

NEWCOM

New qualification schemes
to build high quality

Summary report on national certification strategies for building inspections

Deliverable 4.2



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Abstract

NEWCOM addresses the building quality improvement challenges that supervisory authorities are facing today to meet European and national climate change targets for 2020 and the implementation of nearly-zero energy building standards (nZEB). NEWCOM focuses on the development of missing qualification and certification systems for blue-collar workers and construction professionals who are testing and controlling the key qualities of buildings during the whole construction phase.

This report describes the strategies for establishing a Building Inspections course scheme in the national markets, which is being developed within the project NEWCOM. Based on the described findings strategies for other EU countries can be easily derived. This report focuses on the implementation of modules and special content as a supplement to already established courses. It was observed that trying to create and implement the completely new job description of “Building Inspection” has little chance of being accepted by the market. Ambitious efforts of analyzing the national markets for trainings and intense stakeholder dialogue were the basis for this report.

The first part of the report deals with the national implementation strategies for the mentioned content in the partner countries Austria, Hungary, Slovakia and the Netherlands. The second part reflects the collaboration with important and relevant determined stakeholders in these partner countries. These national findings are merged to a general applicable strategy for Central Europe.

This strategy consists of a roadmap that gives ideas how an implementation process for the content of the Building Inspection education can look like and which questions should be tackled. It also names the key stakeholders that can boost a sustainable implementation, significantly create market demand and promote the Building Inspection training content.

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1 Introduction

As stated in the public NEWCOM report “D2.1 Identification and evaluation of existing certification schemes for blue-collar workers and building inspections”, developing completely new qualifications in the form of personal certification has little chance of being accepted by the market. This matches with the results of the public NEWCOM report “D6.1 Analysis of market barriers towards cross-craft training schemes” where it is stated that an implementation of the Building Inspection (BI) in national job markets by trying to get it ISO certified is unlikely to be successful. There are many barriers for certification institutions to implement a certification like the Building Inspection. Comprehensive quality management is necessary for the certification of training institutions (e.g. following ISO 90001). Unfortunately, this is very complex and cost-intensive especially for small training providers. This led to the statement that the establishment of the completely new profession of “Building Inspection” and a full course implementation is not the right strategy to start a successful implementation.

The major challenge is to create customized strategies in all partner countries and to derive strategies applicable in other EU member states to establish and implement content and modules of the building inspection scheme. A fundamental part of all the strategies will be an intense collaboration with stakeholders – either from the vocational training sector or from the customer sector –, to create market demand and promote the educational contents. Within this report the potential for a successful cooperation with the following stakeholders will be analyzed:

- Training institutions (predicted key stakeholders)
- Existing networks for trainees (predicted key stakeholders)
- Stakeholders which benefit from increased building quality (customer)
- Stakeholders which indirectly benefit from building quality (contractor)

- Stakeholders which benefit strategically from building quality (legislature)

Training institutions and existing networks are predicted to be the key stakeholders because they are well established and can steer the demand on the market towards trainings and standards. The legislature can create market demand by a top-down principle.

2 Strategy for the establishment of the Building Inspection education

To derive a general strategy for the implementation of content and modules of the Building Inspection education, the national sub-strategies developed within this project are illustrated in this chapter. This involves a description of the national analysis of the target groups for quality inspection tasks, associated relevant key training institutions and an analysis of the training scene for quality inspection in the partner countries.

2.1 Austria

In Austria, it was determined that an implementation of the whole profession and new job description Building Inspection will not have the chance to be accepted on the market. Neither the training institutions have interest in providing such a training, nor the trainees of the future target group have interest in or expect benefits from this whole education on the job market. Therefore, the strategy should be to contact the educational institutions that educate the target groups of the Building Inspection and establish jointly relevant missing modules. In Austria, a close cooperation with the training institution ARGE EBA is ongoing. The project partner Energy Agency Styria is also a member of the ARGE EBA network. Further cooperation with the Austrian Society for Thermography and the BAU Akademie Österreich (Construction Academy) has already started.

2.1.1 Target groups

For the building inspection the following target groups have been identified in Austria:

- Energy consultants
- Construction supervisors
- Construction foremen

2.1.1.1 Energy consultants

Energy consultancy is not a protected brand or job description in Austria. There is an umbrella organization that gives a quality-assured framework for trainings for energy consultants that is called ARGE EBA. Regional networks in the federal states organize the ARGE EBA educated consultants. In the federal state of Styria, this network is called netEB. These networks provide continuous education; membership in these networks is often required to offer governmentally funded consultations in the building sector. Energy consultants often offer services like Energy Performance certification (EPC) calculations, energy audits for buildings, services regarding building certifications, state-funded consultations for house owners and services related to building physics like thermography or blower door tests.

2.1.1.2 Construction supervisors

Construction supervisors are employees responsible for:

(a) the technical, commercial and personnel management of medium-sized but independent construction sites (construction projects), or

b) the management of well-known sections at major construction sites in technical, commercial and personnel terms, insofar as the performance of these tasks has not been entrusted to the employer himself, an executive body of the management or the responsible head of the major construction site. Construction supervisors must carry out their tasks in accordance with the instructions and guidelines delivered to them by the employer or the management or a representative of these bodies, while at the same time observing the applicable laws, legal provisions and customary practices in the industry.

They must be able to independently determine prices for all construction work and levels of difficulty, including the cost of site equipment and clearing and the accounting of the construction work they execute.

Additionally, the construction supervisor is responsible:

- a) for the technically proper and orderly execution of the construction tasks;
- b) for the efficient conduct of business with the client and their representatives, with offices, authorities, organizations, associations, suppliers, subcontractors, professionals and the like, as well as with the individual departments and business premises of the enterprise or consortium to which he or she belongs;
- (c) the appropriate use of workers under his or her authority, their guidance and supervision at work and their fair and social treatment;
- (d) for compliance with all obligations otherwise due to the contractor in the performance of his or her trade, insofar as they relate to the performance of the contract awarded to the construction supervisor.

