BIMEET

BIM-based EU -wide Standardized Qualification Framework for achieving Energy Efficiency Training

D5.3 – Validation and documentation of BIMEET labelling

WP 5	**Leader: BRE**
Task 5.3	**Leader: House of Training**
Prepared by	Elisabeth De Sousa, Sylvain Kubicki, Tarja Makelainen, Richard Hartless
Date	February 2020
Partners involved	House of Training, LIST, VTT, BRE

Table of Contents

Abbreviations

ALO	Achieved Learning Outcomes
BEM	Building Energy Model
BIM	Building Information Modelling
CA	Consortium Agreement
DoA	Description of the Action
EE	Energy Efficiency
EPBD	Energy Performance Buildings Directive
EPC	Energy Performance Certificate
EQF	European Qualification Framework
GA	Grant Agreement
HOTS	High Level Thinking Skills
ICT	Information and Communication Technologies
ILO	Intended Learning Outcomes
KSC	Knowledge – Skills – Competencies
LO	Learning Outcomes
LOTS	Low Level Thinking Skills
Mx	Milestone date designating the start of a given task
My	Milestone date designating the end of a given document delivery deadline
PC	Project Coordinator
PSC	Project Steering Committee
QA	Quality Assurance
RIBA	Royal Institute of British Architects
RTO	Research and Technology Organisation
ToC	Table of Content
UAS	Universities of Applied Sciences
WP	Work Package
WPL	Work Package Leader

1   Executive Summary

As defined in the BIMEET project workplan, the task T5.3 aims at applying experimentally the proposed labelling scheme in order to assess it against several training modules developed within BIMEET funding. The labelling scheme developed in deliverable D5.2. is therefore included in this analysis and broken down in order to answer several underlying questions.

Following the labelling scheme proposed, the following stages were addressed in the analysis:

- Definition of the label
- The label assessment commission
- The training labelling process
- The constituent elements of the application
- Training assessment criteria for awarding the label
- The test on training courses
- Conclusions

2   Introduction

2.1   BIMEET Project

The aim of BIMEET is to (a) pave the way to a fundamental step change in delivering systematic, measurable and effective energy efficient buildings through BIM training with a view to effectively address European energy and carbon reduction targets; (b) promote a well-trained world leading generation of decision makers, practitioners, and blue collars in BIM for energy efficiency; (c) establish a world-leading platform for BIM for energy efficiency training nurtured by an established community of interest. These general aims translate into the following strategic objectives (STO):

- STO1: Screen and synthesize past and ongoing European, as well as national, initiatives and projects with a focus on assembling evidence-based quantitative / measurable scenarios and use cases that demonstrate the role of BIM in achieving energy efficiency in buildings across the whole value chain.

- STO2: Benchmark existing Europe-wide BIM trainings across the building value chain (including lifecycle and supply chain), highlighting energy efficiency linkages, as well as qualification targets, delivery channels, skills, labelling mechanisms, while highlighting training gaps and enhancement potential.
  - ✓ This will include: (a) better determination of future capability needs; (b) clear routes of entry and clear career progression pathways; (c) clear, standard means of recognizing competence; (d) exploring the scope to make apprenticeships more flexible; (e) an industry review of the current skills and capability delivery mechanisms; (f) review of approaches to career planning, training and development with a commitment to rationalize.

- STO3: Harmonize energy related BIM qualification and skills frameworks available across Europe (Objective 1) with a view to reaching a global consensus through our BIM for energy efficiency expert panel.
  - ✓ The focus is on setting up a mutual recognition scheme of qualifications and certifications among different Member States supported by an effective strategy to ensure that qualification and training schemes are sustained after the end of the project.

- STO4: Map identified skills, qualifications, and labelling into a BIM for energy efficiency overlay with a total lifecycle and supply chain (including blue collar) perspective.
  - ✓ There are country specific delivery and process variations that will be considered to ensure successful take-up of the BIMEET training program at a national level.

- STO5: Adapt the BIM4VET platform (delivered in the context of a related ERASMUS+ ongoing project) to provide a robust computer-based online and open-access environment for BIMEET.
  - ✓ The BIM4VET platform is already providing: (a) BIM stakeholder competence matrix, (b) classification of BIM training curriculums in Europe, (c) BIM qualification maturity assessment method, and (d) recommender system for BIM training selection.

✓ The resulting BIMEET platform will be available on-line on an open-access mode, nurtured by an established community of interest underpinned by an adapted business model.

