



awakening | relevant | innovative | scalable | equitable

D 2.3 First overview of the national/regional qualification framework report

Author: Anna Moreno

IBIMI

ISSUE DATE: 29 JULY 2022

V. 1.0



Co-funded by the Horizon 2020
Framework Programme of the European Union

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033864.

Deliverable 2.3: First overview of the national/regional qualification framework report

Lead partner	IBIMI
Issue Date	29.07.2022
Produced by	IBIMI
Main authors	Anna Moreno, Mario Napolitano, Emanuele Mignone
Co-authors	All partners
Version	V2.0
Reviewed by	
Approved by	
Dissemination level	Public

Colophon

Copyright © 2021 by ARISE consortium

Use of any knowledge, information or data contained in this document shall be at the user's sole risk. Neither the ARISE Consortium nor any of its members, their officers, employees, or agents shall be liable or responsible, in negligence or otherwise, for any loss, damage or expense whatever sustained by any person because of the use, in any manner or form, of any knowledge, information or data contained in this document, or due to any inaccuracy, omission or error therein contained. If you notice information in this publication that you believe should be corrected or updated, please get in contact with the project coordinator.

The authors intended not to use any copyrighted material for the publication or, if not possible, to indicate the copyright of the respective object. The copyright for any material created by the authors is reserved. Any duplication or use of objects such as diagrams, sounds, or texts in other electronic or printed publications is not permitted without the author's agreement.

Revision and history chart

Vers.	Date	Editors	Comment Description
2.0	08-08-2022	IBIMI	Final revision
1.0	29-07-2022	ISSO	Netherland data entry
0.1	30-06-2022	TU Dublin, BMET, IST, IECE, KEA	Partners' data entries for their respective countries
0.0	08-2-2022	IBIMI	First release with the index of the content of the deliverable



1 Table of Contents

1. Table of Contents	3
2. Publishable executive summary	4
3. List of acronyms and abbreviations	4
4. Education and training addressed to energy performance of buildings.....	5
Education in high schools	6
Education and training in professional schools	6
recurring training among professional organisations.....	7
Universities curricula.....	8
5. The role of the blue and white collars for the redevelopment of buildings and ZEB ...	12
6. The role of stakeholders for boosting the need for a platform of recognition of competences	14
7. Conclusions.....	16



2 Publishable executive summary

This report will contribute to the development of the roadmap that will bring the participating countries, and possibly all Europe, to have a platform for the recognition of competences necessary to fulfil European directives related to energy performance and digitalization.

All the targets that could be potentially interested in the use of the ARISE platform for the recognition of competences have been considered.

The heterogenous situation among the member states does not allow for a unique approach, but this report provides thoughts for the definition of the roadmap bringing to a common understanding of the gaps and the needs of the current education and training systems among the participating countries

