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BIMZeED

Education for zero energy buildings using Building Information Modelling

2nd National Steering Group Meeting in Ireland

2nd April 2020.

NSG 2 Virtual Workshop

The MS Teams meeting is to be recorded by the organiser

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BIMZED

education
for zero energy buildings
USING BUILDING INFORMATION MODELLING

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BIMzeED

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- BIMzeED is a three-year project funded by the European Union through the Erasmus + program.

Budget:	€955,600
Start date:	November 2018
End date:	October 2021
Call:	Erasmus+ Knowledge Alliances for Higher Education (KA2) - Cooperation and Innovation for Good Practices

PARTNERS

The Challenge

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Overcoming skills gaps, shortages and mismatches and improving employability (using energy efficiency and digitalisation approaches) in the European construction sector.

➢HOW?

By improving and expanding the existing skills of educators, trainers, small and medium-sized enterprises, construction managers, craftspeople and other experienced employees.

BIMzeED Objectives:

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1. **Identify lack of knowledge and skills in NZEB and digitisation (BIM)**

   within higher and vocational educational institutions and the construction sector for each partner country (Ireland, Spain, Hungary and Croatia).

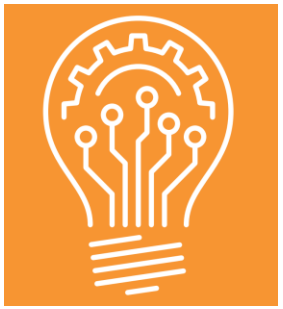
2. **Improve human capacity in the construction sector**

   acting on higher education institutions and vocational education and training systems in Europe.

3. **Support the construction sector through education and skills development**

   to work with technical innovation and digitisation.

4. **Transfer knowledge of BIM and NZEB to and from other countries.**



How?

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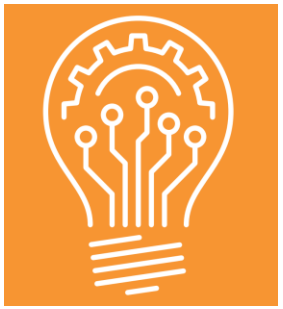
5. **Establish and develop 12-16 Learning Units (LUs)**

   To increase the understanding of BIM tools and NZEB within existing curricula in the construction sector.

6. **To upskill 120 lecturers at European higher and vocational educational organisations**

   through a series of trainings (Learning Units) using innovative and new educational materials that will be publicly available and downloadable on the BIMzeED e-learning portal.



Objectives:

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7. **To upSkill 400-500 students, construction supervisors, craftspeople and other members in the construction industry**

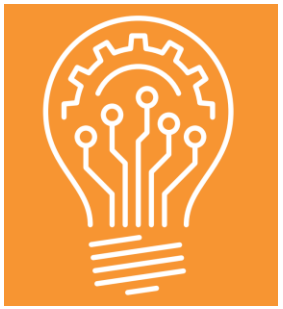
   in order to improve their employment opportunities.

8. **Improve links and collaboration between educational bodies, industry and SMEs through innovative technologies**

   Ensuring up to date and innovative approaches (learning through good practices, site visits, industry demonstrations).

9. **Increase employment opportunities in educational and small and medium-sized enterprises**

   better known as business development collaboration.



