

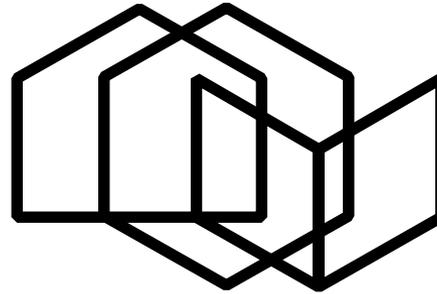
**PROF / TRAC:**

**PROFessional multi-disciplinary TRaining and  
Continuing development in skills for nZEB  
principles**

**The PROF/TRAC qualification schemes and  
skills mapping methodologies**

**European Multi-Level Skills Offensive:  
The key to ensuring public support for  
the energy transition**

**Brussels, Belgium, 20-02-2018**



**PROF / TRAC**

Peter Op 't Veld, PROF / TRAC coordinator  
Huygen Engineers & Consultants, Maastricht, The Netherlands



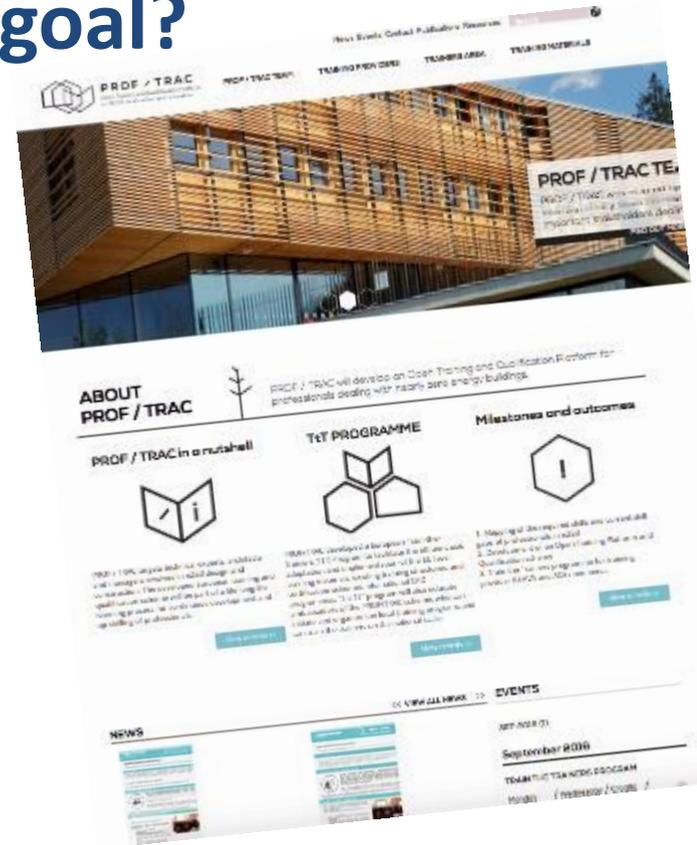
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**INGENIEURS & ADVISEURS**

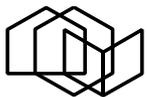
# What is the PROF/TRAC overall goal?

- Develop and maintain an **Open Education Platform for Continuing Professional Development** for professionals in the building sector.
- This platform **addresses technical experts, engineers, architects and building managers** > middle and senior professionals
- The developed **European qualification scheme** as part of a life-long learning process for continuing development and up-skilling of professionals.



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# Current situation in EU

- Slight shortage of building workers by 2020 in most European countries
- The need for training of the current workforce is much stronger than the estimated need for additional workers
- More than 3 million workers (blue collar and white collar) would require up-skilling on energy efficiency or renewable energy sources by 2020
- Importance of transferable and cross-trade knowledge and skills
  
- Challenge: Need to improve also the skills of middle and senior level professionals to achieve overall quality in NZEB's
- Scope: upgrading or setting up large-scale qualification & training schemes, foster cross-trade and cross-level collaboration > *understanding and transparency between different trades and levels (e.g installers must be able to understand designs related to their work, engineers need to know how to present their design/engineering to installers)*

***No quality and quality control in construction and renovation without the required skills and trainings!***



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# Outcomes:

## Development of a roadmap to train nZEB professionals

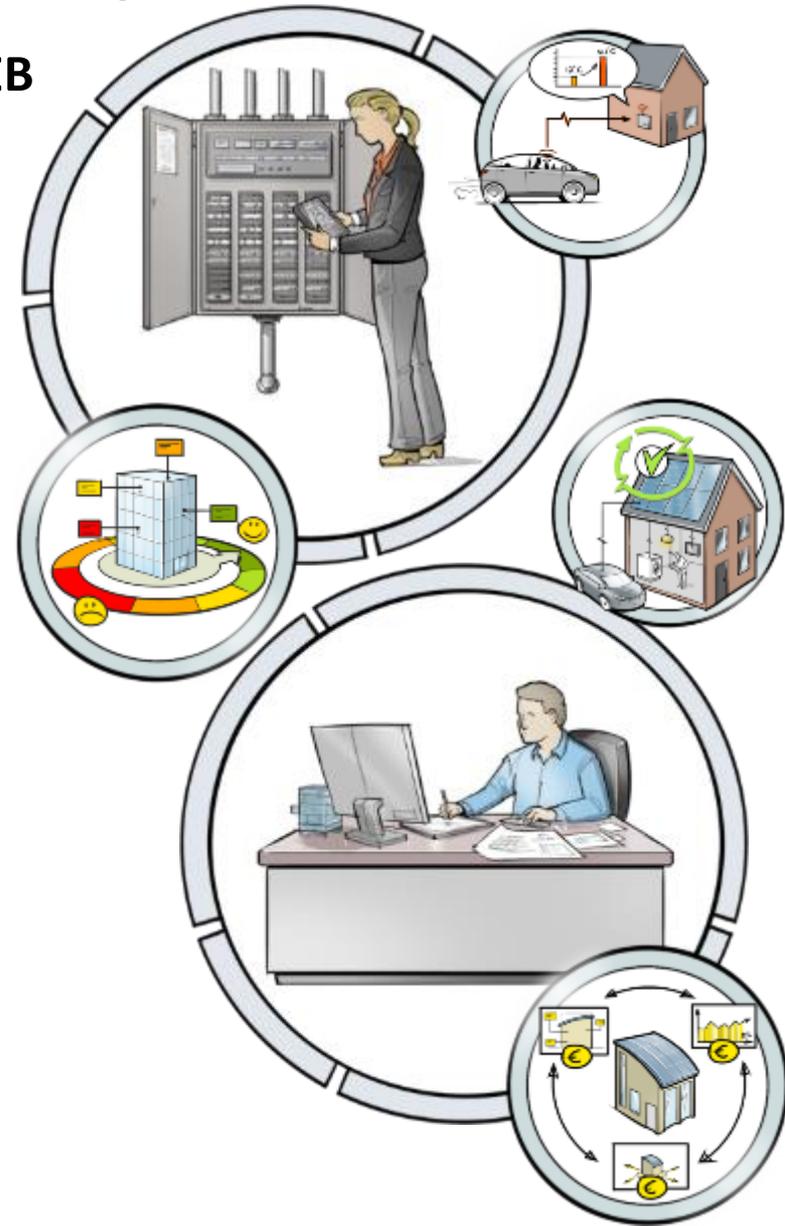
### Mapping of the skills and current skill gaps in nZEB

#### First step:

- ▶ Adapting methodologies of national BUILD UP Skills actions
- ▶ Methodology available for any new comer training provider on [www.profrac.eu/publications/reports](http://www.profrac.eu/publications/reports)
- ▶ Done in 7 member states

#### Second step:

- ▶ Roadmaps have been developed on a national and EU-wide level focussing on successful national implementation of nZEB trainings for professionals.
- ▶ The EU roadmap does the same for the EU, focussing on similarities or corresponding outcomes of the member states



# Methodology skills mapping

## 1. PROF/TRAC Consortium defined:

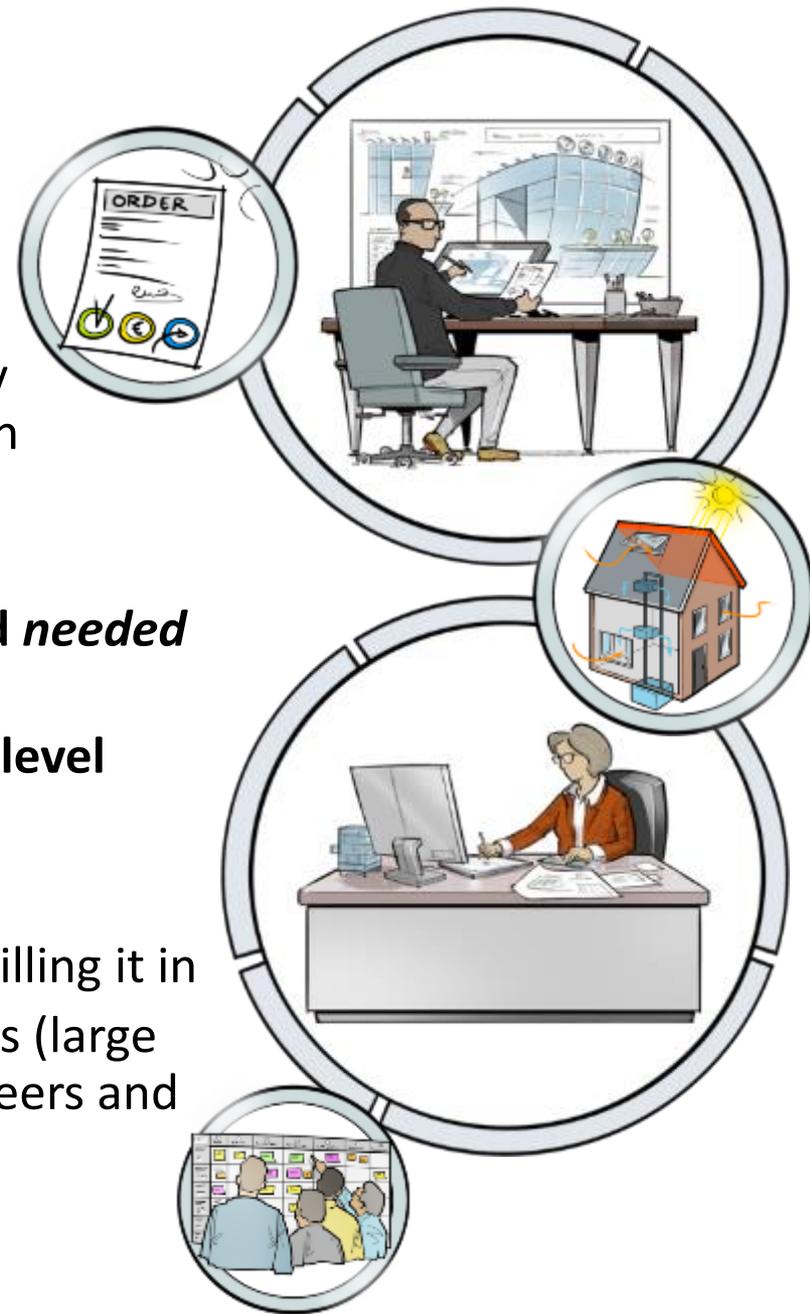
- ▶ Professions
- ▶ Skills levels
- ▶ Relevant nZEB Technologies on Energy Management / Production / Reduction
- ▶ Interdisciplinary skills, such as communications, economics