- STO6: Establish a governance, policy, and regulatory framework as well as adapted business models to ensure the long-term sustainability of the proposed BIMEET training agenda.
  - ✓ The consortium will be supported by a 200+ members of the BIMEET community of interest and a panel of experts (around 20 members).
  - ✓ The consortium members will adopt an incremental and participative approach engaging effectively all the above stakeholders.

- STO7: Disseminate within and beyond Europe the resulting BIMEET platform and training program.

BIMEET endeavours to enhance the skills, qualifications and capabilities of construction practitioners (from high professionals to blue collar workers), thus increasing market penetration and adoption of key technological development in BIM, given the timelines of the need for training in combined green and functional performance engineering. There are several areas that are key to the potential growth of BIM for energy efficiency and its impact on the green building marketplace:

- Multi-disciplinary integrative capacity of BIM: BIM provides a unique opportunity to integrate data, information and underpinning processes across lifecycle and supply chains. This will promote informed and energy efficient design interventions.
- Informed sustainability design: BIM contributes to sustainable lifecycle decisions and processes as it leverages on the capability of the complete construction value chain thus optimizing design decisions on complex issues such as energy efficiency.
- Modelling standards: BIM is currently promoting the development and adoption of a wide range of standards and best practice guide as evidenced by BIM adoption dynamics in Europe.
- Increase of BIM use for retrofit: there is an increasing trend for use of BIM in large as well as smaller projects with a sought benefit of maximizing energy efficiency and sustainable outcomes. Recognition of the appropriateness of BIM for small retrofit projects is also critical given the dynamic growth anticipated in the green retrofit market in the existing domestic stock across Europe.
- Using BIM for building performance monitoring: there is an increasing evidence of the value BIM tools during the operations and maintenance phase of a project, with the view of reducing the endemic gap between predicated and actual energy consumption in buildings.
- Training support & communication tool: As BIM embraces building products and processes, it constitutes a useful support for training, and to communicate the best practices for energy efficient and high-quality construction, in particular to on site staff.

This report focuses specifically on the strategic objective no.3.

2.2 Learning outcomes definition

The European Qualifications Framework is a common European reference framework whose purpose is to make qualifications more consistent and understandable across different countries and systems[1]. The framework includes eight reference levels, which are defined in terms of learning outcomes.

The purpose of the common frameworks for learning outcomes is to enable the comparison of qualifications across national borders and stakeholders. The use of common language makes such comparison possible.

Learning outcomes discussed in this report refer to the intended learning outcomes rather than achieved learning outcomes *"Learning outcomes are attributed to individual educational components and to programmes at a whole. Learning outcomes are specified in three categories – as knowledge, skills and competence* (KSC). *This signals that qualifications – in different combinations – capture a broad scope of learning outcomes, including theoretical knowledge, practical and technical skills, and social competences where the ability to work with others will be crucial."*[2]

Building Information Modelling offers potential benefits for a better management of energy and other performance aspects of buildings. To enable and ensure the utilization of these benefits there is a need for the identification of the required KSC for the different roles in design, building and maintenance processes as well as to support the definition and creation of learning outcomes. Further, it is important to define the learning outcomes to support the planning and delivery of training courses that fulfil the identified requirements.

Certain basic principles are important, when defining learning outcomes. The following list presents the recommendations from the European guide book *Defining, writing and applying learning outcomes* [3]:

- Focus is always kept on the learner: what is (s)he expected to know or understand.
- Learning outcomes need to be defined and written in a way where there is room for individual and local adaptation.
- Too detailed statements should be avoided. Also, overly complex statements prevent learners, teachers and assessors from relating to the statements.
- Learning outcomes cannot replace related knowledge, skills and competence statements.
- Learning outcome should start with an action verb, followed by the object of the verb as well as a statement specifying the depth of learning to be demonstrated, and complete with an indication of the context. Table 3 illustrates the system.
- Generally not more than one action verb for each learning outcome. Figure 4 was used as one of the references for using appropriate action verbs.

The definition of the learning outcomes was based on country specific definitions for the required KSC for the main roles. The basic method for defining the country-specific requirements was based on the following procedure:

---

[1] http://www.cedefop.europa.eu/fi/events-and-projects/projects/european-qualifications-framework-eqf
[2] Users'Guide, E. C. T. S. "Luxembourg: Publications Office of the European Union." DOI 10 (2015): 87192. https://europass.cedefop.europa.eu/sites/default/files/ects-users-guide_en.pdf
[3] CEDEFOP European Centre for the Development of Vocational Training. 2017. Defining, writing and applying learning outcomes. A European Guide Book. Luxembourg: Publications Office of the European Union, 2017. Web-source: < http://www.cedefop.europa.eu/files/4156_en.pdf > Referred 20th November 2017.