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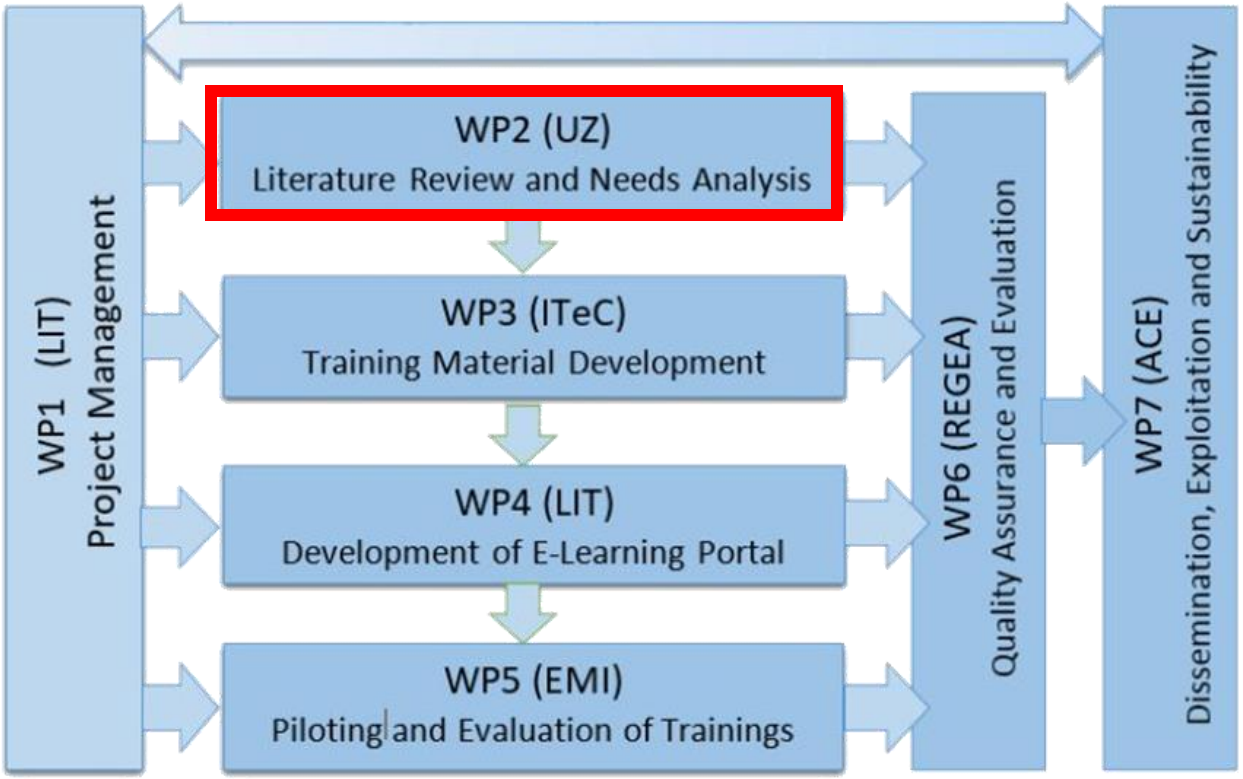
Responsibilities



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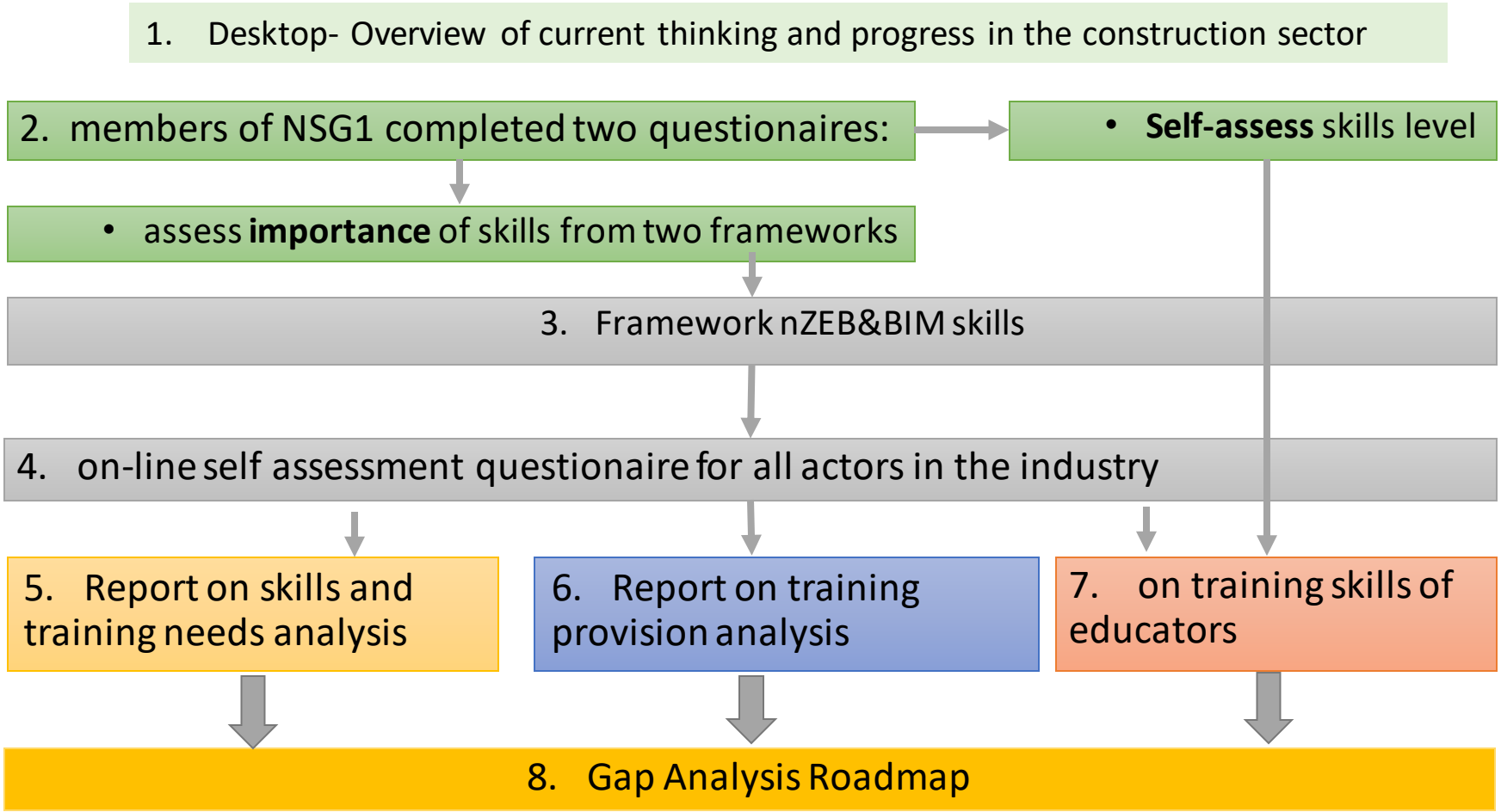
3 stage research design