2.1.1.3 Construction foremen

As a professional link between company management and construction management, on the one hand, and the construction workers, on the other, the foreman is one of the most important positions in the middle management level of the construction industry.

Foremen are employees who – on construction sites – carry out orders placed with them by the employer construction supervisor on the basis of plans made available to them or, according to information given to them, divide up the work of the workers under their authority and instruct and supervise them in their work. Foremen also keep shift records and other records from which the daily performance and use of each worker under their supervision can be ascertained and are responsible for compliance with accident prevention regulations and with the rules and regulations of the place of work, and for the proper and professional execution of the construction work entrusted to them by the instructions given.

It is the foremen's duty to ensure that the workers are used in accordance with their suitability and ability and that the mechanical equipment on the construction site is installed and maintained properly and appropriately.

They shall arrange the part of the site entrusted to them in such a way to ensure the safety of traffic. In addition, they are responsible for the correct and professional installation of all sanitary and hygienic facilities.

Where they must receive or test building materials, they are responsible for ensuring that unsuitable building materials are not used.

Foremen shall ensure that workers, transport and operating materials, building materials, timber for construction, scaffolding and formwork, scaffolding, machines and tools are required in good time, and that the spaces provided for storage purposes and the number of workers are reduced in good time as the scope of construction decreases. They shall also take all precautions to guarantee that the accounts can be settled without complaint and shall therefore cooperate steadily and amicably with the bodies responsible for this purpose.

Based on the general data and fixed points given to them with regard to height and direction as well as on the basis of the execution plans, foremen shall determine the height and depth contours of the building components themselves and arrange for their professional installation. This includes, among other things, the preparation of the excavation site, the formation of batter boards and the reference meter level.

Furthermore, they shall ensure the professional installation of all types of timbering, supports, spreaders, underpinning, scaffolding and bridging, not only with regard to the correct wood connection, but also with regard to the ground condition and the safety of the building and the persons directly subordinate to it or working in the building site area, and shall constantly inspect these facilities.

They also take care of the division of the brick association, the execution of the formwork, iron bending and laying work in accordance with the execution plans and the like.

2.1.2 Established relevant training institutions

In Austria, there is in just one established and accredited organization that offers a holistic energy consultant training. As a result, only this training institution (ARGE EBA) is determined as relevant and described in this chapter.

In the field of further education for the construction industry the BAU Akademie is the leading (and almost the only one) institute offering relevant quality trainings for foremen and construction supervisors. Therefore, the subsequent chapter is focused on these two institutions.

2.1.2.1 Training institution ARGE EBA

In Austria, one main cooperation partner for the implementation of the building inspector course is the training institution ARGE EBA (**A**rbeits**g**emeinschaft **E**nergie**b**eraterInnen **A**usbildung = Workgroup Energy Consultancy Traineeship). Several stakeholder meetings have been held with representatives from the federal states of Carinthia, Styria and Salzburg. ARGE EBA is interested in the NEWCOM topics and is willing to implement interesting parts in their course program.

ARGE EBA was founded in the early 1990s and is an umbrella organization of the Austrian federal states' energy agencies. It has nine members according to the nine Austrian federal states.



Figure 1: Federal organization structure of ARGE EBA Austria

Some provinces are direct members, others are represented by their local energy agencies. ARGE EBA sees its task in the quality assurance and further development of Austrian-wide, high-quality training for energy consultants. As there is no legally protected business title for energy consultants, the ARGE EBA traineeship enables a differentiation from other energy consultants in the market ensuring specific knowledge and consulting capabilities of their graduates.

Targets of ARGE EBA:

- High-quality training
- Trans-sectoral availability to all crafts
- Consistent adjustment of catalogue of learning objectives
- Quality assurance and further development of the training
- Recognition in all parts of Austria through oral board examination

By passing the examination of the ARGE EBA training consultants show that they differ from others in the market thanks to their special knowledge and special consulting skills. Today, ARGE EBA sees itself primarily as an organization that has set itself the goal of maintaining

the training of energy consultants on a qualitatively high level and of providing further development of these training courses.

2.1.2.2 BAU Akademie Österreich

With eight locations in Austria, the BAU Akademie (Construction Academy), the inter-company training center for the construction industry, is the third pillar of the construction apprenticeship training. This approach, which goes beyond the classic model of vocational school and on-the-job training, makes Austrian skilled worker training an international role model, thereby strengthening the reputation of the Austrian construction industry in Europe and around the world.

The main tasks of the BAU Akademie concentrate on two main topics:

- Inter-company apprenticeship training
- Education and training

The extensive course offerings are aimed at all construction-related employees, but also at professionals interested in an internationally competitive further qualification: skilled workers, foremen, construction tradesmen, site managers / technicians and master builders.

In addition to the courses needed for the further qualification from apprentice to master-builder, trainings include occupational safety, construction technology, business administration / law / management, energy, forklift / crane / blasting and numerous other topics from the practice of construction companies.

2.1.3 Analysis of trainings of established training institutions

2.1.3.1 ARGE EBA Training Courses

The training for energy consultants basically consists of a beginner course (Course A), an advanced course (Course F) and a substantial practical part. The training is completed with a

board examination after attending these course modules. Occasionally, specific courses are available (indicated with “S”).

- Course A
- Course F
- Specific courses (S)

Course F is the most relevant course regarding overlaps in content for the Building Inspection education and is thus described more in detail in the following.

ARGE EBA Course F

As well as Course A, Course F was developed for the time being as a pure classroom course. In its first version, the course included 120 lessons. However, the entire training still included a large practical part of about 80 teaching units. In this practical part, at least 6 energy consultations had to be concluded to complete a detailed energy consulting project. Only after this practical part could participants take the exam.

Also, Course F was developed over time and thus the overall duration was significantly longer. Today, the course is offered in different states in the Austrian federal provinces depending on whether an e-learning system is connected or not. In any case, the actual duration of the seminar is longer today than the specified 120 UE. This is mainly due to the much more complex technical developments that are being taught.