- defining the main roles in design, building and maintenance processes
- identification of the main process phases
- identification of tasks related to energy performance management and BIM for the different roles based on the main phases
- defining the required KSC for the roles to manage these tasks in different phases
- summarizing the results for role-specific requirements
- concluding the required learning outcomes on the basis of the summarized required knowledge, skills and competence.

During this procedure, national guides for plans of works for different roles and national guides for common BIM requirements were made use of in defining phases, tasks and roles. For example, in Finland, guides for plan-of-work have been formulated for architectural design, structural design, HVAC/MEP design, and management of building projects.

In addition, the earlier results from previous stages of BIMEET and other European projects that have studied advanced BIM processes for energy-efficient design and building were made use of when formulating the needed knowledge and skills during the performance-based and BIM-based design and building process. These include the recent HOLISTEEC project that developed methods and tools for BIM-based energy efficient design [4] [5]. In the formulation of the learning outcomes, this report also studied the on-going relevant projects and their conclusions about learning needs.

Construction industry and building projects involve numerous roles and stakeholders. Because of existing differences in design, building and maintenance processes, the main roles are also called and defined in somewhat different ways in different European countries. To define the European learning outcomes related to BIM and energy-efficient building, six main categories were selected:

- Client & Clients advisors
- Architectural design roles
- Structural design roles
- Building services design roles
- Construction work roles
- Maintenance work roles

---

[4] Jung N, Häkkinen T, Rekola M. Extending the capabilities of BIM to support performance based design.
ITcon Vol. 23 (2018), pg. 16. https://itcon.org/papers/2018_02-ITcon-Jung.pdf

[5] Ferrando C, Delponte E, Difranco M, Häkkinen T, Rekola M, Abdalla G, Casaldaliga P, Pujols WC, Lopez A, Shih SG. Holistic and optimized life-cycle integrated support for energy-efficient building design and construction: HOLISTEEC methodology. Vienna, Austria. 17-19th September 2014

2.3   Objectives of the task T5.3

As defined in the BIMEET project workplan, the task T5.3 consists of testing the labelling protocol for training courses. The labelling scheme developed in deliverable D5.2. is therefore included in this analysis and broken down in order to answer several underlying questions.

Following the labelling scheme proposed, the following stages were addressed in the analysis:
- Definition of the label
- The label assessment commission
- The training labelling process
- The constituent elements of the application
- Training assessment criteria for awarding the label
- The test on training courses
- Conclusions

3   Definition of the label

According to the common definition, a label is a "Label or mark on a product to guarantee its quality".

The project aims to develop skills in "BIM and energy efficiency". The aim is therefore to offer a label to organizations which offer training on this topic in order to guarantee the quality of their content.

A general definition of the label is given in deliverable D5.2:

Objectives:
Pave the way to a fundamental step change in delivering systematic, measurable and effective energy efficiency buildings through BIM training with a view to effectively address European energy and carbon reduction targets,

Promote a well-trained world leading generation of decision makers, practitioners, and blue-collars in BIM for energy efficiency.

Target:
- training centers, which essentially train all stakeholders
- universities
- Engineering schools
- Architect schools
- Software vendors
- Independent trainers

Validity:
The label is issued for a period of 3 years.

Some additional information will be collected to control the quality of the training provided and will be use as data for statistics like, number of sessions delivered, total number of attendees, number of attendees for each group of stakeholders, level of satisfaction of attendees

---

The elements defined above seem to be relevant in the European framework, even if some issues deserve further consideration:

- Is the label intended for continuing training and/or initial training?
- Will the assessment criteria be differentiated for university degrees?
- Why target engineering and architecture schools in particular? Should not vocational secondary schools be included?
- In view of the rapid evolution of the subject, 3 years' validity could be reduced to 2.

4   The BIMEET labelling commission

4.1   The role of the BIMEET labelling commission

The labelling scheme provides the following definition for the role of the BIMEET labelling commission:
"To ensure a match between the reference framework defined for the label and the training courses which would be eligible".