3 List of acronyms and abbreviations

BIM: Building Information Modeling

CA: Concerted Action

ECDL: European Computer Driving Licence

EE: Energy Efficiency

EPB: Energy Performance of Buildings

LCA: Life Cycle Analysis

LCC: Life Cycle Costing

LLL: Long Life Learning

MS: Member State

NGOs: Non-Governmental Organisations

nZEB: Nearly Zero-Energy Buildings

R&D: Research and Development

RES: Renewable Energy Source

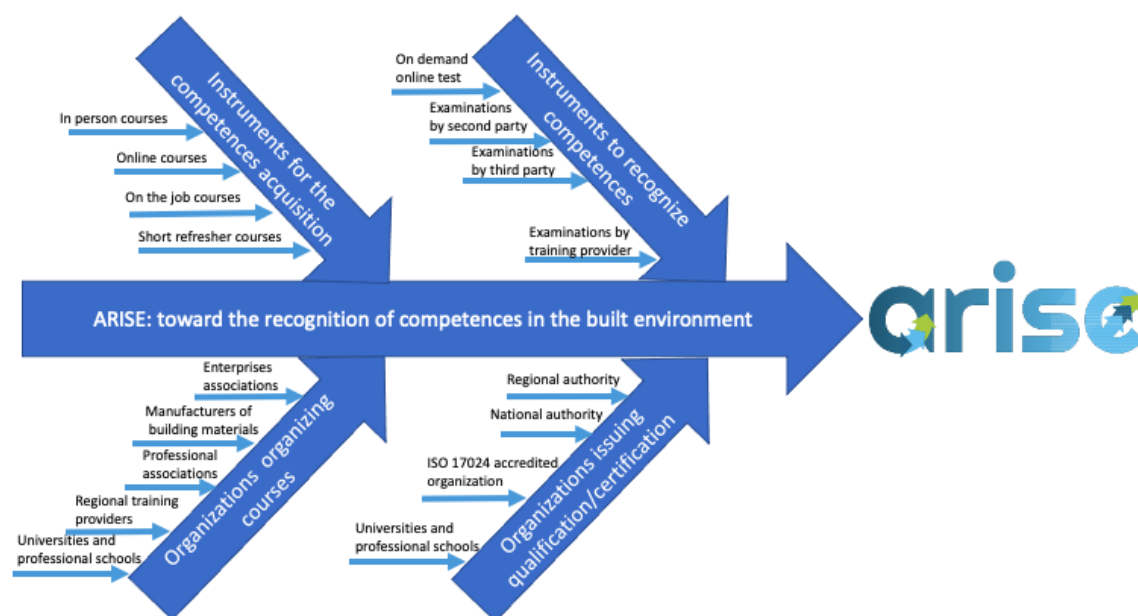
SME: Small and Medium-size Enterprise

4 Education and training addressed to energy performance of buildings

In recent years more and more attention has been given to education and training in the domain of building industry especially for the subjects of Energy Performance (EP) and Building Information Modelling (BIM). The reasons for this attention are many:

- The introduction of European directives calling for qualification systems for workers to improve energy performance of buildings (See deliverable D2.2 First overview of EU directives implementation report)
- The EUBIM task group calling for the use of BIM among the public tenders (See deliverable D2.2 First overview of EU directives implementation report)
- BUILD UP Skills which is an EU Initiative to improve the qualification and skills of Europe's building workers which are essential to build, equip and renovate buildings of high energy performance. The Initiative focuses on continuing education of craftsmen and other on-site building workers.
- The green deal adopted by the European Commission to make the EU's climate, energy, transport, and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.
(https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en)
- The provision of financial measures to redevelop both public and private buildings.

In the next paragraphs we try to synthesise the situation in each country. In the image, the global vision of education and training activities, involving numerous heterogenous stakeholders.





4.1 EDUCATION IN HIGH SCHOOLS

In the national education systems, a few profiles dealing with high education are present. The following table summarises the current situation.

Country	
Denmark	n/a
Ireland	1 curriculum in secondary level education in construction studies. The subject places a strong emphasis on international best practice in relation to the conservation of energy and the selection of sustainable materials when designing and constructing buildings 1 pilot programme in secondary level school delivering the first Class Of Your Own (COYO) Design Engineer Construct! (DEC) learning programme. This programme applies academic subjects to the latest construction industry practices, opening the possibilities presented by a professional career in construction.
Italy	5 curricula in technical schools (5 teachings)
North Macedonia	2 curricula in technical schools
Netherlands	All higher education schools with construction (related) studies have BIM embedded in their curricula (as agreed with builders' and installers' trade associations) as well as energy performance
Portugal	Secondary level don't have in general specific qualifications in BIM and constructions
UK	The curriculum in FE (secondary level) makes strong emphasis on best practice in relation to the conservation of energy and the selection of sustainable materials when designing and building homes. For example level 3 course in construction extended-diploma-in-construction-and-built-environment

4.2 EDUCATION AND TRAINING IN PROFESSIONAL SCHOOLS

Professional education is usually organised at regional level to adapt the training to the needs of the region where the school is located.

