937,5
Building owners (commercial/public)	200	10	750	1500
Totals	**700**			**3 375**

Table 9 Demo 2 Measurable energy savings

Demo 3 Number of attended 750 resulting in 1350 GWh/year

	No. profess	No. project	Increase in RES	RES (GWh/year)
Designers (commercial)	150	2	750	225
Construction (commercial)	500	2	750	750
Building owners (commercial/public)	100	5	750	375
Totals	**750**			**1 350**

Table 10 Demo 3 Measurable energy savings

Demo 5. The table below summarizes the estimated energy produced from RES, being 956 GWh

Attendees by category		No. of homes	from RES (MWh/yr)	effectiveness ratio (*)	total energy from RES (MWh/yr)
Category	No.				
Home owners	150	1	1,25	10%	18,75
Condominium managers	150	20	1,25	10%	375
Professionals	150	5	1,25	30%	281,25
Contractors	150	5	1,25	30%	281,25
Totals	600				**956**

Table 11 Demo 5 Measurable energy savings

(*) Effectiveness ratio: percentage of attendees who perform the actions required to obtain the energy saving following the participation to the course.

Demo 6. Number of attended 300 resulting in 1500 GWh/year

	No. profess	No. project	Increase in RES	RES (GWh/year)
Building owners (homes)	100	5	1.25	625

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Building owners (commercial/public)	200	10	750	1500
Totals	**300**			**1500.6**

Table 12 Demo 6 Measurable energy savings

Demo 7 The estimated RES increase is 563 GWh/year

	No. profess	No. project	Increase in RES	RES (GWh/year)
Designers (homes and commercial)	250	3	375.6	281.7
Construction professionals	250	3	375.6	281.7
Totals	**500**			**563**

Table 13 Demo 7 Measurable energy savings

Note: in Demo 7 the estimated RES is average in commercial and homes since many professionals are doing both types of projects.

3.3. Investments in sustainable energy triggered by the project (in million Euro)

Demo 1: Number of attendees 960 (designers and constructors) will result to 37. 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)	400	2	20000	16.000
Totals	**960**			**37.600**

Table 14 Demo 1 Triggered investments

Demo 2: Number of attendees 700 (all construction process) will result in 90 M€

	No. profess	No. project	investment €/project	Investment (M€)
Designers (commercial)	250	5	20000	25
Construction (commercial)	250	5	20000	25
Building owners (commercial/public)	200	10	20000	40
Totals	700			**90**

Table 15 Demo 2 Triggered investments

Demo 3 Number of attended 750 resulting in 7.560 M€

	No. profess	No. project	investment €/project	Investment (M€)
Designers (commercial)	150	2	4200	1.260
Construction (commercial)	500	2	4200	4.200
Building owners (comm./public)	100	5	4200	2.100
Totals	750			7.560

Table 16 Demo 3 Triggered investments

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Note: Demo 3 is calculated based on assumption that the reached people have in average 40% less investment costs than in average Europe.

Demo 5 Number of attended 600 resulting in 22.95 M€

Attendees by category		No. of homes	estimated investment per home (€)	effectiveness ratio (*)	total investment (k€)
category	number				
Home owners	150	1	30000	10%	450
Condominium managers	150	20	30000	10%	9000
Professionals	150	5	30000	30%	6750
Contractors	150	5	30000	30%	6750
Totals	**600**				**22950**

Table 17 Demo 5 Triggered investments

(*)Effectiveness ratio: percentage of attendees who perform the actions required to obtain the energy saving following the participation to the course.

Demo 6. Estimated investments 42 500 M€

	No. profess	No. project	investment €/project	Investment (M€)
Building owners (homes)	100	5	7000	3.500
Building owners (commercial/public)	200	10	20 000	40.000
Totals	**300**			**43.500**

Table 18 Demo 6 Triggered investments

Demo 7 Estimated investments 20 250 M€

	No. profess	No. project	investment €/project	Investment (M€)
Designers (homes and commercial)	250	3	13 500	10.125
Construction professionals	250	3	13 500	10.125
Totals	**500**			**20.250**

Table 19 Demo 7 Triggered investments

Note: in Demo 7 the estimated investment is average in commercial and homes since many professionals are doing both types of projects.