Moreover, for Course F, after the founding of the ARGE EBA, a list of teaching objectives was bindingly agreed.

The practical part of the training still includes at least 6 energy consultations that must be held by the course participants. However, these consultations must also be accompanied by a supervisor, or at least be discussed with a supervisor. For newcomers it is also possible to complete 3 of these 6 consultations as a companion, although a detailed protocol must be prepared in any case.

In addition to these consultations, an energy consulting project is to be developed in which all areas of energy consulting should be treated. The resulting report typically comprises about 15 to 20 pages.

After completing the course and the practice, an examination in front of the board must be taken. In some federal states, a written exam about the course content is also required, which is usually held at the end of each course. The examination will be conducted by a board of examiners, ARGE EBA representatives from the respective federal state and at least one representative from another federal state.

Practical part: 6 documented consultations and a project work

Examination: written and / or oral

Analyses of units of learning outcomes (ULOs) and needed modules/content

The ULOs of the existing Course F were screened and squared with the developed ULOs for the nZEB Building Inspector. This analysis gave an overview of the needed additional training modules, which are described below.

Table 1: Missing Modules ARGE EBA Course F Austria and external training providers

Field of knowledge	Module Name	ULO No.	External training provider
Air and vapor tightness of buildings	Air and vapor tightness of building envelope	7.1	Not found
Water tightness of buildings	Water tightness of roofs	7.3	Not found
	Splash-water protection	7.2	Not found
	Waterproofing of structural components in contact with the ground and internal structural components	7.4	Not found
Quality assurance methods	Thermal imaging	10.1	Not found
	Moisture measurements	10.2	Not found
	VOC ¹ measurement	10.3	Not found
	Testing of air tightness	10.4	Not found
Heating technology	Electric infrared panels	11.12	Not found
Thermal activating of building components	Possibilities for thermal component activation	16.1	EU-BIT, BAU Akademie, Wifi, VÖZ
	Thermal component activation concepts	16.2	EU-BIT, BAU Akademie, Wifi, VÖZ
	Thermal component activation implementation	16.3	EU-BIT, BAU Akademie, Wifi, VÖZ
General tasks for building inspector	nZEB: terms and definitions	19.4	Not found
	Tendering and evaluation of offers	19.1	Not found
	Cross-craft communication at construction site	19.3	Not found
Monitoring process	Monitoring strategies	20.1	ARS, TÜV
	Implementation of monitoring strategy	20.2	ARS, TÜV
	Performance of monitoring and analyzing data	20.3	ARS, TÜV
Building Information Modeling (BIM)	BIM Systems	21.1	AIT, ARS, mum
Building operation	Adjustment of technical installations	22.1	Several

¹ Volatile Organic Compounds

Functional check	22.2	universities of applied sciences WIFI, ARS
User training	22.3	

2.1.3.2 BAU Akademie Training Courses

Construction Supervisor

The construction supervisor is one of the most important management positions in the construction industry. Constantly changing construction tasks under always new aspects of efficiency, economics and with high leadership competence is the challenge for this leading position in the construction industry. The joining of own and external strength, the right timing and cost management combined with rapid development and implementation of problem solutions are outstanding characteristics of good construction supervisors.

Professionals with this education are becoming more and more interesting for companies because they can compete more efficiently and more effectively and operate faster than others and thus help to improve the competitiveness of the company.

The training as a construction supervisor actively takes up these challenges and imparts practical and project-related knowledge.

Target groups

The course is primarily aimed at employees of the construction industry, architecture and engineering offices, property developers and employees of the ancillary construction trade, who are all responsible for the construction management of construction projects. Admission requirements for participation in the course is the graduation of a higher technical college, construction foreman training with at least three years' relevant professional experience, or a comparable qualification with appropriate professional experience.

The following modules are taught in the regular education for construction supervisors:

Module 1: Invitation to tender, bid and award of contracts

Module 2: Calculation

Module 3: Accounting

Module 4: Project management

Module 5: Local construction supervision / construction site management

Module 6: Reporting

Module 7: Law for construction supervisors

Module 8: Occupational safety for site managers

Module 9: Communication – Leadership

Construction foreman

The challenges facing foremen in the construction industry are constantly changing construction tasks, which must be mastered efficiently, cost-effectively and with leadership competence under ever new aspects. The joining of internal and external strength, the right time and personnel management, combined with rapid development and implementation of problem solutions, are the outstanding characteristics of a good foreman.

The training as a foreman actively takes up these challenges and imparts practical and project-related know-how through the involvement of instructors from the construction industry, who share their specialist knowledge based on their practical relevance and professional competence. According to the collective agreement on construction, foremen are designated and classified as "auxiliary bodies of the employer or a site manager in the execution of construction work". In this role, the foreman, together with the site manager, is responsible for the smooth running of construction sites in technical and personnel terms. The training is primarily aimed at employees of the construction industry and at companies in the ancillary construction industry who use foremen in the construction process. Admission requirements for participation in the training are a positive apprenticeship certificate as a bricklayer, formwork constructor, civil engineer, concrete constructor, carpenter or stonemason and, in addition to the apprenticeship, two years of practical experience or at

least five years of relevant professional experience. Spoken and written proficiency in German is assumed. The training is strongly practice-oriented and its duration extends over three classes in the fields of building construction, civil engineering and stone construction and two classes of 500 hours each in the field of timber construction.

The training as a building foreman represents an important step towards securing the high level of qualification at middle management level and thus also towards the competitiveness of the Austrian building industry. In addition to subject-specific focuses, the training contents also include mathematics, construction drawing, construction chemistry and physics, construction law, construction management, correspondence and static fundamentals. Communication and leadership are also part of the training. The training is to be completed with a project work and an oral examination. Each participant receives a certificate of completion. Subsequently, there is the possibility of additional training as a general contractor (GU) foreman with at least 80 teaching units. The focus of this additional training is on construction engineering and construction industry subjects.

As the training for construction foreman, offered by the BAU Akademie, follows the curriculum of the public "Master Craftsman School for Professionals in the Construction Industry", in the following part this curriculum is cited.