Taking into account the rapid evolution of the subject and the experience acquired as applications for the label are made, we propose also to add:
"to re-evaluate the framework regularly and submit proposals for improvements to the governance body."

4.2   The composition of the BIMEET labelling commission

The scheme puts forward the following composition:
- BIM experts
- Energy Efficiency experts
- Educational Engineering experts

The scheme does not suggest a number or a definition of the necessary expertise.
The test carried out on existing training courses enabled us to draw some conclusions:
- Mastery of the subject "BIM and energy efficiency" at European level is an absolute necessity.
- The national tools for calculating energy certificates, and broadly the methods and tools for assessing energy performance, vary from one country to another and this has an impact on the assessment of training.
- A pedagogical engineer who does not have advanced knowledge of BIM cannot evaluate the application of training institutes to the BIMEET label.
- A BIM expert who does not have advanced knowledge of tools specifically related to energy efficiency cannot evaluate the application.

To summarize:
The ideal would be to have a majority of members combining educational and BIM & EE expertise so as to ensure overall consistency.

4.3   The commitments of the BIMEET labelling commission

The Commission is committed to complying with the following principles:

- Ensure the promotion of the label and labelled training
- Animate the network of training providers
- Organize at least one workshop during the year to tackle evolutions linked to BIM for energy efficiency
- Actualize the framework according the evolutions.

We suggest to add the principle:
- Collect information as described in Chapter 3: Validity

5   The labelling process

The individual steps of the process defined in deliverable D5.2 are listed above and form a logical sequence.

5.1   Submission of the application

It is foreseen that the applications will be submitted via the platform https://www.energy-bim.com/.

Note: At the time of finalising the BIMEET project activities, the development focused on the support to the design of new training schemes, and so far has not addressed the new features that will enable the registering of new training modules.

All documents can be uploaded online or sent by e-mail. The languages for submitting the application remain to be defined. Given the European context of the label, it is recommended that documents be submitted in English. In addition, it will be necessary to provide for the possibility of submitting an updated version for the provisional opinions (chapter 5.3 of this document).

With regard to a possible payment for services, it seems obvious to ask for this payment at the time of submission of the application, since the analysis of the documents and the Commission meeting will give rise to costs.

5.2   Processing of applications

The quality has to be checked with help of the criteria described in chapter 6.

A quality control checklist should be developed and integrate some elements as:

- source of the content must be based on research or state of practice
- scope of the training according to LO it mean to address
- visible sources of content and the pictures are in place
- professional appearance of slides, videos etc
- up-to date content on BIM-EE knowledge /tools/ development

The applications will be analysed by the BIMEET labelling commission within a reasonable period of time. This remains to be defined, but in no case may it be longer than 30 days.

5.3 The opinion of the BIMEET labelling commission and any further clarifications by the training provider

The opinion of the Commission will be drawn up in English and sent to the label applicant in electronic form.

This opinion can be categorized as follows:

- Positive opinion = award of the label and publication of the labelled training course online
- Provisional opinion = this opinion requires additional information and/or the adaptation of training content; the training is not published in the "labelled" section.
- Negative opinion = the training does not correspond to the purpose of the label and is not published in the "labelled" section.

5.4 Signature of the charter by the training provider receiving the label and issue of the label

In order to receive the label, the training provider must sign a charter in which it undertakes to respect the following main principles for the entire duration of the label's validity:

- Create and actualize training materials in alignment with BIMEET framework
- Ensure the quality of labelled trainings
- Ensure the quality of the trainers to deliver these training courses
- Participate to the workshops organized by BIMEET structure
- Pay the fee for the use of the label and logo.

The training provider has to give some information about number of attendees and other informations as describe in chapter 2: validity.

NB: In chapter 4.1 we propose payment of the costs connected with the label and the submission of the application and not with obtaining the label. The costs entailed by the analysis of the application and the use of the BIMEET logo as a label may have to be dissociated.

5.5 Online publication of the labelled training courses

Publication of labelled training courses is provided for on the platform https://www.energy-bim.com/, where a specific widget has been developed.

6   The constitutive elements of the application

The labelling scheme puts sets out a list of information to be provided to enable the assessment to take place and the label to be awarded.
To carry out the test, we based ourselves on the current functionalities of the platform https://www.energy-bim.com/.
These have been developed so as to respond to the application for the registration of a training course on the platform and not to the application for labelling so far.
As the platform is the means chosen for submitting the application for labelling, we have preferred to formulate comments based on this fact.