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T2.2 Current Training Provision Analysis

- Reviewed the current education systems and the existing programmes including training material, methodologies & techniques

- HEIs and VETs completed a standard series of questionnaires and surveys.
  - Developed a **database of training programmes** from HEIs and VETs active in the field of BIM and nZEB in all partners' countries. (identified min of 10 suitable courses by each partner)
  - Establish a framework for NZEB and BIM Skills
  - The report outlined the range, scope and nature of education and training provision with particular focus on all countries.

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T.2.3 Training Needs Analysis

- **Reviewed the training needs of the construction industry:**

  general operatives, apprentices, craftworkers, site managers, managers and current students in higher education.

- **and Educators/Trainers:**

  The training needs of the educators were also be assessed to determine their level of skill and knowledge for BIM in NZEB trainings.

This task involved desktop research, surveys and reporting using the following methods:

- on-line research
- questionnaires/survey assessing training needs of:

  workers in SMEs and industry (10 SMEs and 25 Industry stakeholders per country – 140 in total)

  educators in HEIs and VETs (15 per country – 60 in total)

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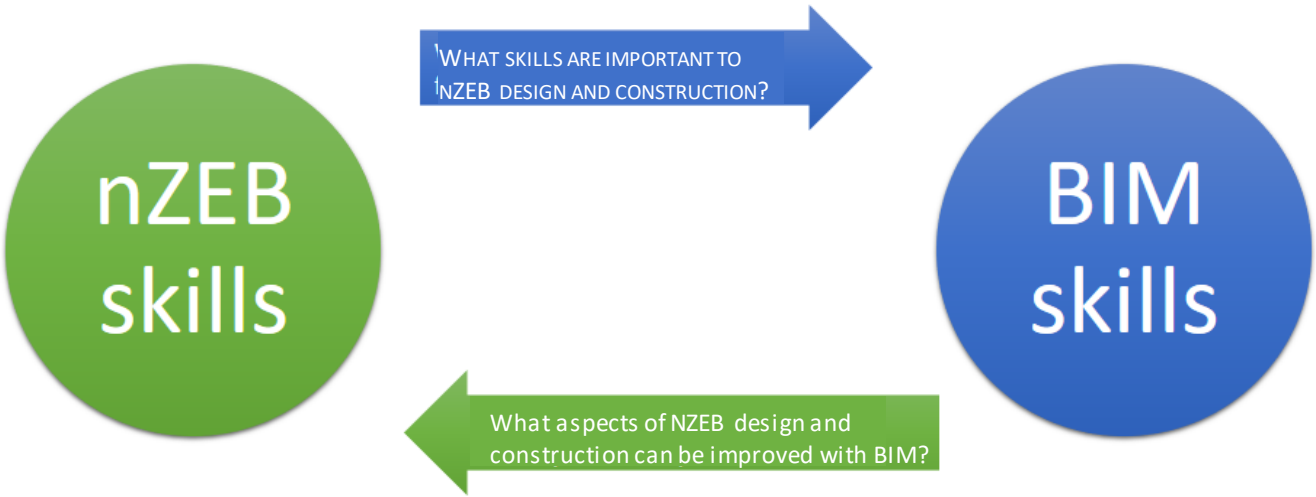
Skills and Abilities