3.4. Increased number of certification schemes for energy efficiency skills

Our project will initiative altogether **14 certification schemes or preparation of certification schemes** which will include the energy efficiency aspects in our 6 demonstrations in 7 countries. The number of professionals in the schemes or planned schemes is (300+500+280+300+500) = **1880.**

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Demonstrations enabling the impact:

- Demo 1. Yearly 5 certifications schemes including energy aspects. These 5 schemes will include round 300 professionals yearly applying the certification.
- Demo 2. Standardization is very linked to the certification schemes. The working group will reach 500 professionals and will give the spark for the preparation of the energy efficiency schemes estimated to be 4 in number.
- Demo 4. Energy skills recognition in and requirements for skilled workers will discuss a part of the quality check also certification. The reached professionals is estimated to be 280 in number. The plan is for 3 schemes or preparation of schemes
- Demo 5. National certification body is involved in campaigns and will reach estimated 300 professionals in number. (1 scheme)
- Demo 7 and 8: National agencies are involved in campaigns and will reach 500 professionals (1 scheme in preliminary preparation)

3.5. 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.
- Central West Cluster (Lead Luxemburg): working with Benelux and French-speaking (France, Canada, Switzerland) countries via standardisation association (BuildingSmart) and BIM alliance (a collaboration amongst 4 projects funded under H2020, incl. BIMEET).
- Central East Cluster (Lead Poland): working with Germany, Czech Republic and Slovakia to align the recognition via local Chambers of Commerce
- South Cluster (Lead Italy): working with Italian and French countries directly via companies like R2M which have units in both countries
- South East Cluster (Lead Bulgaria): working with Romania, Croatia and Greece via Building Knowledge Hubs network, product manufacturers and regional energy agencies. In addition close co-operation is dome with PRO-NZEB and URBAN-INCERC

3.6. Improved collaboration and understanding across different trades and professional groups

Project will reach **directly** in courses, meetings and workshops **3 210 professionals** from different trades and disciplines (manufacturers, designers, architects, construction workers, building owners, municipalities) leading to better understanding and improved collaboration. (960+240+200+600+250+500+480) = 3 210
Additionally, the project will reach **12 000 professionals** (6000+2000+2000+1000+1000) **with its wider networks and information campaigns**.

Demonstrations enabling the impact:

- Demo 1. Yearly 960 participants days for the courses targeting on multidiscipline understanding of aspects of factors affecting on energy efficiency (32 courses with 30 participants in average). The participants for courses are at least from four different professional groups (architects, construction engineers, HVAC engineers, building owners)

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TOTAL 960 professionals. In addition, the information campaigns will reach 6000 professionals (RIL members)

- Demo 2. Training in 3 countries (LUX, UK, FRA), 8 trainings each having in average 30 participants from stakeholders in design, construction and building owners. Total reach 240 professionals. Additional information campaigns will reach 2000 professionals (LIST professional collaboration network)
- Demo 3. Arranged meetings and collaboration workshops between different stakeholders, 8 workshops/meetings/consultations from stakeholders varying from producers and manufacturers, contractors as well as retailers, special focus is given to SMEs with a TOTAL 200 targeted professionals, and 1000 people with its wider networks
- Demo 5. Arranged of 12 meetings with 50 people, together 600 150 professionals. In addition, multimedia campaign about the benefits of the improvements of energy efficiency are produced reaching up to 2000 professionals. TOTAL 2600 professionals.
- Demo 6. Arranged of 10 meetings and workshops with building owners and municipalities (in average 25 people), together the reach is 250 professionals
- Demo 7. Training engagement arranged in 10 times with an average of 50 people resulting in 500 people
- Demo 8. Capacity building engagement meetings and and information 12 times in average 40 people resulting 480 professionals. In addition, the wider network contains roughly 1000 people.

3.7. 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.
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.

3.8. 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)
- Demo 3. Requirement for energy certification of products (Polish Construction Chamber)

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- Demo 4. Energy certification of skills (Polish Construction Chamber)
- Demo 5. Energy efficient renovation requirements (Distretto Famiglia Vallagarina, Italy)
- Demo 6. Sustainable energy skills (Ministry of Environment, Finland)
- Demo 7. Public procurement requirement (Ministry of Energy, Bulgary)
- Demo 8. Energy skills certification requirement (Municipal Energy Efficiency Network EcoEnergy, Bulgary)

3.9. Demonstrated reduction in the gap between designed and actual energy performance through improved quality of construction

INSTRUCT will reach directly 3 210 professionals and with its wider network 12 000 being total 15 000 professionals of which 60% are working directly in the construction process (design and construction). The yearly number of the projects (in average 3 projects per person) carried out by these professionals is 0.6 x 12 000 x 3 = 21 600 projects
Energy consumption per project in average (20 + 200)/2 MWh (see impact 1) resulting 110 MWh per project.
The potential to reduce the gap via increased skills 21 600 x 110 MWh x 0.04 = 95 040 MWh