## 2. National experts mapped the *current and needed* skills on nZEB

## 3. Outcome is a skills gap, at a certain skills level

### >> *Lessons Learned:*

- ▶ Results depend very much on expert filling it in
- ▶ Different skills for different professions (large difference between architects / engineers and building managers)



# Example of results of skills mapping

Professional

CODE	TECHNOLOGY, INTERDISCIPLINARY SKILLS AND PROFESSIONS	Mechanical Engineer					Building aut. Engineer										
		current	nZEB	Gap	1	2	3	4	5	current	nZEB	Gap	1	2	3	4	5
<b>M</b>	<b>ENERGY MANAGEMENT</b>																
EM1	Smart grid systems	2	2	0						4	1						
EM2	Domotic systems	2	2	0						5	1						
EM3	Building management systems	2	3	1						4	5	1					
<b>P</b>	<b>ENERGY PRODUCTION (on-site and nearby)</b>																
EP1	Geothermal energy	3	3	0						2	3	1					
EP2	Biomass	2	2	0						1	2	1					
EP3	Biogas	2	2	0						1	2	1					
EP4	District heating and cooling	3	4	1						2	3	1					
EP5	Heatpumps	3	5	2						3	3	0					
EP6	Solar power systems for electricity generation	3	2	0						3	3	0					
EP7	Solar thermal systems for cooling generation	2	4	2						2	2	0					
EP8	Solar thermal systems for domestic hot water	3	4	1						2	2	0					
EP9	Mini wind power	2	1	0						2	2	0					
EP10	Combined Heat and Power (CHP)	3	3	0						3	2	0					

Skills

Skills gap from level 2 to 3

CODE	TECHNOLOGY, INTERDISCIPLINARY SKILLS AND PROFESSIONS	Architect					Building Engineer					Construction Engineer															
		current	nZEB	Gap	1	2	3	4	5	current	nZEB	Gap	1	2	3	4	5	current	nZEB	Gap	1	2	3	4	5		
<b>M</b>	<b>ENERGY MANAGEMENT</b>																										
EM1	Smart grid systems	1	1	0						1	1	0															
EM2	Domotic systems	1	1	0						1	1	0															
EM3	Building management systems	1	1	1						1	1	1															
<b>P</b>	<b>ENERGY PRODUCTION (on-site and nearby)</b>																										
EP1	Geothermal energy	0	1	1						0	1	1															
EP2	Biomass	0	1	1						0	1	1															
EP3	Biogas	0	1	1						0	1	1															
EP4	District heating and cooling	1	1	1						1	1	1															
EP5	Heatpumps	1	1	1						1	1	1															
EP6	Solar power systems for electricity generation	1	1	1						1	1	1															
EP7	Solar thermal systems for cooling generation	1	1	1						1	1	1															
EP8	Solar thermal systems for domestic hot water	0	1	1						0	1	1															
EP9	Mini wind power	0	1	1						0	1	1															
EP10	Combined Heat and Power (CHP)	0	1	1						0	1	1															
<b>R</b>	<b>ENERGY REDUCTION</b>																										
ER1	Insulation	3	4	1						4	5	1															
ER2	Airtightness building	3	4	1						4	5	1															
ER3	Micro-climates	2	4	2						2	2	0															
ER4	Envelope systems	2	4	2						2	2	0															
ER5	Hot water systems	1	2	1						1	1	0															
ER6	Window and/or glazing systems	3	3	0						4	4	0															
ER7	Heating and cooling emission systems	2	3	1						2	3	0															
ER8	Electric heating systems	2	1	0						2	1	0															
ER9	Artificial lighting systems	2	2	0						2	2	0															
ER10	Ventilation systems	2	2	0						2	2	0															
<b>S</b>	<b>INTERDISCIPLINARY SKILLS</b>																										
IS1	Communication	4	5	1						4	3	0															
IS2	Information management	4	4	0						4	3	0															
IS3	Collaboration	3	4	1						3	3	0															
IS4	Quality assurance	3	4	1						3	4	1															
IS5	Sustainable architectural design	4	5	1						3	3	0															
IS6	Integrated design	3	4	1						3	3	0															
IS7	Sustainable building materials	3	4	1						3	3	0															
IS8	Sustainable insulation materials	2	2	0						2	2	0															
IS9	Environmental (indoor) quality	3	3	0						2	2	0															
IS10	Economics	3	3	0						2	2	0															
IS11	Procurement	2	3	1						2	1	0															

Skills levels can be estimated from level 0 to 5, and will automatically be coloured.