6.1   Training provider information sheet

Currently, the fields to be filled in for "Organiser":

- Name
- Country
- Municipality
- Organization type

Proposals to supplement the information for "Organiser":

- Contact person (Training content): Title, first name, surname, e-mail, telephone number
- Contact person (Invoicing): Title, first name, surname, e-mail, telephone number
- Legal form
- Legal representative of the company: Title, first name, surname, e-mail.

6.2   Training information sheet

Currently, the fields to be filled in for "Training":

- Title
- Description
- Price
- Language
- URL
- Is the training available on demand?
- Training period
- Training Duration
- Training Start/End Date
- Delivery type
- Select the RIBA Stages (0.Strategic Definition 1. Prepare.Briefing 2.Concept Design 3. Developed Design 4.Technical Design 5.Construction 6.Handover 7.In use)

Currently, the fields to be filled in for "Venue":

- Name
- Country
- Municipality

Proposals to supplement the information for "Venue":
No comment.

Currently, the fields to be filled in for "Exam/Diploma":

- Select training type (Qualification, Certification, Graduate Education)
- Is there an exam at the end of the training course?
- Diploma name

Proposals to supplement the information for "Exam/Diploma":
No comment.

Currently, the fields to be filled in for "Targeted Public":

Select from the list below:

Architectural design
Building services design
Client & Client Advisor
Construction Work
Maintenance Work
Structural Design

Proposals to supplement the information for "Targeted Audience":
No comment.

Currently, the fields to be filled in for "Learning Outcomes":

Depending on the selection made in "Targeted Public", a table must be completed per role

Architectural design
ADLO1   - pre-requirement from 0 to 5   – level expected after training from 0 to 5
AD.1.1
AD.1.2
…
ADLO2
ADLO2.1
ADLO.2.2

The above scale represents a level of competence that has been defined in the BIM4VET project: 0 = None and 5 = Expert.
The precise definition can be found in the final report on page 11, at the link
https://www.bim4vet.eu/fileadmin/files/Files/IO3_Deliverable_BIM4VET_Final.pdf

Currently, the EQF level is not included on the platform, but could be added at this level, following the principles established in D5.2.

The level of detail of the Learning Outcomes is relevant for making recommendations, but may be a disincentive for the training Organiser.

6.3   Training support

Currently, the fields to be filled in for "Supporting Material":

- Support Material name
- Support Material description
- Support Material author
- Support Material URL

Suggestions for supplementing the information for "Supporting Material":
No comment.

6.4   Description of the practical work

There is at present no page for this information. We suggest the following fields for "Practical Exercises":

- Title practical exercise
- Description
- Examples (upload)
- URL

6.5   Curriculum Vitae of trainers

There is currently no page for this information. We suggest the following fields for "Trainers information"

- Contact: Title, surname, first name, e-mail
- Education: name of degree, year of graduation, university
- Description of the training given (all or part of the training)
- CV: upload

Provide one page for every trainer involved. The trainer must have a level of competence higher than that identified in the LO of each role concerned by the training in the specific field. E.g. for the architect LO at level 2, the trainer should have at least level 3 for the architecture field.
The analysis of the trainer's expertise is a delicate point, but necessary to guarantee the quality of the training provided.

7 Assessment criteria and test for existing training

7.1 Assessment criteria

The assessment grid provided in the annex of the D 5.2 labelling scheme defines a certain number of fields to be completed. We defined the general fields in chapter 6. Here we will identify the breakdown made to assess whether or not the training allows the acquisition of the various LOs by role.

We confirm the need for a breakdown by role and a detailed analysis of all the "Learning Outcomes" for all the roles that are the subject of the application for labelling.

The labelling scheme uses the same structure for each role:
- Purpose and role
- Requirements for the role
- EQF levels definition
- EQF Mapping
- Labelled training
- Exam
- Maintain of knowledge

Some sections will need to be clarified/adapted:

- Purpose and role: this refers to the minimum required. The document does not describe the minimum, but rather all of the LOs for the role.
- Labelled training: the definition indicates that all the training courses referenced on the platform in the "Training" section have obtained the label. This means that a non-labelled training course cannot be referenced.
- Currently, the training courses listed under "Training" do not have the label.