Demonstrations enabling the impact:
Demo 5. South Europe cases
Demo 6. North European cases
Demo 8. South East European cases
(1) de Wilde, P. 2014. The gap between predicted and measured energy performance of buildings: A framework for investigation. Automation in Construction 41 (2014) 40–49.
(2) Dall'O', G., Sarto, L., Galante, A. & Pasetti, G. 2012. Comparison between predicted and actual energy performance for winter heating in high-performance residential buildings in the Lombardy region (Italy). Energy and Buildings 47 (2012) 247–253

Additional impacts Reduction of the greenhouse gases emissions (in tCO2-eq/year) and/or air pollutants (in kg/year) triggered by the project
The average CO2 ekv emissions in EU is 385 g CO2/kWh (Eurostat).

- The saved energy (impact1) is estimated to be 1309 GWh/year, thus the average CO2 ekv reduction is 1309 GWh x 385 g CO2/kWh = 503 965 tn CO2ekv
- The RES increase (impact 2) will additionally reduce the CO2ekv emissions 8 945 GWh x 385 g CO2/kWh = 3 442 825 tn CO2ekv
- The increased quality in construction (impact 9) will reduce CO2ekv emissions 95 040 MWh x 385 g CO2/kWh = 36 590 tn CO2ekv

Total reduction of greenhouse gas emissions is: **4.0 million tn CO2ekv**

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4. Refinement impacts of the project

4.1. Primary Energy savings triggered by the project

Demo 1: 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**

Table 20 Demo 1 Primary energy savings

Demo 2: Number of attendees 840 (all construction process) will result in 294 GWh/year

	No. profess	No. project	Energy saved(kWh/year/build)	Energy saving (GWh/year)
Designers and Construction professionals (commercial)	840	5	70	294
Totals	**840**			**294**

Table 21 Demo 2 Primary energy savings

Demo 3 Number of attended 894 resulting in 191 GWh/year

	No. profess	No. project	Energy saved(kWh/year/build)	Energy saving (GWh/year)
Designers (commercial)	150	2	70	21
Construction (commercial)	644	3	70	135
Build,owners(comm/publ)	100	5	70	35
Totals	**894**			**191**

Table 22 Demo 3 Primary energy savings

Note in Demo 3 the expected savings are calculated based on estimated number of projects per professionals.

Demo 5: The demo consists in awareness courses for four different categories: homeowners, condominium managers, designers and contractors. The estimated energy saving is 10.3 GWh/year.

Attendees by category		No. of homes	Energy saving (MWh/yr/home)	effectiveness ratio (*)	Energy saving (MWh/yr)
category	No.				
Home owners	198	1,3	7	10%	180
Condominium manag.	28	3,7	7	10%	103

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Professionals and Contractors	536	5	7	30%	10 017
Totals	**762**				**10 300**

Table 23 Demo 5 Primary energy savings

(*) Effectiveness ratio: percentage of attendees who perform the actions required to obtain the energy saving following the participation to the course.

Demo 6: The estimated energy savings are 143 GWh/year

	No. profess	No. project	Energy saved(kWh/year/build)	Energy saving (GWh/year)
Building owners (homes)	90	5	7	3.15
Build,owners(comm/publ)	200	10	70	140
Totals	**290**			**143.15**

Table 24 Demo 6 Primary energy savings

Demo 7 The estimated energy savings are 34.7 GWh/year

	No. profess	No. project	Energy saving (kWh/year/build)	Energy saving (GWh/year)
Designers (homes and comm)	150	3	38.5	17.3
Construction professionals	150	3	38.5	17.3
Totals	**300**			**34.7**

Table 25 Demo 7 Primary energy savings

Note: in Demo 7 the estimated energy saving is average in commercial and homes since many professionals are doing both types of projects.

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

Demo 1: 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**

Table 26 Demo 1 Measurable energy savings

Demo 2: Number of attendees 840 (all construction process) will result in 3150 GWh/year

	No. profess	No. project	Increase in RES	RES (GWh/year)

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Designers and Construction professionals (commercial)	840	5	750	3150
Totals	**840**			**3 150**

Table 27 Demo 2 Measurable energy savings

Demo 3 Number of attended 894 resulting in 2049 GWh/year

	No. profess	**No. project**	**Increase in RES**	**RES (GWh/year)**
Designers (commercial)	150	2	750	225
Construction (commercial)	644	3	750	1 449
Building owners (commercial/public)	100	5	750	375
Totals	**894**			**2 049**

Table 28 Demo 3 Measurable energy savings

Demo 5. The table below summarizes the estimated energy produced from RES, being 1834 GWh

Attendees by category		**No. of homes**	**from RES (MWh/yr)**	**effectiveness ratio (*)**	**total energy from RES (MWh/yr)**
Category	**No.**				
Home owners	198	1,3	1,25	10%	32,17
Condominium managers	28	3,7	1,25	10%	12,95
Professionals and contractors	536	17,8	1,25	30%	1 789
Totals	762				**1 834,12**

Table 29 Demo 5 Measurable energy savings

(*) Effectiveness ratio: percentage of attendees who perform the actions required to obtain the energy saving following the participation to the course.