Explanation of the levels 0 - 5:

0	Not applicable / no knowledge and skills required
1	Has little knowledge and skills with respect to the relevant field / technology
2	Understands basic knowledge and has practical skills within the field, is able to solve problems by
3	Has comprehensive, factual and theoretical knowledge, is capable of solving problems within the field
4	Has advanced knowledge involving a critical understanding of theories and principles and skills, required
5	Has specialised knowledge and problem-solving skills, partly at the forefront of knowledge in the field, in

# Development of a European qualification scheme

- a **qualification scheme** is elaborated
- for the **targeted professions** using the **integrated, multidisciplinary approach** of the IEE IDES-EDU and other relevant projects

Technology Nr.								
EP5	Planning and design of heat pump installations 	energy production for heating, cooling and potable hot water, making use of an energy source with low temperature and bringing it to a higher temperature.						
Project phase	General description and subtasks	Workfield						
		Architecture	Mechanical Engineering	Electrical Engineering	Structural engineering	Construction management	Financing and procurement	Building management
<b>General</b>	<b>General knowledge of heat pumps, design and application</b>	<b>1</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
	Understands the basic working and application of heat pumps, is able to explain and discuss.	x	x	x	x	x	x	x
	Is aware of types of available heat sources for use with heat pumps, understands the influence of source temperature on energy efficiency.		x	x				
<b>Pre design</b>	<b>Performance of a feasibility study</b>	<b>2</b>	<b>5</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>-</b>
	Can make an inventory of available heat sources and identify possibilities or restraints		x					
	Can estimate the heat loss of the building, to perform feasibility study of heat pumps		x					
	Inventory of possible heat pumps and available sources (e.g. outdoor air, exhaust air, soil, rivers)		x					

# Development of a European qualification scheme

## PROF/TRAC recommended nZEB skills levels per skill and per work field

Work field	Architecture	Civil Engineering	Electrical Engineering	Mechanical Engineering	Building Management	Construction Management	Financing and Procurement
Reference professions	Architect	Civil Engineer	Electrical Engineer	Mechanical Engineer	Facility Manager	Project Manager	Procurer
		Construction engineer	ICT engineer	Building automation eng.	technical energy engineer	Cost engineer	project developer
		structural engineer		Energy engineer	operator	Quality assurance	
<b>TECHNOLOGY, INTERDISCIPLINARY SKILLS AND PROFESSIONS</b>							
<b>ENERGY MANAGEMENT</b>							
EM							
EM1	Smart grid systems	2	1	5	3	3	2
EM2	Domotic systems	2	1	4	4	3	2
EM3	Building management systems	2	1	4	5	3	2
<b>ENERGY PRODUCTION (on-site and nearby renewable energy production and off-site renewable energy)</b>							
EP							
EP1	Geothermal energy	2	2	3	4	2	2
EP2	Biomass	2	2	3	4	2	2
EP3	Biogas	2	2	3	4	2	2
EP4	District heating and cooling	2	2	3	4	2	2
EP5	Heatpumps	2	2	3	5	2	2
EP6	Solar power systems for electricity generation	3	3	5	4	2	2
EP7	Solar thermal systems for cooling generation	2	2	3	4	2	2
EP8	Solar thermal systems for domestic hot water and/or heating generation)	2	2	3	5	2	2
EP9	Mini wind power	3	3	4	3	2	2
EP10	Combined Heat and Power (CHP)	2	2	4	4	2	2
<b>ENERGY REDUCTION of construction</b>							
ER							
ER1	Insulation	5	4	1	2	1	3
ER2	Air tightness building	5	4	1	2	1	3
ER3	Micro climates	4	3	1	2	1	3
ER4	Envelope systems	5	4	1	2	1	3
ER6	Window and/or glazing systems	4	4	1	2	1	3
<b>ENERGY REDUCTION of installations</b>							
ER							
ER5	Hot water systems	3	2	3	4	2	3
ER7	Heating and cooling emission systems	3	2	3	5	2	3
ER8	Electric heating systems	3	2	4	4	2	3
ER9	Artificial lighting systems	3	2	5	3	2	3
ER10	Ventilation systems	3	2	3	5	2	3
<b>SUSTAINABLE INTEGRATED DESIGN</b>							
IS							
IS5	Sustainable architectural design	5	4	3	3	2	2
IS6	Integrated design	5	4	4	4	3	3
IS7	Sustainable building materials	5	4	3	3	3	3
IS8	Sustainable installation materials	3	3	4	4	3	3
IS9	Environmental (indoor) quality	4	3	4	4	3	3
<b>INTERDISCIPLINARY SKILLS</b>							
IS							
IS1	Communication	4	3	3	3	3	5
IS2	Information management	5	3	3	3	3	5
IS3	Collaboration	4	4	4	4	4	4
IS4	Quality assurance	4	3	3	3	3	4
IS10	Economics	4	3	3	3	3	5
IS11	Procurement	4	3	3	3	3	4



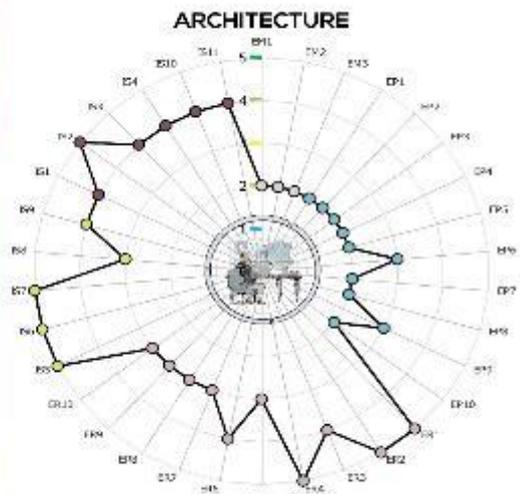
# PROF/TRAC European Qualification Scheme – nZEB knowledge and skill level