NZEB	BIM
Framework ProfTRAC	Framework BuildingSmart



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WP2 Literature Review and Needs Analysis Summary

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O2.1 Report: Overview of current thinking and progress in the construction sector, including NZEB Regulations and future BIM policies.
O2.2 Report: Development of a database of current education systems and existing programs.
O2.3 Report: Assessment of skills and knowledge for BIM and NZEB of educators.
O2.4 Report: Training needs of the construction industry.
O2.5 Report: Roadmap for analysis of learning deficiencies and outcomes.

Conclusions:

- Improve the approach to education, so that the application of BIM in the design and construction of NZEB buildings goes from a theoretical to a practical level
- Insufficient level of knowledge of professionals to carry out BIM and/or NZEB at a practical level

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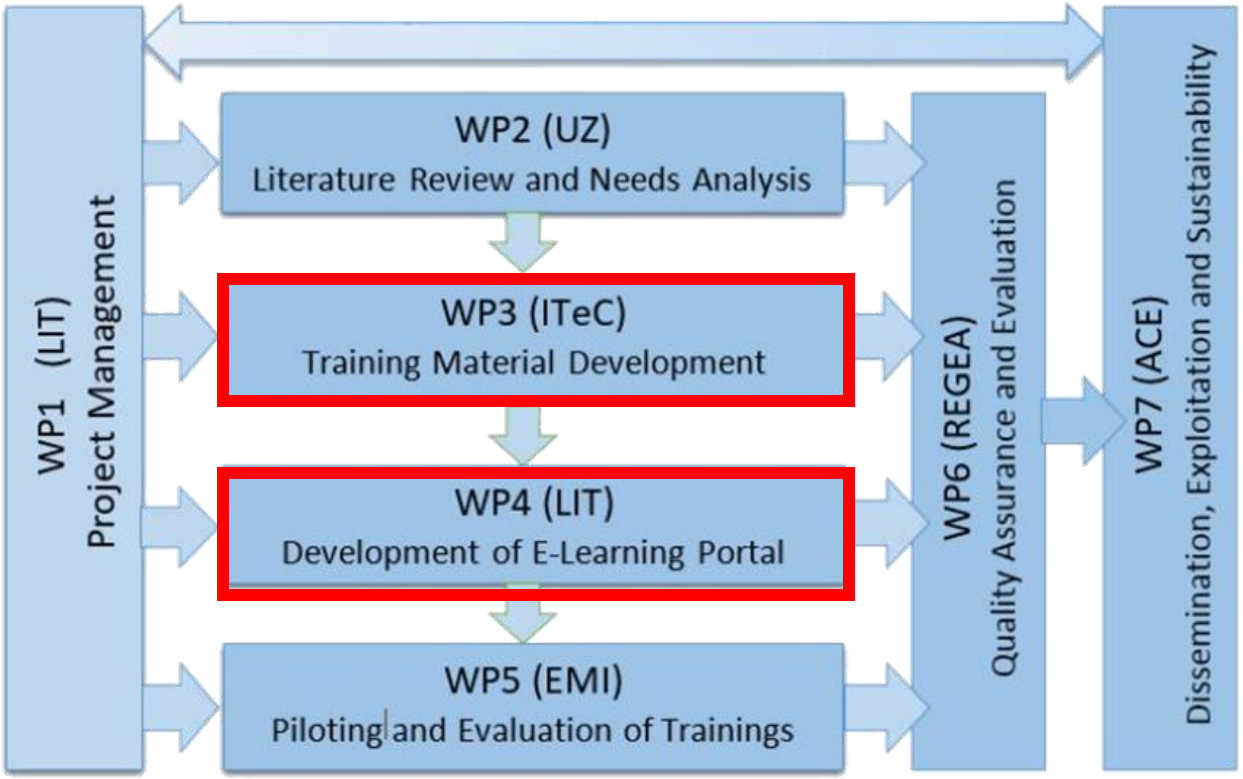
Responsibilities