The following table summarises the current situation.

Country	
Denmark	n/a
Ireland	No current professional schools that deliver Energy/BIM related courses

Country	
Italy	3 curricula in post-diploma professional schools
North Macedonia	n/a
Netherlands	3 BIM-focused curricula in professional schools
Portugal	<p>There are a few professional schools (politecnicos) that deliver courses at a similar education level as universities but geared more towards practical technical professional skills driven courses.</p> <p>There are not many with BIM courses, but for example Politecnico do Porto has one (Coordenação BIM (Building Information Modelling) • EduPortugal)</p>
UK	<p>FE and HE colleges are usually the institutions that deliver:</p> <ul style="list-style-type: none"> • professional courses; • pathways to further studies (universities); • and upskilling of existing workforce <p>For example, in NI, Belfast and the surrounding area we have 4 main colleges: BMC, SRC SERC and NRC, and all have construction and engineering courses- from FE to HE levels . In those course BIM modules training are included in the curriculum (mainly introduction 3D modelling)</p> <p>Also some colleges offer further specific BIM courses, for example Belfastmet offers a Level 3 Award and Diploma in Digital construction and BIM.</p>

4.3 RECURRING TRAINING AMONG PROFESSIONAL ORGANISATIONS

Continuing Professional Development (CPD) is usually organised by associations of architects, engineers, surveyors, electricians, plumbers, etc. or even by manufacturers of building products and equipment or software vendors.

The following table summarises the current situation.

Country	
Denmark	Ad-hoc, usually by software vendors
Ireland	CPD recurring training courses on BIM provided by 8 groups in Ireland.
Italy	CPD recurring training courses on BIM and energy efficiency in buildings provided by 31 groups offering 104 courses accredited by the professional associations (Architects, Engineers, Surveyors)
North Macedonia	Trainings are organised periodically by the Chamber of Certified Architects and Certified Engineers
Netherlands	8 organisations (trade associations and commercial institutes) offer a variety of BIM-focused courses; also, all software vendors offer practical training courses in BIM

Portugal	Professional bodies such as Ordem dos Arquitectos (OA) and Ordem dos Engenheiros (OE) have their own accredited CPD schemes for members which cover subjects as energy efficiency, BIM, integrations of HVAC systems
UK	CPD training provided by several entities, for example: The CPD Standards Office (https://www.cpdstandards.com/about-u) Then professional bodies such as RIBA have their own accredited CPD schemes, in which in their case there is BIM related training.

4.4 UNIVERSITIES CURRICULA

In universities there are some curricula, namely architecture and engineering, both bachelor and master's degrees, related to building construction and heating, ventilation and air conditioning (HVAC) systems, which have some specific courses dealing with energy efficiency, RES and BIM. There are also many post-graduation courses devoted to specific domains, mainly related to Building Information Modelling (BIM).

In the table the current situation is synthesised.

Country	
Denmark	<p>Architecture: The Royal Academy of Fine Arts (KADK), Aarhus School of Architecture (AAU)</p> <p>Architecture and Extreme Environments, The Royal Danish Academy of Fine Arts, School of Architecture in Copenhagen</p> <p>Computation in Architecture, The Royal Danish Academy of Fine Arts, School of Architecture in Copenhagen</p> <p>Political Architecture: Critical Sustainability, The Royal Danish Academy of Fine Arts, School of Architecture in Copenhagen</p> <p>Spatial Design, The Royal Danish Academy of Fine Arts, School of Architecture in Copenhagen</p> <p>Strategic Design and Entrepreneurship, The Royal Danish Academy of Fine Arts, School of Architecture in Copenhagen</p> <p>Urbanism and Societal Change, The Royal Danish Academy of Fine Arts, School of Architecture in Copenhagen</p> <p>Engineering: DTU, AAU, SDU, KU,</p> <p>The Energy Engineering program at Aalborg University (AAU)</p> <p>Technical science (civil engineer) in Mechanical Engineering: Design of Mechanical Systems, Electro-Mechanical System Design, Manufacturing Technology</p> <p>Robot technology - University of Southern Denmark in Odense</p> <p>Electrical Engineering, Aarhus University (AAU)</p> <p>Technical University of Denmark (DTU)</p> <p>Mechanical Engineering, University of Southern Denmark</p>