Below is an extract from the platform: https://www.energy-bim.com/view/training?course=19&doctitle=Sustainable%20Training&q=&token=
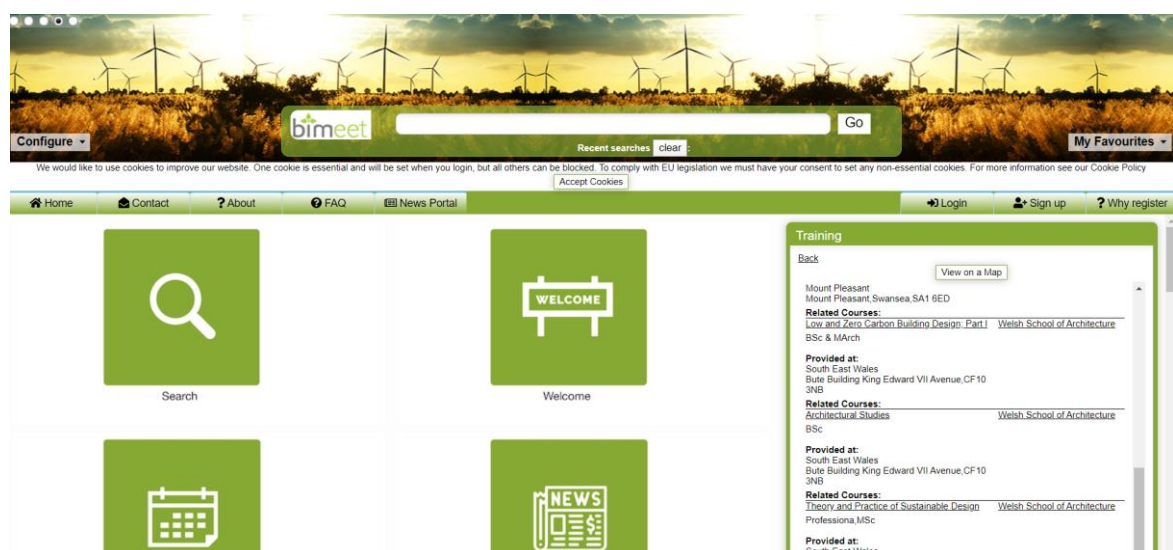
The Commission will have to assess the various elements:

- The EQF level required
- The EQF level reached at the end of the training
- Whether the learning outcome has or has not been reached.

A summary table could take the following form:

Title of the training course	General comment on the training course	EQF level required	Comment on the level required	EQF level reached	Comment on the training course	Learning outcome reached yes/no

Proposal for adaptation:

At this stage, we note that no assessment based on the BIM and energy efficiency skills assessment scale has been included in the labelling scheme. On the platform, the organiser of the training course must however provide this. This could also be used to give a finer level of assessment.

7.2 The test in respect of existing training courses

To carry out the test on existing courses, training courses were chosen to represent the following types:

- face-to-face continuing vocational training
- face-to-face Master training
- e-learning continuing training

We note that none of the three tested training programs corresponded to all of the Learning Outcomes for a role.

This can be explained by the fact that these training courses were set up without knowing the assessment criteria and that the level of requirement per role remains an ideal to be reached over time.

Let us take the example of a 4-day training course organised as part of the Master and take the LOs of the "Client & Client Advisor" role. We find that only one LO out of the 7 is reached. To complete our analysis, we take the example of the BIM training scheme (without energy efficiency specification) organised in Luxembourg by CRTI-B since 2019.

These are modular programs that allow participants to follow the modules that meet their needs.