The "Master Craftsman School for Professionals in the Construction Industry" focuses on the acquisition of practical skills. The graduates are particularly qualified to take on tasks in the execution, technical planning and inspection of buildings.

The core areas of construction engineering training are building physics, building materials and building ecology, building construction, structural analysis and strength theory, construction operations and construction machinery, civil engineering, surveying, construction drawing and applied computer science (including CAD). The training primarily pursues the goal:

- to achieve the application safety required for the profession through practical work in design and practice-related project work,

- to ensure a sufficient understanding of the construction, erection and equipping of structures,
- to provide appropriate general and business education.

Professional core competencies:

The graduates of the “Master Craftsman School for Professionals in the Construction Industry” have the following technical skills:

- Participation in the planning and construction of the details of construction projects,
- Ecological and economical material selection and production preparation,
- Supervision of the execution and execution of construction work,
- Coordination of the main building trade and ancillary building trade on the building site, including quality assurance,
- Use of relevant construction software (including CAD) and surveying equipment,
- Knowledge of relevant regulations and procedures.

Interdisciplinary core competencies:

In the area of personal and social skills, graduates of the “Master Craftsman School for Professionals in the Construction Industry” are to be particularly qualified,

- to carry out practical tasks precisely and systematically according to technical specifications, in compliance with standards and the law,
- to execute work orders both independently and in a team with other specialists,
- to train independently in the areas relevant to the subject area, as well as
- to communicate with customers and suppliers, write relevant documentation, understand descriptions and technical literature.

Fields of activity:

The fields in which the graduates work is building construction and building installation, building supervision including the coordination of all trades involved in building, the maintenance and operation of building facilities and surveying.

The documentation of construction projects, also by means of relevant construction software, the maintenance of construction equipment and machinery as well as company training (also training of apprentices) are among the typical areas of responsibility of graduates. The application of relevant standards and regulations on safety and health at work and construction worker safety measures are an integral part of all activities.

Summary on BAU Akademie courses: construction foreman and construction supervisor

Both the training for construction supervisor and the training for construction foreman cover the topics relevant/important for quality control/quality assurance in several modules. Missing is – in both educations – a stringent, process-oriented structure/guideline for quality control regarding the nZEB-relevant qualities.

2.1.4 Screening of training scene

2.1.4.1 Energy consultants

On the basis of “Table 1: Missing Modules ARGE EBA Course F Austria” and the results from Deliverable 2.1 “Identification and evaluation of existing certification schemes for blue-collar workers and building inspectors”, other training providers that cover the ULOs of the missing modules were searched. The result is shown in Table 1 in the last column and described below.

Air and vapor tightness of buildings

The ULOs for air and vapor tightness of the building envelope are covered in several courses in Austria. Often, there are courses merely for certain construction methods and construction

parts. We see the need for a compact course that covers all the construction methods, renovation and new construction and for the whole outer shell of the building. Also, we regard this as one of the core competences of the Building Inspection and will develop detailed training material for this field of knowledge.

Water tightness of buildings

The same argumentation as for air and vapor tightness applies to water tightness, and we will therefore also develop detailed training material for this field of knowledge

Quality assurance methods

There are several courses on the Austrian market that deal with quality assurance topics. The weakness of these courses is that there is not one that deals with all the required topics in the appropriate depth according to the ULOs. There is a myriad of courses that deal with single measurement methods – but then often are much too detailed. And often the courses lack a practical part where real measurements have to be performed at the construction site. That is why the consortium decided to develop these modules within NEWCOM as a core module for the Building Inspection education.

Heating technology – IR (infrared) Heating

The screening of the market in Austria revealed that there is a lack of training providers that deal with this topic. As this is a particularly sensitive issue, there is a notable need for trainings that inform about the risks and the correct implementation of IR-heating technologies and, as a result, there is a requirement to develop course material.

Thermal activating of building components

As this is an interesting new technology, there are many trainings courses of high quality training providers for these ULOs in Austria. We do not see the necessity for the development of course material in this section because this knowledge can be covered in a complete topic-specific course.

General tasks for building inspector

The topics mentioned above cannot be covered adequately by courses already on the training market in Austria. Moreover, they need to be further customized for the special needs of the Building Inspection and for that reason developing training material within NEWCOM is required.

Monitoring process

Education for energy management systems according to ISO 50001 is available on the market, provided by several institutions, but it is basically an education at management level. There are several technical colleges and universities that offer this topic as part of their educations but not as a separate course to cover the needed ULOs. Therefore, a module covering this topic is required.

Building Information Modeling (BIM)

The results of our investigation showed that there are enough training institutions in Austria that provide well-limited and adequate ULOs according to the requirements. At least three well established training institutions were identified and a check for the ULOs was carried out.

Building operation

In Austria several training providers offer educations for facility managers. This education covers the ULOs to a large extent. However, these courses are often established as one unit and, as a result, certain relevant content cannot be picked out. That is the reason why there is a need for the development of modules covering these ULOs.

Summary of needed modules to be developed for Austria within the NEWCOM project

A summary of the courses that are missing in Austria and training materials that must be developed are listed in Table 2: Summary of missing modules with ULOs. The table shows the needed modules for Austria where no adequate training institutions could be found to provide the relevant ULOs for the Building Inspection education.

Table 2: Summary of missing modules with ULOs

Field of knowledge	Module Name	ULO Nr.
Air and vapor tightness of buildings	Air and vapor tightness of building envelope	7.1
Water tightness of buildings	Water tightness of roofs	7.3
	Splash-water protection	7.2
	Waterproofing of structural components in contact with the ground and internal structural components	7.4
Quality assurance methods	Thermal imaging	10.1
	Moisture measurements	10.2
	VOC measurement	10.3
	Testing of air tightness	10.4
Heating technology	Electric infrared panels	11.12
General tasks for building inspector	nZEB: terms and definitions	19.4
	Tendering and evaluation of offers	19.1
	Cross-craft communication at construction site	19.3

2.1.4.2 Construction site supervisor and construction foreman

In the field of further education for the construction industry the BAU Akademie is the leading (and almost the only one) institute offering relevant quality trainings for foremen and construction supervisors. WIFI (institute for the promotion of business) and several other training institutions are also covering this education but, as mentioned, they all follow the “Master Craftsman School for Professionals in the Construction Industry” curriculum and, therefore, the content is the same everywhere.