[Environmental technology, Technical University of Denmark \(DTU\)](#), [University of Southern Denmark \(SDU\)](#)
[Mechanics, Aarhus University \(AAU\)](#)
[Mechanical engineering at DTU in Ballerup / Lyngby](#)
[Mechanical engineering at Absalon in Kalundborg](#)
[Mechanical engineering at SDU in Odense](#)
[Mechanical / Mechanical Engineering at SDU in Sønderborg](#)
[Mechanical engineer at VIA University College in Horsens](#)
[Mechanical engineering at AAU in Aalborg](#)
[Mechanical engineering at AAU in Esbjerg](#)
[Mechanical engineering at Aarhus University in Aarhus](#)
[Mechanical engineering at Aarhus University in Herning](#)
 Energy Engineering, [Aalborg University \(AAU\)](#) in Aalborg
 Electric Power Systems and High Voltage Engineering, [Aalborg University](#) in Aalborg
 Mechatronic Control Engineering, [Aalborg University \(AAU\)](#)
 Power Electronics and Drives, [Aalborg University \(AAU\)](#)
 Thermal Energy and Process Engineering, [Aalborg University \(AAU\)](#)
 Wind Power Systems, [Aalborg University \(AAU\)](#)
 Fuel Cells and Hydrogen Technology, [Aalborg University \(AAU\)](#)
 Sustainable Energy Engineering, [Aalborg University \(AAU\)](#),
[Offshore Energy Systems](#)
[Aalborg University \(AAU\)](#), [Process Engineering and Combustion Technology](#)
 General Engineering, [Technical University of Denmark \(DTU\)](#)
 Mechanical Engineering, [Aarhus University \(AAU\)](#)
 Civil Engineering, [Technical University of Denmark \(DTU\)](#)
 Environmental Engineering, [Technical University of Denmark \(DTU\)](#), [University of Southern Denmark \(SDU\)](#)
 Environmental Science at [Aalborg University \(AAU\)](#)
 Architectural Engineering, [Technical University of Denmark \(DTU\)](#)
 Architecture at [Aalborg University \(AAU\)](#)
 Sustainable Energy Engineering, [Aalborg University \(AAU\)](#)
 Construction, [Aarhus University \(AAU\)](#)
 Structural and Civil Engineering, [Aalborg University \(AAU\)](#)
 Civil and Architectural Engineering, [Aarhus University \(AAU\)](#)
 Structural and Civil Engineering, [Aalborg University \(AAU\)](#)
 Indoor Environmental and Energy Engineering, [Aalborg University \(AAU\)](#)
 Construction technology, [Technical University of Denmark \(DTU\)](#)
 Building design, [Technical University of Denmark \(DTU\)](#)
 The Architecture program [University \(AAU\)](#)
 Energy, [Aalborg University \(AAU\)](#)