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WP3 Training Material Development

O3.1 Learning Units Development
O3.2 Learning Materials and Resources
O3.3 Training and Evaluation Methodology
O3.4 Validation and Verification of the evaluation methodology

O4.1 E-Learning Portal Analysis
O4.2 E-Learning Content management
O4.3 E-Portfolio Industry Networking
O4.4 E-Learning Platform Pilot

Taking into account the results of WP2, the first 12 Learning Units have been developed to respond to the needs of the sector

NSG 2

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Today's Goal for NSG:

- Discuss the 12 Learning Units (LUs)
- Prioritise by selecting the most important LUs

- Use the online Questionnaire
- To review Topics for future LUs

- Any comments and suggestions

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Survey online

BIMzeED Learning Units (LU) Survey

BIMzeED will support the construction industry, through education and training to up-skill in the area of technical innovation and digitalisation. BIMzeED will develop and pilot 12 Learning Units as Open Educational Resources (OERs), and will train and upskill 120 educators at European Higher Education Institutions (HEIs) and Vocational Education and Trainings (VETs). The Learning Units will be common units with flexible standardised delivery (in class, on-line and on-site) suitable for HEI and VET training. BIMzeED partners invite you to give your input on the proposal Learning Units through this survey.

1. Are you part of BIMzeED Expert Advisory Board (EAD)?

2. Where do you work?

3. In which county are you?

4. Could you please select the importance of each Learning Unit below?

	Not at all important	Slightly important	Moderately important	Very important
LU 1 - Collaborative BIM to achieve nZEB	○	○	○	○

Please add your comment about this specific Learning Unit here

Open up your Surveys and please complete your details

We will discuss each LU at a time

BIMzeED

TITLE	TARGET	EQF
1. Collaborative BIM to achieve NZEB	Project manager Consultant Designer Construction manager Specialists in green building	7

MAIN POINTS COVERED

- Definition project management (lean construction, agile methodologies…)
- Energy management
- Energy efficiency documents of the building
- Energy efficiency legislation used for project management and evaluation
- Roles and responsibilities and project workflow
- BIM Agreement
- Document management in collaborative projects
- Pre-BEP: before the contract, in order to show suppliers the planned approach to the project, as well as the way in which they plan to carry it out
- Post-BEP: once the contract has been awarded, a Post-BEP is also created to focus on the capabilities of the entire supply chain.

BIM skills to cover	NZEB skills to cover
• Project Roles and Responsibilities - Contractual Hierarchy • Project Collaboration Requirements • Statement of Requirements (SOR) or Statement of Work (SOR) • Pre-Contract Planning: BIM Management Plan (BMP) • Evaluation and assessment of BIM deliverables, requirements, expectations and weighting • BIM Agreement • Information communication Framework • Classification Systems • BIM Workflow • BIM Quality plan • Model Coordination - Availability	• Understand integrated design processes and concepts • Understand effective communication within projects aimed to achieve NZEB • Understand interdisciplinary teamwork towards common goals • Defined and communicative integrated design goals • Present the design and reach consensus on decisions. • Use of information modelling in design teams and management of information modelling within the NZEB design • Specify energy reduction systems in tender documents • Define performance of materials in tender documents • Communicate in contracting phase, understand and respect the role of all actors involved. • Coordinate the project team to ensure building quality • Coordinate contractors and suppliers by effective communication

TITLE	TARGET	EQF
2. BIM & NZEB for Workers	Craft workers Apprentices Specialised workers Construction workers	4-5

MAIN POINTS COVERED

- Overview legislation (EU, national…)
- Knowledge on installation materials, performance and benefits vs costs
- Understand building physics
- Understand energy efficient and sustainable building fabric
- Understand the design, installation and benefits of building services
- Understand the design, installation and benefits of renewable energy, photo-voltaic, smart metering and electric vehicles
- How to manage the model (export a floor plan, analyze different construction stages…) in the construction site
- How to accomplish a fluent communication between the design team and the construction team with BIM based tools in the constr uction site