2.1.5 Implementation of new modules/content

2.1.5.1 Implementation with the training institution ARGE EBA

In Austria, the findings about the content lacking on the market was presented to the ARGE EBA board. It was determined that there is an interest at least in the regional group in Styria and Salzburg to offer further training to the energy consultants and probably to add specific ULOs to the ARGE EBA Course F. At first, a “quality assurance in the construction phases”

module shall be implemented as a further education program within the netEB network in Styria. This module shall be listed in the permitted consultant offers that are linked to the persons in the network (<http://www.net-eb.at/> – click on “BeraterInnen”). Further implementation of this module is planned in Salzburg also within a continuing education workshop for trainees of the ARGE EBA course.

The planned course covers issues of practice relevance, such as compliance with standards and limit values, the performance and interpretation of on-site measurements and associated protocols. Furthermore, the responsibilities and quality definitions in the construction process are discussed with the different actors. A practice day at the construction site with many on-site measurements, test structures for penetrations and illustrative material underpins what was theoretically learned.

This includes (listed in modules):

- Responsibilities and quality definitions in the construction phases
- Airtightness of the building envelope in the construction phases
- Water tightness of the building envelope in the construction phases
- Avoidance of thermal bridges in the construction phases
- Guarantee of comfort in inner spaces
- Practice day on construction site with testing and measuring

2.1.5.2 Implementation with BAUakademie Lower Austria

Both the training as construction supervisor and the training as construction foreman cover the topics relevant/important for quality control/quality assurance in several modules. Missing is – in both educations – a stringent, process-oriented structure/guideline for quality control regarding the nZEB-relevant qualities, following the key questions:

- What are the relevant qualities for buildings in general?

- What are the special qualities for the specific project?
- Where are these qualities described?
- How are these qualities to be controlled?
- Who should control these qualities?
- How are deviations from agreed qualities to be treated?

Regarding the qualifications needed by the craftsmen involved, the following considerations should be implemented:

- Review of the personnel policy of the participating companies in comparison to voluntary and/or mandatory measures and requirements (e.g. regular internal training for craftsmen to update their technical knowledge): e.g. through interviews on site with a few employees
- On-site review of quality assurance procedures compared to voluntary and / or mandatory procedures/requirements (e.g. a few hours on-site training of tradesmen before a crucial implementation phase, specific site management tasks such as filling in and signing commissioning checklists, etc.): e.g. through interviews with a small number of on-site staff
- Verification of the qualifications of the craftsmen involved on site: All documents required according to tender specifications and / or mandatory requirements must be available on site for random testing
- Review of the time and execution schedule, including site visits at critical times and verification that the execution complies with voluntary and/or mandatory requirements (visual inspection); review of report documents; commissioning checklists and measurement protocols (air tightness) for compliance with voluntary and/or mandatory requirements (functional inspection)

- Quality assurance modules following these considerations will be included in the courses for construction foremen and construction site supervisors at the BAUAkademie in Lower Austria. Both modules are implemented as a four-hour workshop in the main training course for the mentioned professions. Based on these pilot activities a nation-wide implementation in the other BAUAkademien in the next training year (2019-2020) is planned. First activities towards this step have been already carried out (meetings with the CEO of the Styrian BAUAkademie and meeting with the CEO of the Lower Austria BAUAkademie).

2.2 Hungary

In Hungary there is a Building Inspection training available which is part of the NQR - National Qualification Register. Training centers all around the country offers this training, which is completely voluntary, because in Hungary currently only an exam is required to work as a building inspector.

The training takes 250-300 hours and cost about 900-1000 EUR.

The content of the training is to perform tasks related to building inspection: including control of materials, structures, processes, related laws, regulations in order for the professional to be able to work as a building inspector, who – as the representative of the builder – facilitates and controls the compliance of the related law, regulations, rules, contracts and construction documentation.

In Hungary the Basic Law of building (*Law LXXVIII. of 1997. on the protection and forming of the built environment*) specifies the tasks of the building inspectors and the terms and responsibilities related to working as a building inspector.

The task of the building inspector is to foster and control the adequate implementation of the related regulations, standards, contracts and documentations during the whole construction. The building inspector must have vocational education and professional experience.

It is mandatory to employ a building inspector in every construction activity which requires a construction permit.

According to *Government Regulation 244/2006.(XII.5.)*, in Hungary for building inspectors it is not mandatory to complete a training, but in order to work they are obliged to pass an exam and prove at least three years of experience.

The exam is organized and maintained by the national professional chambers and consists of the following two major parts:

- 1) general part, which is the same for all types of entitlement,
- 2) special part, which differs according to the various related professions.

In the case of college/university graduates three years of professional experience is required, whereas graduates of secondary/vocational educations must prove five years of professional experience.

Those who acquire the entitlement to perform activities as building inspectors also need to participate continuously in further trainings. There are mandatory (financial, law, standards) and voluntary sections, and a minimum of 10-hour and maximum of 20-hour training must be completed.

It is not compulsory to be a member of the relevant national chambers but to be included in the chambers register is a requirement.

2.2.1 Target groups

In Hungary employing a building inspector is mandatory at every construction which requires a building permit. At the construction site there is a responsible technical supervisor who is responsible for the quality of the work. The company who implements the construction work provides the responsible technical supervisor and the client employs the building inspector.

During the construction phase, the quality defined in the plans and technical description/project manual must be considered and the building needs to be constructed according to that.

For the building inspector the following target groups have been identified in Hungary:

- responsible technical supervisor
- building inspector
- energy consultant / auditor

2.2.1.1 Responsible technical supervisor

The building contractor employs the **responsible technical supervisor**, who is a qualified engineer/architect with skills and is liable for the adequate implementation of the plans. He approves every modification or deviation from the plans if it has the same technical qualities.