	<p>Graduate Engineer - Building Design, Building design - Technical University of Denmark in Lyngby Building design - Aarhus University in Aarhus Graduate Engineer - Sustainable Energy Technology, Sustainable energy technology at AAU Construction, Aarhus University (AAU) Urban Design, Aalborg University (AAU) Sustainable energy, University of Denmark (DTU) Graduate Engineer - Materials Technology, VIA University College in Herning Sustainable construction processes, Aalborg University in Copenhagen Sustainable energy design, Technical University of Denmark (DTU) Wind energy, Technical University of Denmark (DTU) Engineer, Maskinmester - Fredericia Maskinmesterskole in Esbjerg, Fredericia and Sønderborg Machinist - MARTEC in Frederikshavn Machinist - MARTEC in Thisted Maskinmester - Maskinmesterskolen København in Kongens Lyngby Engineer - SIMAC in Svendborg Maskinmester - Aarhus Maskinmesterskole in Viborg and Aarhus Sustainable Design, Aalborg University (AAU) Environmental science, University of Copenhagen (KU, Aalborg University (AAU))</p> <p>Architectural Technology & Construction Management: KEA, ESAV, VIA, ZEA, UCN & UCL</p>
Ireland	<p>10 Universities, 1 Institute of Technology, 1 Private College:</p> <ul style="list-style-type: none"> ● Advanced Wood and Sustainable Building Technology: 1 Bachelor degree ● Architecture: 2 Bachelor degrees ● Architectural Engineering: 1 Bachelor degree ● Architectural Technology: 7 Bachelor degrees ● Architectural & BIM Technology: 1 Bachelor degree ● Building Surveying: 1 Bachelor Degree ● BIM & Digital Construction: 1 Bachelor Degree ● BIM Management: 2 Master Degrees ● Civil Engineering: 9 Bachelor degrees ● Construction Engineering: 1 Bachelor Degree ● Construction Business and Leadership: 1 Master Degree ● Energy Engineering: 1 Bachelor Degree ● Facade Engineering: 1 Master degree ● Management of Built Environment: 1 Bachelor degree ● Mechanical & Electrical Engineering: 1 Bachelor degree

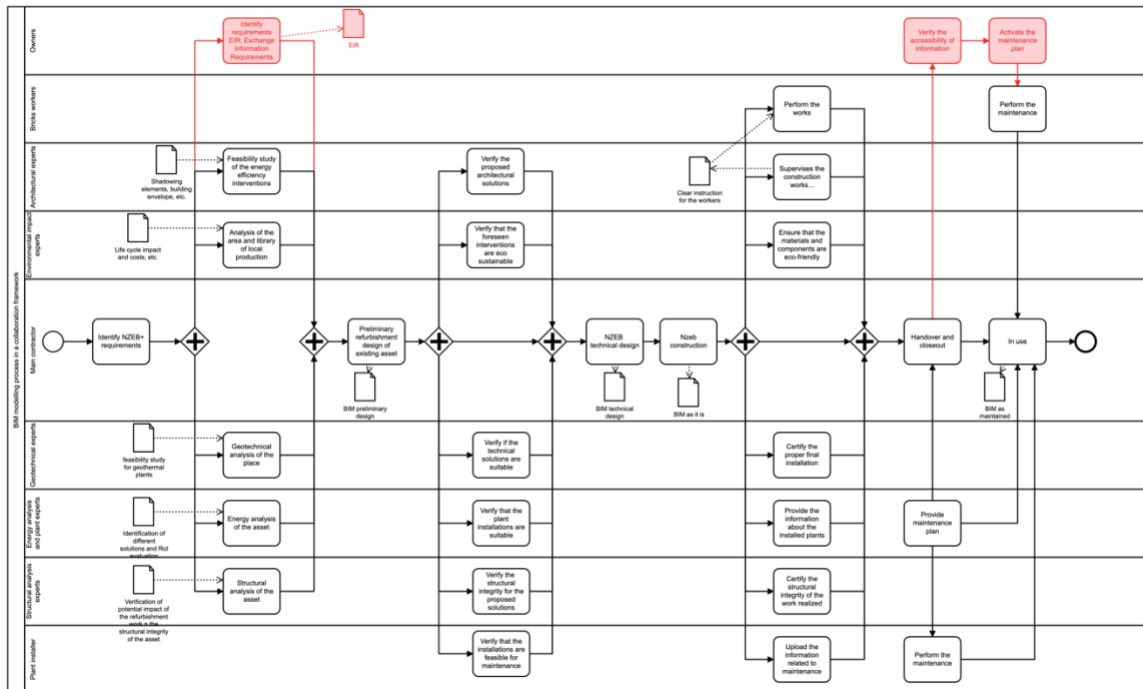
	<ul style="list-style-type: none"> • Project Management: 1 Bachelor degree, 1 Master degree • Quantity Surveying: 8 Bachelor degrees • Safety Engineering: 1 Bachelor degree • Structural Engineering: 1 Bachelor Degree <p>3 higher diplomas, 10 post-graduate certificates, and 4 post-graduate diplomas</p>
Italy	<p>43 Universities:</p> <ul style="list-style-type: none"> • Architecture: 9 Bachelor degrees (15 teachings), 38 Master degrees (85 teachings) • Construction Engineering: 16 Bachelor degrees (39 teachings), 27 Master degrees (74 teachings) • Civil Engineering: 13 Bachelor degrees (16 teachings), 28 Master degrees (47 teachings) • Mechanical Engineering: 8 Bachelor degrees (9 teachings), 17 Master degrees (39 teachings) • Electrical Engineering: 5 Master degrees (9 teachings) • Electronic Engineering: 1 Master degree (1 teaching) • Management Engineering: 1 Bachelor degree (1 teaching), 7 Master degrees (11 teachings) • Energy Engineering: 13 Bachelor degrees (32 teachings), 10 Master degrees (28 teachings) • Environmental Engineering: 3 Bachelor degrees (3 teachings), 18 Master degrees (22 teachings) • Automation Engineering: 1 Master degree (2 teachings) • Environmental Science: 1 Bachelor degree (1 teaching) • Wood Engineering: 1 Bachelor degree (2 teachings) • Technology innovation engineering: 1 Bachelor degree (6 teachings) <p>37 post-graduation courses and 4 post-graduation professional courses</p>
North Macedonia	<p>2 universities:</p> <ul style="list-style-type: none"> - Mechanical Engineering - Faculty of Technical Sciences <p>10 post-graduation courses</p>
Netherlands	<p>All 3 technical universities have BIM incorporated in the curricula of all their construction (related) studies. There also is a special chair for Construction Process Integration & ICT at the University of Twente.</p>
Portugal	<p>Several Universities in Portugal, both state funded and private.</p>