To be more specific, here are the modules that could be imagined for the BIM and Energy component, without this being exhaustive. We will start from the existing BIM training scheme:
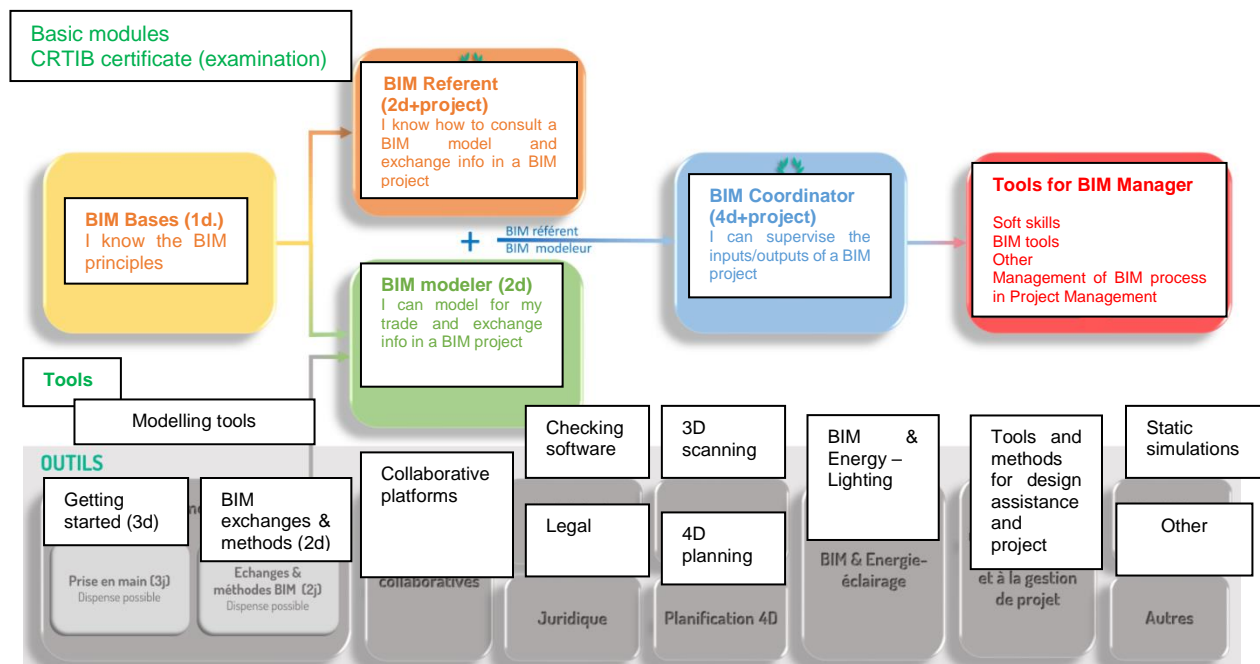
There are currently several modules on BIM and thermics, proposed by different organizations, as well as plans to add 2 more, namely:

a. Existing training:

- CPE housing training + practical application on Luxeeb tool
- Further training on CPE (energy performance certificate) housing
- Lesosai training for CPE housing
- CPE functional training for existing buildings
- CPE functional training courses for new buildings
- How BIM can improve energy performance
- Building the future: energy autonomy in the home
- Training on Lenoz (ecological passport) and subsidies
- Flixo formation for the calculation of linear thermal bridges
- Training on management and realization with the client

b. Other training modules under development in Luxembourg:

- BIM to BEM training Archicad / Revit /Lesosai CPE housing
- BIM to BEM training Archicad / Revit / "new national software" functional CPE

Now let us take the example of an architect who works in housing and uses Archicad in 3D without participating in BIM projects. He does not want to carry out a dynamic thermal simulation for the time being. We consider that a BIM coordinator is present in this office.

Here is the list of the LOs to be reached. In addition, he must master the BIM Archicad and Lesosai software and know the energy regulations for housing.

No	Learning outcome	EQF level		
Architectural design and Architectural BIM Coordinator (ARBCO), Architectural chief designer (ARCD), Architect (ARCH), Architectural assistant designer (ARAD)		ARCD	ARBCO/ARCH	ARAD
ADLO1	Learner is able to explain the fundamentals of BIM and the underlying principles of uses with respect to building life-cycle.	6	6	3
ADLO2	Learner is able to explain the fundamentals of sustainable and energy-efficient buildings and building performance.	4	6	2
ADLO3	Learner is able to lead design process and support the client and other stakeholders in decision making.	6	5	-
ADLO4	Learner is able to implement energy performance, building performance and sustainability targets into design process.	5	6	1
ADLO5	Learner is able to produce BIM models with accurate and required information content for different uses and phases of a building project.	3	6	2
ADLO6	Learner is able to collaborate and use collaborative approaches to support communication and visualization.	6	6	2
ADLO7	Learner is able to explain and give examples about implementing target and quality management procedures in the building project.	6	5	-
ADLO8	Learner is able to use different relevant software and interfaces between relevant software.	5	5	3

For each LO, details are provided below:

ADL01: Basic BIM training enables level 3 to be reached. This corresponds to the suggested level to be reached by architects except for BIM coordinators, which is not the case in our example = 1 day.

ADL02: The basic training on CPE housing allows the regulatory bases to be acquired. The further training day enables encoding to be mastered for most of the configurations encountered. For the LCA component, an additional day is necessary to learn the regulations as well as the system of subsidies linked to the environment and energy performance. Lastly, training in Lesosai is essential in order to be able to generate a CPE from a BIM model = 4 days.