2.2.1.2 Building inspector

The builder employs the **building inspector**, he or she represents the builder at the construction site. Their responsibility is to control the compliance with the related rules, regulations, standards and contracts during the entire construction phase. Building inspectors are qualified engineers with entitlements, skills. They are obliged to visit the site at least every seven days and to document the inspections in the electronic construction schedule/journal. The electronic schedule/journal is a written technical document containing the work performed during the construction and is to be used also in official and court procedures.

2.2.1.3 Energy consultant / auditor

The energy consultant / auditor is a person who performs tasks related to energy audits. The energy auditor's tasks include the objective, external evaluation and to check whether the requirements of the relevant regulations are applied. The auditor can be one individual or a group of engineers.

2.2.2 Established relevant training institutions

Since in Hungary building inspector trainings are not mandatory and only an exam is required to work as a building inspector, the number of training institutions which can be included in NEWCOM is very limited.

2.2.2.1 Budapest University of Technology and Economics – Engineer Further Training Institution (BME Mérnöktovábbképző Intézet)

The institution was established in 1939 at the Budapest University of Technology and Economics. The aim of the institution is to provide further trainings for engineers. This training institution occasionally organizes trainings for responsible technical supervisor and building inspectors.

The Budapest University of Technology and Economics offers a two-year postgraduate course related to building waterproofing and acoustics, where the ÉMI Non-profit Llc. has 12 lecture opportunities on building quality and its control. To these courses NEWCOM modules could be added.

There is a basic building energy expert training at the Budapest University of Technology and Economics, which is also a postgraduate course (10 lectures, 180 hours altogether).

2.2.2.2 Hungarian Chamber of Engineers

The Chamber provides regular trainings for engineers in different fields. Building inspectors can apply to take the mandatory exam at the Chamber. It is advised to be registered at the Chamber.

2.2.3 Analysis of trainings of established training institutions

2.2.3.1 Training for responsible technical supervisors and building inspectors

The aim of the 2-day training (two eight-hour sessions) is to provide information to participants who intend to work as responsible technical supervisors and building inspectors.

The training is conducted in groups, both theoretical and practical sessions are included and there is a closing workshop at the end of each day. The participants are not evaluated individually, but within their group. Participants receive a certificate at the end of the course provided that they attend 75% of the time and participate in the group test.

The curricula of the training include the new requirements and regulations related to building inspection, current construction laws, quality assurance, new regulations related to construction products and their installation, electronic construction documentation.

2.2.3.2 Exam requirements

The above-mentioned exam (which is mandatory according to *Government Regulation 244/2006.(XII.5.)*) costs about 115 EUR. In case of failure it can be repeated partially or entirely. The exam consists of two parts: a general and a specific part.

To complete the general part, the participant must have knowledge related to the following topics:

- legal environment (legal hierarchy)
- general rules applying to contracts
- basic knowledge related to entrepreneurship including requirements of taxation
- basic rights of employers and employees
- rules related to public proceedings
- Basic Law of building (Law LXXVIII. of 1997. on the protection and forming of the built environment)
- knowledge related to fire safety
- laws and regulations related to working in the EU
- rules related to procurements
- basic knowledge related to historic preservation, environment protection

- quality management system
- rules related to certificate of conformity, CE marking
- types of standards and how to apply them
- health and safety

To complete the specific part, participants are required to have knowledge about:

- conditions of working as a building inspector
- tasks and responsibilities of a building inspector
- conflicts of interest and disciplinary rules
- rules, regulations, technical specifications
- requirements related to the content of construction plans
- requirements related to the content of building inspector contracts

The examining board is organized by the national chambers (Chamber of Hungarian Architects and Hungarian Chamber of Engineers).

The mandatory further trainings are provided by those technical higher education institutions which are connected to the different fields of the activities of a building inspector, and also by the Chamber of Hungarian Architects and Hungarian Chamber of Engineers.

The training can be a short vocational training, participation in conferences, courses, study trips or the obtainment of a scientific degree or price.

Analyses of ULOs and needed modules/content

Since there is no complete training for building inspectors, the ULOs defined in NEWCOM are not provided in any available course, therefore almost all modules are missing.

2.2.4 Screening of training scene

The Technical University of Budapest has a two-year postgraduate program for building waterproofing, insulation and acoustic. That training covers the insulation and waterproofing part of the ULOs.

Summary of needed modules developed for Hungary within the NEWCOM project

Table 3: Summary of missing modules with ULOs for Hungary

Field of knowledge	Module Name	ULO Nr.	External training provider
energy concept		2.1	Not found
building materials	thermal insulation materials	4.6	Not found
building components	walls to unconditioned spaces (lightweight constructions)	5.10	Not found
	windows and other transparent building components	5.11	Not found
air and vapor tightness of buildings	air and vapor tightness of building envelope	7.1	Not found
	testing of airtightness	10.4	Not found
quality assurance methods	thermal imaging	10.1	Not found
	moisture measurements	10.2	Not found
heating technology	hydraulic balancing	11.6	Not found
	heat storage systems (hydraulic)	11.7	Not found
	heat generation systems without combustion (heat pump)	11.10	Not found
ventilation technologies	natural ventilation	12.2	Not found
	mechanical ventilation systems	12.3	Not found
control systems	control systems for heating, ventilation and air conditioning	13.1	Not found
thermal activating of building components	possibilities for thermal component activation	16.1	Not found
	thermal component activation concepts	16.2	Not found

general tasks for building inspector	tendering and evaluation of offers	19.1	Not found
	economic evaluation	19.2	Not found
monitoring process	monitoring strategies	20.1	Not found
	implementation of monitoring strategy	20.2	Not found
	performance of monitoring and	20.3	Not found
BIM	BIM Systems	21.1	Not found
building operation	functional check	22.2	Not found

2.2.5 Implementation of new modules/content

2.2.5.1 Implementation with Budapest University of Technology and Economics – Engineer Further Training Institution

The training organized for building inspectors and responsible technical supervisors is completely voluntary and aims at updating the existing knowledge of working professionals. However, the training provider is open to include the modules developed in NEWCOM.