BIM skills to cover	NZEB skills to cover
• Project Interactions - Model Use • Model Checking • Construction Optimization • Construction Progress Tracking • Model Coordination - Availability • Collaborative Workflows - Native and Non-Native Applications	• Understand interdisciplinary teamwork towards common goals • Assess systems related to building function and architecture • Defined and communicative integrated design goals • Communicate in contracting phase, understand and respect the role of all actors involved. • Communicate with customers on construction progress and effectuation of building performance • Manage data, keep records of implementation, monitor outcome. • Financial management • Monitor project realization and handle deviations

TITLE	TARGET	EQF
3. NZEB Realization and commissioning: Building Envelope and Air Tightness	Project manager Consultant Designer Construction manager Specialist in green building	6

MAIN POINTS COVERED

- Describe the key energy principles pertaining to NZEB (location, orientation, floor distribution, U values…)
- Outline current and best practice and procedures in the context low energy buildings
- Understand the principles of passive solar design
- Design of building envelope elements (foundations, walls, roofs, windows, etc.) with emphasis on using products that can meet defined NZEB and certification requirements
- Outline the key parameters and benchmarks for achieving good air tightness in a dwelling
- Relevant approaches and technologies used to achieve air tightness (Blower Door test)

BIM skills to cover	NZEB skills to cover
	• Understand the impact of architectural design on sustainability and energy performance • Understand the interaction of building location, design, use and outdoor climate • Understand sustainable materials and the importance of its appropriate application • Understand design methods for passive energy technologies • Assess systems related to building function and architecture • Select sustainable constructions technologies and materials • Defined and communicative integrated design goals • Knowledge on various installation materials, their performance, benefits versus costs • Understand application of passive or active technologies • Design and engineer energy reduction systems to reach NZEB • Design of an architectural sustainable building (including sustainable and flexible floorplan) • Evaluate the integrated design • Select sustainable materials and technologies in NZEB design

TITLE	TARGET	EQF
4. NZEB Realization and commissioning: Building Services and Smart Technologies	Project manager Consultant Designer Construction manager Specialist in green building	6

MAIN POINTS COVERED

- Outline the range of renewable energy systems, for heating and electricity production
- Mechanical ventilation with heat recovery (MVHR)
- Smart measurement: types, data management, visualization
- Self-assessed and self-optimized systems
- BEMS systems: requirements, principles, solutions
- Semi and Full automation systems
- Smart Readiness Indicators
- Risks of mold formation and condensation
- Compare and contrast different technologies to facilitate selection of an appropriate solution or solutions
- Calculate the heat demand and electrical load profile of a home and select appropriate RE technology(ies)

BIM skills to cover	NZEB skills to cover
	• Understand influence of heating and cooling generation on energy performance • Understand specifics and basic parameters of heating and cooling • Understand different energy production systems in relation to energy performance • Understand importance of energy reduction systems in relation to energy performance • Understand sustainable building technologies and appropriate application • Understand the interaction between energy performance and IEQ • Assess systems related to building function and architecture • Investigate, determine and advise on energy reduction systems to reach NZEB • Select sustainable constructions technologies and materials • Defined and communicative integrated design goals • Understand performance, benefits and costs of various technologies • Understand application of passive or active technologies • Design and engineer energy reduction systems to reach NZEB • Evaluate the integrated design • Select sustainable materials and technologies in NZEB design

TITLE	TARGET	EQF
5. NZEB Realization and commissioning: Quality Assurance	Technicians Craft workers Apprentices Specialized workers Construction workers	4-5

MAIN POINTS COVERED

- Influence and minimization of thermal bridges and their control using infrared thermography
- Explain how ventilation systems operate and should be utilized to optimize energy efficiency
- Blower door test to ensure or control air tightness for appropriate Indoor Air Quality (IAQ)

BIM skills to cover	NZEB skills to cover
• Quality Checking - Standards	• Quality assurance of different energy production systems • Quality assurance of energy reduction systems • Coordinate the project team to ensure building quality • Quality assurance of sustainable materials

TITLE	TARGET	EQF
6. BIM Model Uses during construction	Project manager Consultants Designers Site engineers Construction managers Site supervisors Specialists in green building Quantity surveyors	6