Demo 6. Number of attended 290 resulting in 1500 GWh/year

	No. profess	**No. project**	**Increase in RES**	**RES (GWh/year)**
Building owners (homes)	90	5	1.25	0,563
Building owners (commercial/public)	200	10	750	1500
Totals	**290**			**1500.6**

Table 30 Demo 6 Measurable energy savings

Demo 7 The estimated RES increase is 338 GWh/year

	No. profess	**No. project**	**Increase in RES**	**RES (GWh/year)**
Designers (homes and commercial)	150	3	375.6	169.0
Construction professionals	150	3	375.6	169.0
Totals	**300**			**338**

Table 31 Demo 7 Measurable energy savings

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

Note: in Demo 7 the estimated RES is average in commercial and homes since many professionals are doing both types of projects.

4.3. Investments in sustainable energy triggered by the project (in million Euro)

Demo 1: 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**

Table 32 Demo 1 Triggered investments

Demo 2: Number of attendees 840 (all construction process) will result in 84 M€

	No. profess	No. project	investment €/project	Investment (M€)
Designers (commercial)	840	5	20000	84
Totals	840			**84**

Table 33 Demo 2 Triggered investments

Demo 3 Number of attended 894 resulting in 11.474 M€

	No. profess	No. project	investment €/project	Investment (M€)
Designers (commercial)	150	2	4200	1.260
Construction (commercial)	644	3	4200	8.114
Building owners (comm./public)	100	5	4200	2.100
Totals	894			11.474

Table 34 Demo 3 Triggered investments

Note: Demo 3 is calculated based on assumption that the reached people have in average 40% less investment costs than in average Europe.

Demo 5 Number of attended 762 resulting in 86.95 M€

Attendees by category		No. of homes	estimated investment per home (€)	effectiveness ratio (*)	total investment (k€)
category	number				
Home owners	198	1,3	30000	10%	772.200
Condominium managers	28	3,7	30000	10%	310.800

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Professionals and contractors	536	17,8	30000	30%	85 867.2
Totals	**762**				**86 949.4**

Table 35 Demo 5 Triggered investments

(*)Effectiveness ratio: percentage of attendees who perform the actions required to obtain the energy saving following the participation to the course.

Demo 6. Estimated investments 43 150 M€

	No. profess	No. project	investment €/project	Investment (M€)
Building owners (homes)	90	5	7000	3.150
Building owners (commercial/public)	200	10	20 000	40.000
Totals	**290**			**43.150**

Table 36 Demo 6 Triggered investments

Demo 7 Estimated investments 12 150 M€

	No. profess	No. project	investment €/project	Investment (M€)
Designers (homes and commercial)	150	3	13 500	6.075
Construction professionals	150	3	13 500	6.075
Totals	**300**			**12.150**

Table 37 Demo 7 Triggered investments

Note: in Demo 7 the estimated investment is average in commercial and homes since many professionals are doing both types of projects.

4.4. Increased number of certification schemes for energy efficiency skills

Our project initiated altogether **14 certification schemes or preparation of certification schemes** which will include the energy efficiency aspects in our 6 demonstrations in 7 countries. The number of professionals in the schemes is (300+500+280+300+500) = **1880.**

Demonstrations enabling the impact:

- Demo 1. Yearly 5 certifications schemes including energy aspects. These 5 schemes will include round 300 professionals yearly applying the certification.
- Demo 2. Standardization is very linked to the certification schemes. The working group will reach 500 professionals and will give the spark for the preparation of the energy efficiency schemes estimated to be 4 in number.
- Demo 4. Energy skills recognition in and requirements for skilled workers will discuss a part of the quality check also certification. The reached professionals is estimated to be 280 in number. The plan is for 3 schemes or preparation of schemes
- Demo 5. National certification body is involved in campaigns and will reach estimated 300 professionals in number. (1 scheme)
- Demo 7 and 8: National agencies are involved in campaigns and will reach 500 professionals (1 scheme in preliminary preparation)

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4.5. 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:

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- South East Cluster (Lead Bulgaria): working with Romania, Croatia and Greece via Building Knowledge Hubs network, product manufacturers and regional energy agencies. In addition close co-operation is dome with PRO-NZEB and URBAN-INCERC

4.6. Improved collaboration and understanding across different trades and professional groups

Project reached **directly** in courses, meetings and workshops **4 021 professionals** from different trades and disciplines (manufacturers, designers, architects, construction workers, building owners, municipalities) leading to better understanding and improved collaboration. (935+840 +894+762+290+300) = 4 021
Additionally, the project will reach **12 000 professionals** (6000+2000+1000+2000+1000) **with its wider networks and information campaigns**.