2.2.5.2 Implementation with the Hungarian Chamber of Engineers

There are intense ongoing negotiations with the Hungarian Chamber of Engineers in order to collaborate with them in relation to the building inspector training.

2.3 Netherlands

In the Netherlands there is great potential for the profession of building inspection. At the time being there is no such thing as a clear-cut building inspection. This means a myriad of different target groups must be addressed which could be suitable for the building inspection certification. The challenge will be to select the most promising groups and involve those further in the NEWCOM project.

The contacted stakeholders see potential for this profession but are also critical of a whole new certification since this will basically add to the (obligatory) certifications they already have. So, it will not only be the question which group is most eligible, but also which group seems most willing considering the existing education.

2.3.1 Target groups

For the building inspection the following target groups have been identified in the Netherlands:

- Energy consultants/advisors (EPA);
- (Building) commissioner, upskilled in building;
- Private quality controllers, upskilled in installations.

The first possible solution with regard to these different target groups is to divide the work between the commissioner and the private quality controller. Each group is then responsible for a couple of main task fields. The commissioner gets involved in the project development and planning phase, while the private quality controller takes care of the execution phase, the handover and the operation. Our focus should then be to ensure that they can work together optimally.

The other strategy is to invite all groups and confront them with the quality requirements of nearly zero energy buildings and the NEWCOM training modules to inspect these quality requirements.

Energy consultants/advisors

Energy consultancy is a protected branch, applicants are obligated to pass a series of exams to become a certified consultant. The scheme which is the framework for these exams is owned by InstallQ and managed by ISSO. Since 2018, the consultants are also obligated to keep their knowledge up to date by attending further training each year.

There are also a few of branch organizations and a handful of education institutes specialized on energy consultant trainings.

Building commissioner

The profession of building commissioners is still not fully accepted in the Netherlands. The most important organization who tries to strengthen the position of commissioners is the Dutch Building Commissioning Association (DBCxA). They are also working with a European project to get a certification model implemented.

Commissioning is a form of quality control which focuses on safe and healthy buildings, improves the energy performance, reduces operational costs, etc. There are three scopes of quality and competence: specialist, manager and authority. Various organizations and education institutes are already involved with commissioning.

Their scope is broader than that of an building inspector, but there are important areas of overlap which makes commissioners a likely relevant stakeholder.

Private quality controllers

There is an upcoming new law on Private Quality Control in the Netherlands. This law should introduce a new system for quality control to improve the building quality. Although this law proposal has been delayed multiple times, numerous companies are already preparing for it.

There are organizations who offer tools to implement private quality control. Some of these organizations also include certification, so users of the tool can distinguish themselves in the market. There are also various trainings available for individual employees offered by different (training) institutes.

2.3.2 Established relevant training institutions

This chapter describes training institutions that cover some fields of knowledge relevant to building inspection in their courses.

Training institution TVVL

An important education partner in the Netherlands is TVVL, founded in 1959. This is an important knowledge partner in the building services sector, who organizes trainings, workshops and courses for different skills and for different educational levels. TVVL wants to fulfill a platform role to involve their members in the production, transference and spreading of knowledge. To accomplish this, TVVL connects professionals in multiple think tanks. Beside this, they facilitate expert groups and communities in developing and sharing ideas.

As a result, TVVL has about 1,000 personal members and 500 company members. Connected specialists range from technical advisors, installers and architects, to researchers, suppliers and building owners.

Training institution ROVC

ROVC is one of the most important training institutes for secondary vocational education in the building services sector. They organize regular education programs, but also specialized trainings and courses for professionals who are already employed. ROVC has 13,000 students each year who follow a multitude of different technical courses, ranging from air-conditioning to process engineering. Their target is mostly focused on installers and (service) mechanics.

ROVC's main principle is practical learning; they want their students to work with real installations and systems as fast as possible. To enable this, they have numerous practice centers with all different kinds of test installations.

ROVC already has courses which address various NEWCOM modules for building inspectors.

2.3.3 Analysis of trainings of established training institutions

Course Commissioning at Training institution TVVL

TVVL organizes a commissioning course for higher educated technicians who work for consultancy bureaus, building services companies, clients or government. Commissioning as a phased process focuses on quality control and performance assurance. As a guideline for

the course they use the commissioning process conform to the ASHRAE² guideline, which was adapted as much as possible to the Dutch situation.

The goal of the course is for students to be able to self-sufficiently make a commissioning plan and carry out commissioning activities. The following modules are addressed:

- Name and budget a commissioning process;
- Draft a commissioning plan for the design and construction phase;
- Draft the commissioning specifications;
- Apply commissioning in building standards like BREEAM or LEED;
- Select the necessary commissioning activities;
- Draft a commissioning report;
- Perform with sufficient capacities the role als Commissioning Authority.

Through offering multiple cases, like writing a commissioning plan, the theoretical materials are learned interactively. The study load consists of about 140 hours, which include 6 course days. In these course days the following are discussed: total commissioning of buildings, commissioning case and commissioning and certification, commissioning in different phases, transference to the maintenance phase and BREEAM, commissioning in existing buildings and practical commissioning cases.

2.3.4 Analyses of ULOs and needed modules/content

The analysis of the full set of modules and content parts shows that most of them are available in the existing materials of different organizations.

The fields of knowledge about the basics of building physics, building materials, building components, air tightness of buildings, ventilation technologies and energy balances and demand forecasts, energy certificates and certification programs are all found in different

² American Society of Heating, Refrigerating and Air-Conditioning Engineers

publications and training materials of ISSO (and/or Build Up Skills modules for the Netherlands). The knowledge field of heating technology is for the most part also covered in ISSO materials, although some modules are more fragmented.