	<p>Large number delivering engineering and architecture course, in which BIM and sustainability are embedded in part of the curriculum (BIM more as a modelling and drawing software than coordination method) Faculdade de arquitectura do Porto, Faculdade de arquitectura de Lisboa, IST, Universidade Lusófona, etc</p> <p><i>“The University of Minho also coordinates the Portuguese National Course on Building Information Modelling, managing a team which comprises the Universities of Minho, Porto and Lisbon, and targeting practitioners (Engineers and Architects) in a 90h course, held at the National Engineers Association (www.cursobim.com). More than 350 people have attended such a course, which currently is engaging to its 8th Edition (simultaneously in Porto and Lisbon).”</i></p> <p>IST and other Universities that deliver engineering (MEP) courses will cover HVAC, Heatinc , etc</p>
UK	<p>Several Universities in the UK (England, Scotland, Wales & Northern Ireland)</p> <p>Specifically in Northern Ireland the two universities are Queen's University Belfast (QUB) and Ulster University (UU). Also Open University (OU) can be considered</p> <p>Both with or validate architecture and engineering course that cover BIM subjects, for example :</p> <ul style="list-style-type: none"> • Bachelor and Masters Degree in Architecture (QUB and UU) • Bachelor and Masters Degree in Civil engineering (QUB) • Degree in architectural technology (UU) • Bachelor and Masters Degree Degree in Architecture (QUB and UU) • Foundation Degree in Digital Construction (OU)

5 The role of the blue and white collars for the redevelopment of buildings and ZEB

In the following figure a global vision of the employment of blue and white collars during the life cycle of a building are considered.

To view the diagram in full size go to this [link](#).