ADL03: This is a skill that is mainly acquired through experience. Nevertheless, House of Training in collaboration with OAI offers training courses of this type. We consider in the example that the architect has this experience.

ADL04: "Building the future" training affords a pragmatic approach to energy design and shows how to proceed in order to attain complete energy autonomy for a home, including all mobility needs. This complement to the previously listed training courses enables the required EQF to be reached = 1 day.

ADL05: In our case, the architect has to go through the "BIM Exchanges and Methods" module on Archicad in order to know how to manage material properties and the IFC configuration for exporting the model. Then, he must go through the BIM modeler module to understand the interactions with other designers working on other software. Lastly, he must be able to transfer the Archicad model to Lesosai in an efficient way, the BIM to BEM CPE housing training is therefore required = 5 days.

ADL06: Learning to collaborate is started in the BIM modeler and "BIM exchanges and methods" training courses where the exchange of comments (BCF and native) is addressed. A supplement is necessary in relation to collaborative platforms and the use of IFCs in the BIM referent module = 2 days.

ADL07: The BIM to BEM CPE housing training course addresses this topic at the level of the transition from the model to energy simulation. In addition, this subject is looked at in depth in the BIM modeler and "BIM exchanges and methods" training courses. No additional training is therefore required.

ADL08: This aspect has been covered by the previous points. Indeed, learning a subject is often linked to a practical application using software.

We get to a total of 11 training days in a modular training system despite the fact that we assumed that our architect already had some experience and that he was not the BIM coordinator of his office. This is a good illustration of the fact that a single training course can hardly meet all the LO requirements of a given professional role. The prerequisites for taking part in one or another module are related as much to the LOs as to the mastery of the IT tool.

The prerequisites for participating in training courses are not only connected with LOs or the EQF level. Indeed, a more or less advanced mastery of certain software is essential in order to be able to use and put into practice the knowledge acquired during the training courses. The same applies to knowledge of regulations and best practices. It seems illusory to be able to define prerequisites solely on the basis of an EQF per professional role.

It could be useful to specify training by training course, the software used and the level of knowledge that has to be acquired before the training course. Indeed, there is a multitude of software tools for modelling, thermal simulation and collaboration. This information would be useful both for the analysis of training courses and for guiding potential participants towards training.

Assessment by BIM & EE skill level from 1 to 5, as described in section 5.2 would be useful.

The labelling scheme provided indicates all LOs as a "minimum requirement". This seems difficult to achieve in the light of the examples described above.

As described in chapter 7.1, we propose an adaptation of the mention "minimum requirement".

8   Conclusion

The labelling scheme constitutes an initial framework, developed by the project team in order to prepare further valorisation of BIMEET outputs and ensure the maintenance and acceptance of these results after the project lifetime. The task T5.3, extensively presented throughout this deliverable D5.3, aims at applying experimentally the proposed labelling scheme in order to assess it against several training modules developed within BIMEET funding, and to better evaluate and **define** all the aspects of the labelling scheme.

The definition of the label is a crucial stage, which warrants particular attention, as it is a question of knowing what guarantee of quality is given and this obviously has an impact on the target.
According to the definition of the target proposed in the scheme, it is a question of targeting continuing and initial training, at vocational training and university level.
Moreover, the maturity level of "BIM & EE" as a subject varies from one country to another. It will be necessary to remain vigilant as to the level of requirements and assessment criteria, at the risk of dissuading all potential clients or of not being able to award any label.
In our opinion, it is a question of **giving visibility to training courses** which satisfy the learning outcomes in relation to each role. Also, we believe that achieving few (or even a single) LO(s) could potentially give access to the label.

In view of the European context, applications will have to be submitted online and the https://www.energy-bim.com/ platform already brings together most of the elements that make up the application. As it can be assumed that training organisers will already have entered their training in the system to be listed, they will only need to complete certain additional elements. This will avoid double entry and loss of time.

The assessment criteria as defined in the scheme are based on a **breakdown by role**, which is essential.
The mapping between an LO and an **EQF level by role is not sufficient** for the assessment of prerequisites and learning outcomes at the end of the training. The input and output EQF level can be the same. Assessment according to the 0-5 scale of competences put forward in point 6.2 could complement the assessment criteria in a relevant way.

The composition of the assessment commission is a key factor, as a mix of expertise is the only guarantee of adequate processing of applications for labelling. It will be a question of finding **members with skills in BIM & EE and pedagogy.**