MAIN POINTS COVERED

- Data visualization and management
- Engineering analysis
- Conflict analysis and clash simulation
- Code criteria checking
- Communication in a consistent language

BIM skills to cover	NZEB skills to cover
• Design Model Estimations - Constructability • Design Model Interpretation • Classification Systems • Project Interactions - Model Use • Quality Checking - Design • Model Checking • Construction Coordination - Clash Simulation • Model Coordination - Clash Simulation	• Use of information modelling in design teams and management of information modelling within the NZEB design

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TITLE	TARGET	EQF
7. BIM Model Uses for specification and quantification	Project manager Consultants Designers Site engineers Construction managers Site supervisors Specialists in green building Quantity surveyors	6

MAIN POINTS COVERED

- Cost engineering (cost estimating, planning and scheduling…)
- Budgeting
- Bill of materials (mass, square meters, volume…)
- Life cycle assessment

BIM skills to cover	NZEB skills to cover
• Classification Systems • Formal Cost Plans - Technology Integration • Material / Element Tracking • Construction Progress Tracking • Sustainability reporting and testing • Delivery Management - Cost Mapping - 5D • Time / Programme Forecasting - 4D	• Use of information modelling in design teams and management of information modelling within the NZEB design

TITLE	TARGET	EQF
8. BIM Model Standardisation for NZEB Design	Project manager Consultant Designer Construction manager Specialist in green building	6

MAIN POINTS COVERED

- Structure information and data in a BIM model with the aim of a NZEB building design
- Common Data Environment or Collaborative Environment (CDE)
- ISO 19650 for the exchange of digital information between all contract parties at all project's stages

BIM skills to cover	NZEB skills to cover
• Project Collaboration Requirements • Project Procurement Model Requirements • Statement of Requirements (SOR) or Statement of Work (SOR) • BIM Examples • Information communication Framework • BIM Quality plan • Model Coordination - Common Data Environment • Collaborative Workflows - Native and Non-Native Applications • Expectations of BIM • Information Distribution	• Understand integrated design processes and concepts • Use of information modelling in design teams and management of information modelling within the NZEB design

TITLE	TARGET	EQF
9. Building Energy Modeling (BEM) Design and Export	Project manager Consultant Designer Specialist in green building	7

MAIN POINTS COVERED

- Whole-Building Energy Modeling (BEM) for new building and retrofit
- Parameters to consider in order to be able to perform an energy analysis (efficiency, renewable energy, systems, export properties…)

BIM skills to cover	NZEB skills to cover
• Construction Optimization • Sustainability reporting and testing • Performance based analysis • Model Coordination - Availability	• Understand integrated design processes and concepts • Understand interdisciplinary teamwork towards common goals • Assess systems related to building function and architecture • Design passive energy measures • Design and engineer energy reduction systems to reach NZEB • Design of an architectural sustainable building (including sustainable and flexible floorplan) • Evaluate the integrated design

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TITLE	TARGET	EQF
10. Energy Simulation with BIM Tools	Facility manager Project manager Consultant Designer Specialist in green building	7

MAIN POINTS COVERED

- How to read a Building Energy Modeling (BEM) and how to analyze it
- Feasibility studies
- Propose envelope and system modifications based on the simulation results
- In-depth analysis of simulation results to adjust the design

BIM skills to cover	NZEB skills to cover
• Construction Optimization • Sustainability reporting and testing • Performance based analysis	• Understand the interaction between energy performance and IEQ • Perform energy simulations • Perform a feasibility study • Assess systems related to building function and architecture • Design and engineer energy reduction systems to reach NZEB • Design of an architectural sustainable building (including sustainable and flexible floorplan) • Evaluate the integrated design

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TITLE	TARGET	EQF
11. Near Zero Energy Building Facility Management	Facility manager Consultant Technicians Specialist in green building	5-6

MAIN POINTS COVERED

- Use and maintenance of energy production systems
- Smart monitoring
- Effective communication with users and facility employees

BIM skills to cover	NZEB skills to cover
• Model Coordination - Common Data Environment • Change Process - Design Model Change Registry • As-Built Validation	• Understand interdisciplinary teamwork towards common goals • Ensure optimal use of different energy production systems • Communicate the appropriate use and maintenance of different energy production systems • Instruct the facility manager on running and maintaining the buildings energy performance • Ensure optimal maintenance of materials and technologies • Communication with suppliers and facility employers on energy performance • Instruct users and facility managers on energy performance of the building • Monitor building performance