Demonstrations enabling the impact:

- Demo 1. Yearly 935 participants days for the courses targeting on multidiscipline understanding of aspects of factors affecting on energy efficiency (31 courses with 30 participants in average). 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 will reach 6000 professionals (RIL members)
- Demo 2. Training in 3 countries (LUX, UK, FRA), 8 trainings each having in average 30 participants from stakeholders in design, construction and building owners. Total reach 240 professionals. Additional information campaigns will reach 2000 professionals (LIST professional collaboration network)
- Demo 3. Arranged meetings and collaboration workshops between different stakeholders, 8 workshops/meetings/consultations from stakeholders varying from producers and manufacturers, contractors as well as retailers, special focus is given to SMEs with a TOTAL 200 targeted professionals, and 1000 people with its wider networks
- Demo 5. Arranged of 12 meetings with 50 people, together 600. 150 professionals. In addition, multimedia campaign about the benefits of the improvements of energy efficiency are produced reaching up to 2000 professionals. TOTAL 2600 professionals.

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- Demo 6. Arranged of 10 meetings and workshops with building owners and municipalities (in average 25 people), together the reach is 250 professionals
- Demo 7. Training engagement arranged in 10 times with an average of 50 people resulting in 500 people
- Demo 8. Capacity building engagement meetings and and information 12 times in average 40 people resulting 480 professionals. In addition, the wider network contains roughly 1000 people.

4.7. 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.
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.

4.8. 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)
- Demo 3. Requirement for energy certification of products (Polish Construction Chamber)
- Demo 4. Energy certification of skills (Polish Construction Chamber)
- Demo 5. Energy efficient renovation requirements (Distretto Famiglia Vallagarina, Italy)
- Demo 6. Sustainable energy skills (Ministry of Environment, Finland)
- Demo 7. Public procurement requirement (Ministry of Energy, Bulgary)
- Demo 8. Energy skills certification requirement (Municipal Energy Efficiency Network EcoEnergy, Bulgary)

4.9. Demonstrated reduction in the gap between designed and actual energy performance through improved quality of construction

INSTRUCT reached directly 4 021 professionals and with its wider network 12 000 being total 16 000 professionals of which 60% are working directly in the construction process (design and construction).

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The yearly number of the projects (in average 3 projects per person) carried out by these professionals is 0.6 x 12 000 x 3 = 21 600 projects
Energy consumption per project in average (20 + 200)/2 MWh (see impact 1) resulting 110 MWh per project.
The potential to reduce the gap via increased skills 21 600 x 110 MWh x 0.04 = 95 040 MWh

Demonstrations enabling the impact:
Demo 5. South Europe cases
Demo 6. North European cases
Demo 8. South East European cases
(1) de Wilde, P. 2014. The gap between predicted and measured energy performance of buildings: A framework for investigation. Automation in Construction 41 (2014) 40–49.
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Additional impacts Reduction of the greenhouse gases emissions (in tCO2-eq/year) and/or air pollutants (in kg/year) triggered by the project
The average CO2 ekv emissions in EU is 385 g CO2/kWh (Eurostat).

- The saved energy (impact1) is estimated to be 782,4 GWh/year, thus the average CO2 ekv reduction is 787,25 GWh x 385 g CO2/kWh = 303 091 tn CO2ekv
- The RES increase (impact 2) will additionally reduce the CO2ekv emissions 10 035 GWh x 385 g CO2/kWh = 3 863 475 tn CO2ekv
- The increased quality in construction (impact 9) will reduce CO2ekv emissions 95 040 MWh x 385 g CO2/kWh = 36 590 tn CO2ekv

Total reduction of greenhouse gas emissions is: **4.2 million tn CO2ekv**

REFERENCES

1. Artley, W., & Stroh, S. (2001). The performance-based management handbook. Volume Two. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:The+Performance-Based+Management+Handbook#2
2. INSTRUCT Consortium Agreement, Version FINAL
3. Grant Agreement number: 894756 — INSTRUCT — H2020-LC-SC3-2018-2019-2020 / H2020-LC-SC3-EE-2019

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

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