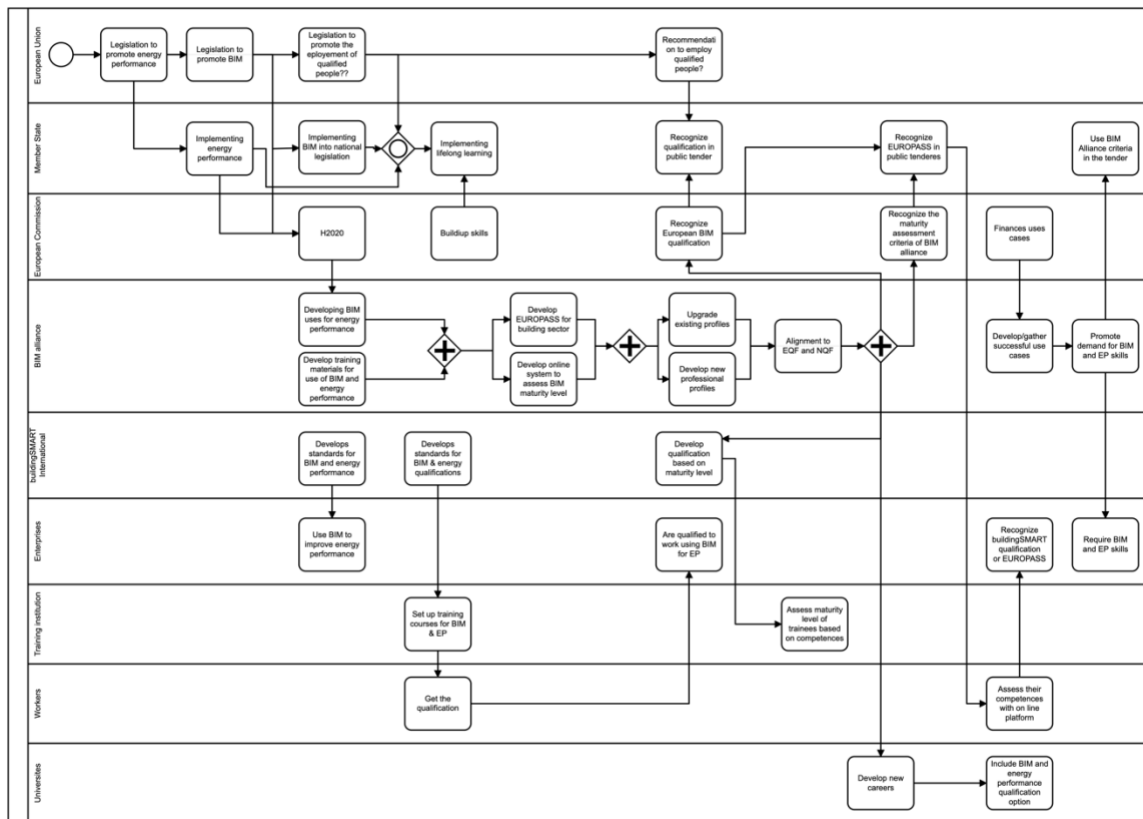
In the diagram, the role for each actor of the building supply chain during the lifetime of a building is summarized. Starting from the top:

- The owner, public or private, should define its requirements both from the energy point of view and from the information needed to operate and maintain the asset during all the lifetimes.
- The workers are involved during the construction and maintenance phases
- The architects identify the best solution for the energy performance of the building together with energy experts. They are also responsible to develop the BIM model of the building collecting all the information necessary for operation and maintenance of the asset.
- Environmental experts should provide advice on the best materials and equipment for the lowest environmental impact. Local products should be preferred.
- The main contractor should establish the requirements for energy performance and information management and make informed decision on the basis of energy simulation as well as financial investment.
- A geotechnical expert could be involved in the beginning for a feasibility evaluation of a low enthalpy geotherm plant and eventually verify the right installation of the plant.
- Energy and plant experts will be involved in the analysis of existing conditions and for the design of new or existing buildings to provide the best solution meeting the owner's financial needs.