TITLE	TARGET	EQF
12. BIM in Facility Management Software (CMMS)	Facility manager Project manager Consultant Designer Specialist in green building	6-7

MAIN POINTS COVERED

- Classification system
- As-built validation against real building (digital twin)
- BIM data structure for CMMS (computerized maintenance management system)

BIM skills to cover	NZEB skills to cover
• Model Coordination - Availability • Model Coordination - Common Data Environment • Change Process - Design Model Change Registry • As-Built Validation	• Ensure optimal use of different energy production systems • Instruct the facility manager on running and maintaining the buildings energy performance • Ensure optimal maintenance of materials and technologies • Instruct users and facility managers on energy performance of the building • Monitor building performance

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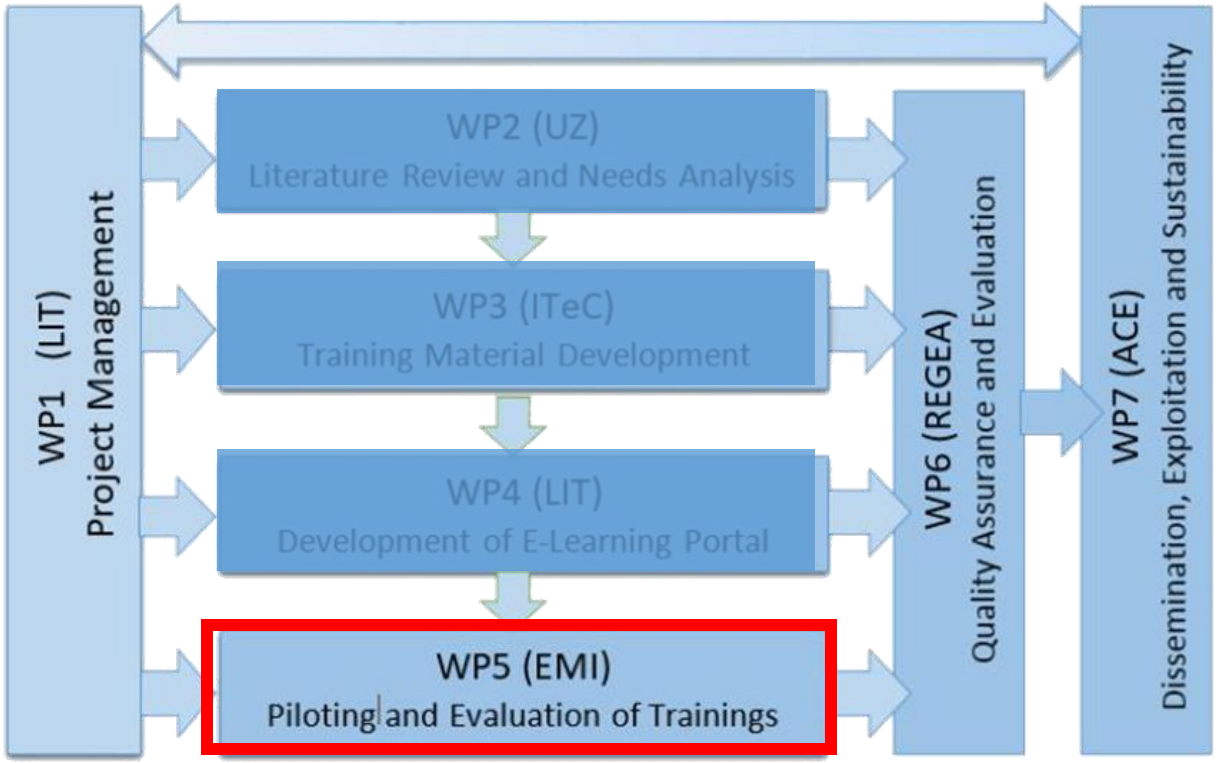

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Trainers and Lecturers

- Are you interested in piloting?
  - Agree at the end of the meeting
  - To pilot the LUs (for trainers/lecturers, students, workers)

- Benefits
  - Use of developed materials and Learning Units
    - as stand-alone LUs and/or
    - inserted as part of your existing courses.

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Thank you all so much

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