## How to use the qualification level?

0	Not applicable knowledge and skills level
1	Has basic knowledge and skills required to understand basic technology knowledge and to perform basic tasks
2	Has essential knowledge and skills to perform basic tasks for the daily work, capable to solve a problem by selecting and applying basic knowledge, facts, rules and/or techniques (based on the technical context)
3	Has comprehensive, factual and theoretical knowledge and skills within the field/technology, is capable of solving problems within the field
4	Has advanced knowledge including a critical understanding of the current practice, and the capability to solve complex and unpredictable problems in the field and in areas of the technology
5	Has advanced knowledge and skills including the potential to transfer knowledge in the field, a critical understanding of knowledge and processes and to integrate knowledge from different fields

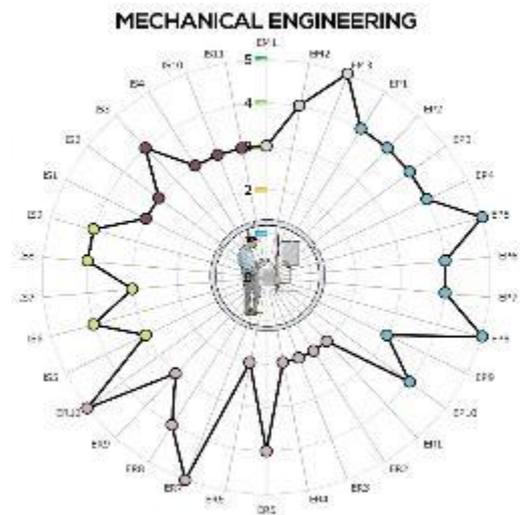
DP1	Energy systems	<b>ENERGY MANAGEMENT ENERGY PRODUCTION</b>
DP2	Control systems	
DP3	Building management systems	
DP4	Cooling energy	
DP5	Heating	
DP6	Boiler	<b>ENERGY REDUCTION</b>
DP7	Control Heating and Cooling	
DP8	Heat pumps	
DP9	Solar power systems for electricity generation	
DP10	Solar thermal systems for cooling generation	
DP11	Solar thermal systems for domestic hot water and/or heating	<b>SUSTAINABLE INTEGRATED DESIGN</b>
DP12	Marine power	
DP13	Control Heat and Power (CHP)	
DP14	Heat exchangers	
DP15	Air conditioning	
DP16	Microclimate	<b>INTERDISCIPLINARY SKILLS</b>
DP17	Energy efficiency	
DP18	Energy storage	
DP19	Water and hydraulic systems	
DP20	Energy modelling systems	
DP21	Building modelling systems	
DP22	Simulation systems	
DP23	Sustainable architectural design	
DP24	Interior design	
DP25	Sustainable building materials	
DP26	Sustainable building materials	
DP27	Energy efficiency	
DP28	Energy efficiency	
DP29	Energy efficiency	
DP30	Energy efficiency	
DP31	Energy efficiency	



0	Not applicable knowledge and skills level
1	Has basic knowledge and skills required to understand basic technology (mostly outside the own field of expertise)
2	Has essential knowledge and skills to perform basic tasks within the field/technology, is capable of solving a problem by selecting and applying basic knowledge, facts, rules and/or techniques (based on the technical context)
3	Has comprehensive, factual and theoretical knowledge and skills within the field/technology, is capable of solving problems within the field
4	Has advanced knowledge including a critical understanding of the current practice, and the capability to solve complex and unpredictable problems in the field and in areas of the technology
5	Has advanced knowledge and skills including the potential to transfer knowledge in the field, a critical understanding of knowledge and processes and to integrate knowledge from different fields