- Structural analysis experts will provide the structural analysis of existing or new buildings and will verify that refurbishment does not interfere with the structural integrity of the building.
- The installer will verify, in the construction phase, that the installations are suitable for maintenance and will intervene for ordinary and extraordinary maintenance.

6 The role of stakeholders for boosting the need for a platform of recognition of competences

In the following figure a global vision of the role of different stakeholders for boosting the need for a platform of recognition of competences is presented. The full size diagram can be seen at this [link](#).



In the map we identify a possible ideal roadmap to enhance the use of the ARISE platform for the recognition of competences at European level. We identify a role for each stakeholder. Starting from the top:

- European Union has enacted laws to increase the capability of the member states to realize a sustainable built environment and digitalize the building industry. What we believe is missing is the requirement of employing a workforce with recognized

- competences when entrusting public works. This will be a driver for the increase of competences also in the private sector.
- Member states should implement the directives into national laws and require for the formalization of lifelong learning (LLL) in terms of recognition of new competences to be considered when entrusting public works. The Europass curricula, with the list of recognised competences, should be mandatory for public works. This will push the supply of more skilled workforce.
 - European Commission has already funded programs related to the development of new skills for the construction sector in both the energy and digital fields through H2020, BuildUpSkills, Erasmus, etc. now there is a need to establish a general framework that capitalize all the achievements and the ARISE platform could become a tool for this framework. another important initiative could be the realization of a database for use cases, that is, the indication of which competences are needed for each activity to be performed within a specific field, construction of school, a hospital, a road, a bridge, etc. Each use case could be recalled in the public tender whenever needed. This methodology, but related only to BIM, is already in use within buildingSMART international to identify the use case for BIM methods.
 - ARISE as coordinator of the “BIM Alliance” is already collecting the training materials produced within several European projects dealing with energy performance and digitalization of the building sector. Is also producing a system to assess the “maturity level” that will allow the upgrading of the existing skills step by step to allow any European worker to reach the desired level in any specific field where he would like to work. This would be in parallel with the national and European qualification framework alignment. Ultimately, ARISE should provide the tools to increase the supply of skilled workforces capable of responding to the demand for skilled services
 - Also, a role for buildingSMART international is identified as there is no reason to duplicate what is already accepted worldwide. Most European countries have a buildingSMART chapter which is already working on the identification of qualification in BIM. The first knowledge-based qualification is already in place and some European countries are already qualified many people and a public register contains the name of all them. Soon other more practical qualification will be ready and people wishing to be recognised also at international level could take the examination after reaching the necessary “maturity level” for the domain.
 - The role of enterprises is double, from one side they should look for more skilled workers, whose competences are certified through the ARISE platform. On the other side, when they are innovative, they could propose new skills to be added to the ARISE platform.
 - The training organization should assess maturity level of trainees based on competences proposed in the ARISE platform. In this way the trainees will have their competences recognised at European level and not only at national or regional level.



- The workers would use the ARISE platform to reach the desired maturity level and will have their competences recognised.
- Universities already issuing course in the field of energy performance and BIM could invite their student to assess their competences in the ARISE platform as now happens with languages skills and ECDL European Computer Driving Licence.
- The owners, both public and private, should be the driver for the demand of more skilled workforce that should be certified and not “self-declared”.

7 Conclusions

In conclusion many very positive initiatives are taking place in all the European countries to increase the competences both in the energy performance and BIM field, but these initiatives are often in parallel with different systems of assessment increasing confusion to the market. ARISE proposes a unique system for the recognition of competences independent by the way they have been achieved. This could be the start for the real free movement of workforce through Europe with the recognition of competences based on tasks to be performed more than qualification that are so different in each country.

From the overview of the different national and regional qualification frameworks it is evident that it will be impossible to harmonise the existing systems. But, from a first enquiry with main stakeholders, it appears that the recognition of competences, linked to activities performed for specific tasks, are more suitable both for the workers, that can acquire these competences step by step, and for the customers that will employ the right people for the right activity.