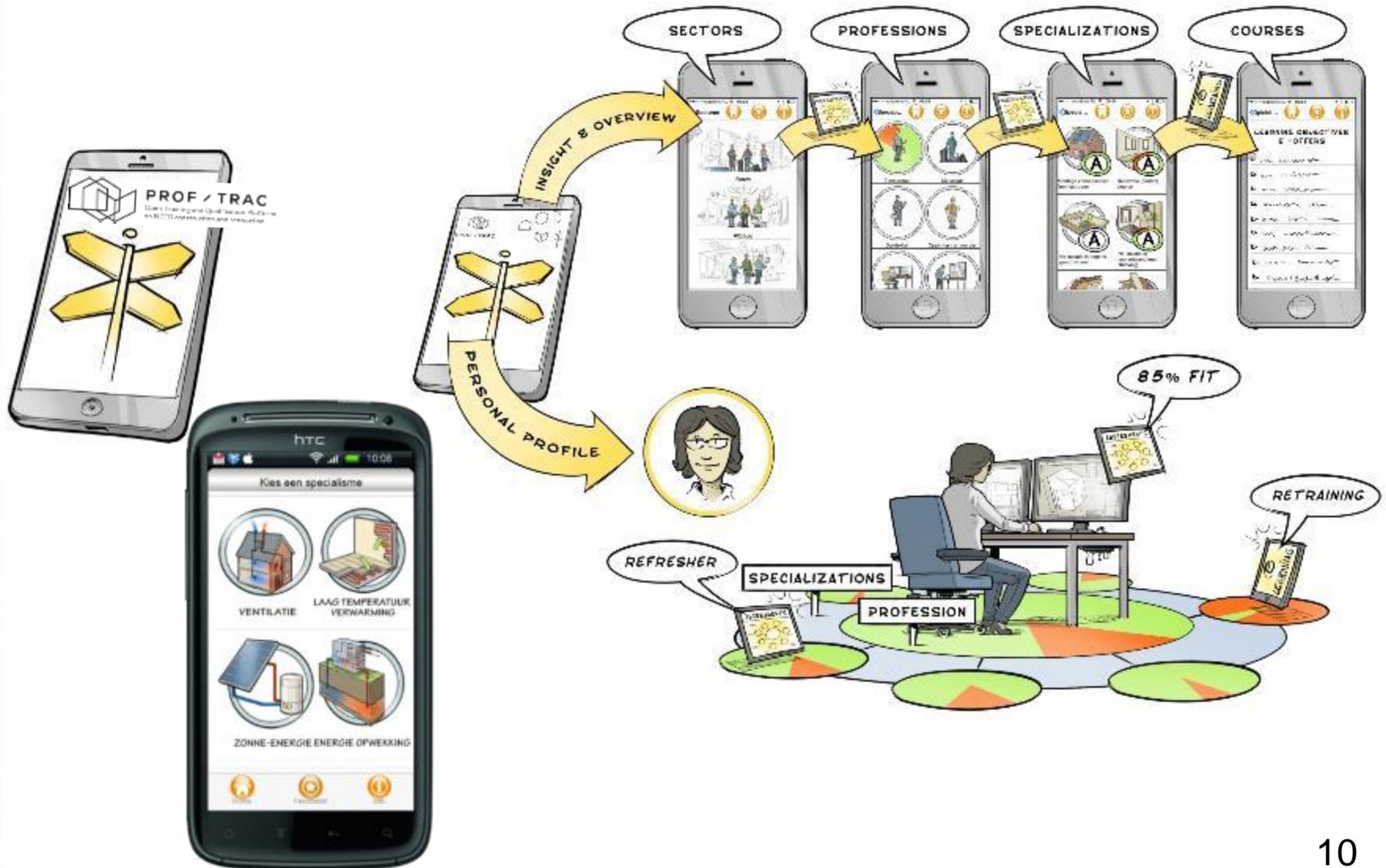
  

EM1	Energy systems	<b>ENERGY MANAGEMENT ENERGY PRODUCTION</b>
EM2	Control systems	
EM3	Building management systems	
EM4	Cooling energy	
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EM20	Energy modelling systems	
EM21	Building modelling systems	
EM22	Simulation systems	
EM23	Sustainable architectural design	
EM24	Interior design	
EM25	Sustainable building materials	
EM26	Sustainable building materials	
EM27	Energy efficiency	
EM28	Energy efficiency	
EM29	Energy efficiency	
EM30	Energy efficiency	
EM31	Energy efficiency	



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# The BUILD UP Skills advisor app



# Outcomes: PROF/TRAC Database – Online

<http://proftrac.eu/training-materials.html>



**PROF / TRAC**

Open Training and Qualification Platform  
on NZEB construction and renovation

PROF / TRAC TEAM

TRAINING PROVIDERS

TRAINERS AREA

TRAINING MATERIALS

## TRAINING MATERIAL REPOSITORY WEBPAGE



On this page you can find all relevant training materials on NZEB. Use the filter form on the left to narrow the results.

### nZEB knowledge to share?

Upload your training material in the repository and make it available to the PROF/TRAC Community.

UPLOAD >>

Topic

Select topic

Type of project

Select one...

Building use

Select one...

Type of material

Select one...

Language

Select one...

Filter result >>

Relevant report

Topic

Project

 <b>The Comfort Houses: Measurements And Analysis Of The Indoor Environment And Energy Consumption In 8 Passive Houses 2008-2011</b>	Energy reduction	ZEB	<a href="#">More details</a>
 <b>Energineutralt Byggeri – Definition og fremtidig rolle i samfundet</b>	Energy management	ZEB	<a href="#">More details</a>
 <b>Energineutralt Byggeri – Designprincipper og byggede eksempler for enfamiliehuse</b>	Energy management	ZEB	<a href="#">More details</a>
 <b>Energineutralt Byggeri – Tekniske løsninger</b>	Energy management	ZEB	<a href="#">More details</a>
 <b>Zero Energy Buildings - DESIGN PRINCIPLES AND BUILT EXAMPLES</b>	Energy management	ZEB	<a href="#">More details</a>
 <b>Survey Findings Report</b>	Awareness of energy efficiency	TRB	<a href="#">More details</a>
 <b>Final conclusions report</b>	Awareness of energy efficiency	TRB	<a href="#">More details</a>



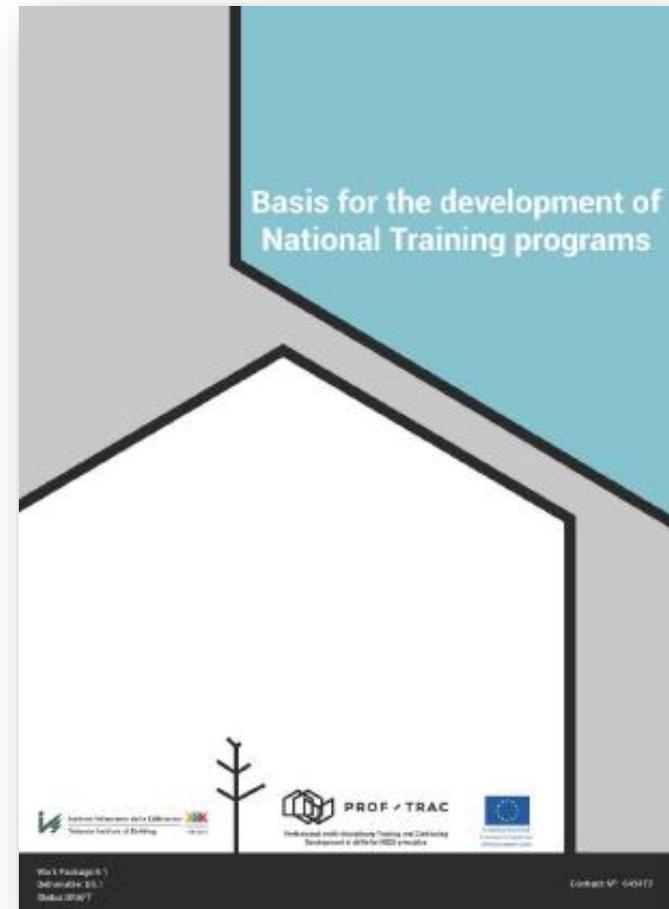
# Outcomes:

## PROF/TRAC Educational guide

- Basis for the development of national training programs
- Available for training providers to be used as a support to design the pilot courses

- Available:

[www.proftrac.eu/publications/reports](http://www.proftrac.eu/publications/reports)



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# Training methods:

## PROF/TRAC Train the Trainer sessions

- Core of the PROF/TRAC training method is the **organisation of a European, central Train-the-Trainers program.**
- Goal of the Train-the-Trainers (TtT) program is to **create ‘ambassadors’ for the PROF-TRAC project**
- These trained experts will initiate and organise the national training programs and can train the trainers on national scale.
- **Three Train-the-Trainers courses have been organized** as interactive face-to-face trainings on central places.
  
- Next training rounds will be done by **webinars** to make these trainings very efficient and easily accessible for new teachers. All the stages will be supported by the Open Training Platform.

<https://www.youtube.com/watch?v=0kmP7DnRFj8>

*Preliminary conclusions after 3 TtT face-fo-face sessions and 2 as webinars:*

- A Train-the-Trainer approach seems to be quite effective to enlarge the impact and to create a snowball effect



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# Training methods:

## PROF/TRAC Train the Trainer sessions

1. TtT

Number of trained trainers:  
1<sup>st</sup> TtT session: 22  
(7 female, 15 male)

2. TtT

2<sup>nd</sup> TtT session: 26  
(13 female, 13 male)

3. TtT

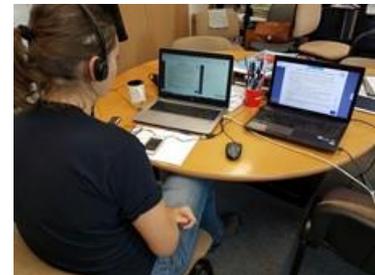
3<sup>rd</sup> TtT session: 12  
(2 female, 10 male)

4. TtT

4<sup>th</sup> TtT webinar session 138  
(48 female, 90 male)

5. TtT

5<sup>th</sup> TtT webinar session 37  
(17 female, 20 male)



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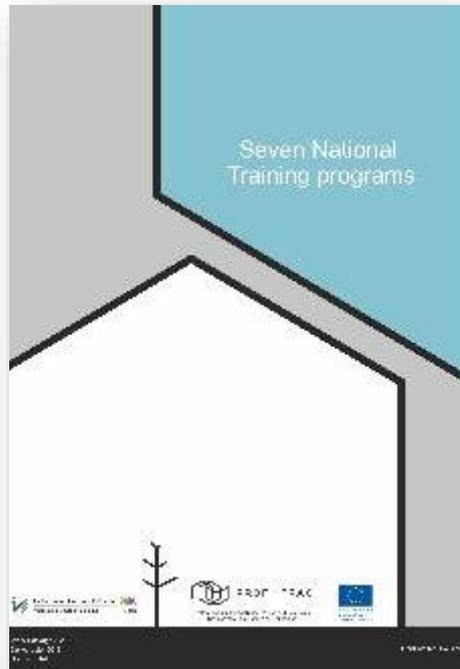
# Outcomes:

*PROF/TRAC Seven national training programs*

*Denmark, The Netherlands, Spain, Italy, Czech Republic, Slovenia and Croatia*

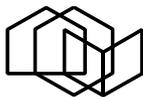
National courses are tailor-made, as an outcome of the skills mapping and preparation during the TtT sessions

Methods: mix of e-learning (preparations, some cases as threshold level) and interactive group working, assignments



Participants national courses:

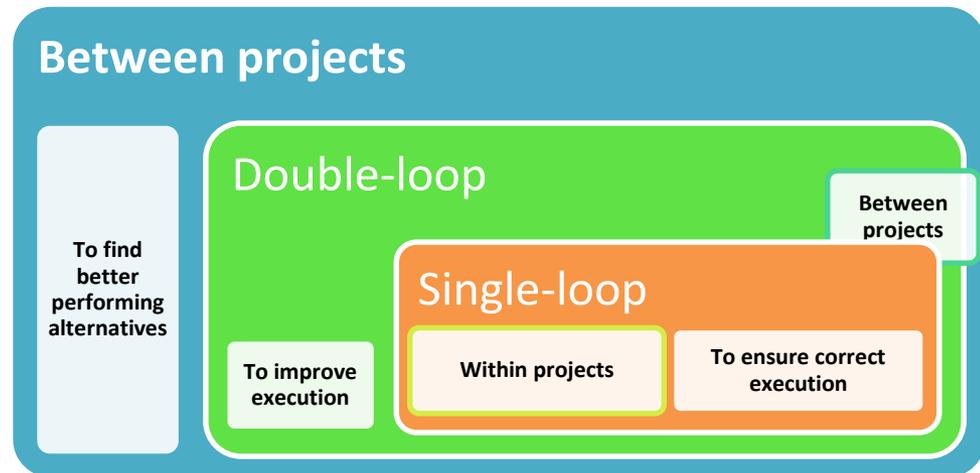
		(female)
•Croatia:	31	(8)
•Czech Republic:	680	(90)
•Italy:	44	(13)
•Netherlands:	20	(2)
•Slovenia:	30	(12)
•Spain:	29	(10)
<b>Total:</b>	<b>834</b>	<b>(135)</b>



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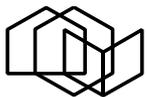
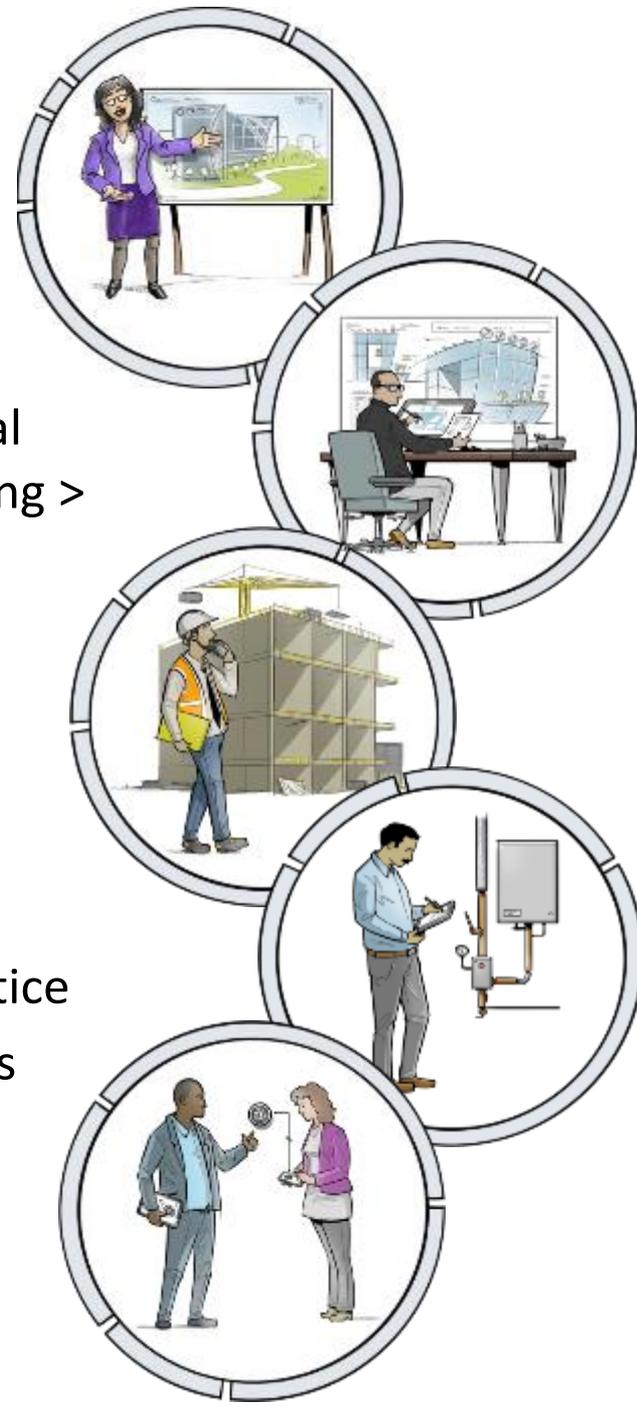
# New developments in construction skills: involving BIM and ICT / digital solutions

- BIM is addressed in the latest contracted Construction Skills projects
  - Training and upskilling to work with BIM
  - Using BIM as a training tool itself (even more interesting as an innovative approach in training)
- Example: BIMplement (started September 2017)
  - Using BIM as a universal ‘information carrier’ for quality control
  - Identifying quality control levels > identifying necessary skills for involved trades and professional levels > identifying necessary trainings and upskilling > BIM enhanced
  - Enriching BIM-models with process or learning metadata
  - Using hands-on and BIM-enhanced workplace learning tools
  - BIM-enhanced learning loops:



# BIMplement in a nutshell:

- Using BIM as a universal ‘information carrier’ for quality control
- Identifying quality control levels > identifying necessary skills for involved trades and professional levels > identifying necessary trainings and upskilling > BIM enhanced
- Cross-trade and Cross-level
- Enriching BIM-models with process or learning metadata
- Using hands-on and BIM-enhanced workplace learning tools
- Implemented on (at least) 50 building sites in practice
- Mainly SME’s oriented but also for large companies



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BIMplement

# Conclusions

- Although the task and challenge is massive (upskilling of more than 3 million workers in the construction sector....) the BUS and Construction Skills actions are not 'a stitch in time' and could give a contribution in upskilling the European work force
- A Train-the-Trainer approach, in combination with local training providers, is effective and can create a snowball effect
- Collaboration with European organisations like REHVA, Architect Council of Europe, Housing Europe is very effective for endorsement and a further European roll out; their national members can act as training providers
- Architectural professions and the (HVAC) engineer branch seem to be covered quite well, managers of housing companies still need attention (for example sustainable procurement, occupant engagement etc.)
- Trainings should also take end-user related issues into account, especially for NZE / deep renovations
- Collaboration between BUS and CS projects (as initiated during the BUS exchange meetings) clearly gives an added value



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