The heating and cooling loads module, the renovation concept module and the monitoring process module, are covered in trainings about sustaining buildings and dwellings. Air conditioning and building operation are available in courses by the ROVC educational institute. The field of thermal activating of building components is organized in OTIB³ courses. The BIM field of knowledge is included in a NET-UBIEP⁴ course.

Modules about comfort, water tightness of buildings, illumination, general tasks for building inspector and parts of the quality assurance methods field are available, but only in external organizations and most of the time the knowledge is fragmented offered by different institutes.

Concerning the missing modules, the situation is almost the same as in Austria. For the Netherlands we need to develop the same content parts to compile a complete building inspection training. Hence, the table below contains the same missing modules and fields of knowledge as the one for Austria.

Table 4: Missing Modules/Content for the Netherlands

Field of knowledge	Module Name	ULO Nr.	External training provider
Air and vapor tightness of buildings	Air and vapor tightness of building envelope	7.1	Not found
Water tightness of buildings	Water tightness of roofs	7.3	Not found
	Splash-water protection	7.2	Not found
	Waterproofing of structural components in contact with the ground and internal structural components	7.4	Not found

³ OTIB, Education and development fund

⁴ Network for Using BIM to Increase the Energy Buildings Performance

Quality assurance methods	Thermal imaging	10.1	Not found
	Moisture measurements	10.2	Not found
	VOC measurement	10.3	Not found
	Testing of air tightness	10.4	Not found – ISSO provided ultragraphics
Heating technology	Electric infrared panels	11.12	Not found
Thermal activating of building components	Possibilities for thermal component activation	16.1	ISSO has materials in Dutch
	Thermal component activation concepts	16.2	ISSO has materials in Dutch
	Thermal component activation implementation	16.3	ISSO has materials in Dutch
General tasks for building inspector	nZEB: terms and definitions	19.4	Not found
	Tendering and evaluation of offers	19.1	Not found
	Cross-craft communication at construction site	19.3	Not found
Monitoring process	Monitoring strategies	20.1	Energieopleidingen
	Implementation of monitoring strategy	20.2	Energieopleidingen Energieopleidingen
	Performance of monitoring and analyzing data	20.3	Energieopleidingen
BIM	BIM Systems	21.1	ISSO has materials in Dutch and English
Building operation	Adjustment of technical installations	22.1	ISSO has materials in Dutch
	Functional check	22.2	ISSO has materials in Dutch
	User training	22.3	ISSO has materials in Dutch

2.4 Slovakia

National strategies in the building sector to contribute to the EU 2020 energy targets are underpinned by two pillars of the national energy policy: energy efficiency and sustainable development. Two key priorities followed by these strategies are:

- Increasing energy efficiency of buildings in life-cycle perspective and decrease energy needs (a) in primary energy consumption and (b) in final energy consumption taking into account the overall CO₂ footprint of buildings
- Increasing the share of renewable sources of energy in saturating the energy needs of buildings in life-cycle perspective

In 2012 and 2013, Slovakia participated in the Build Up Skills Pillar I project managed by EACI (now EASME) to analyze the status quo in the level of competencies available in the building sector, future needs and obstacles for improvement and investments in the skills and knowledge of human resource in the building sector. Although the Pillar I project was aimed at craftsmen and on-site workers in the construction sector, the Slovak BUS team used this opportunity to address also several middle and senior level professionals, as the needs in this area are of same urgency and need to be targeted should the objectives in the energy efficiency of buildings and in the use of renewable energy sources be delivered. Moreover, taking into account the specific situation in Slovakia, not addressing the needs of middle and senior level professions in the building sector would undermine the effectiveness of achieving the expected impact of the action focused on craftsmen and on-site workers.

The agreed and endorsed BUS National Roadmap have anticipated leadership of employers in the process, with support of universities, accreditation bodies (ministries in charge of education), file managers of relevant governmental policies (ministries in charge of energy policies, including achievement of EU 2020 targets, ministries in charge of the construction sector, etc.), social partners and suppliers of services related to preparing and delivering construction works, construction materials, machinery, technology and equipment that is essential for achieving the set objectives.

In implementing the Roadmap, the following two national qualification and further training schemes have been set up so far:

- **StavEdu:** National Qualification and Training Scheme for Craftsmen and On-site Workers on Energy Efficiency and Use of Renewable Energy Sources in Buildings (resulting from the BUS StavEdu project supported by Intelligent Energy Europe);
- **ingREeS:** National Qualification and Training Scheme for Middle and Senior Level Construction Professionals on Energy Efficiency and Use of Renewable Energy Sources in Buildings (resulting from the BUS ingREeS project supported by Horizon 2020, GA No 649925).

2.4.1 Target groups

For the building inspector the following target groups have been identified in Slovakia:

- Construction site supervisors;
- Sustainability/Energy advisors;
- Assessors of the achieved energy efficiency (EE).

2.4.1.1 Construction site supervisor

The key roles of the supervisor, according to Slovak rules, are:

Monitoring:

The method and procedure of the construction work to guarantee the security and health protection;

- Proper installation and operation of technical equipment on site,
- Professional storage of building products and materials, and the appropriateness of their use;
- Professional storage of machinery and equipment.

Responsibilities:

- Compliance of spatial location and construction documentation;
- Observance of general technical requirements for construction;
- Ensuring the removal of faults founded on site. If it is impossible to remove the defects carrying out construction supervision, the supervisor must notify them immediately to building authorities (protects public interest).

2.4.1.1 Sustainability/Energy Advisors

The professional specialization “Energy and Sustainability Advisor” is not yet institutionalized. Energy efficiency advice is fragmented and provided either as fee-based or complementary free services (by energy companies, various agencies, banks, housing, management, trading and design companies). As the advice frequently serves the promotion of commercial interests, the final client often receives fragmentary and sometimes contradictory, or, particularly in terms of the life-cycle of buildings, insufficient information. The planned professional specialization “Energy and Sustainability Advisor” should help eliminate such fragmentation and provide the client with a comprehensive view on energy performance and integration of renewable energy sources based on principles of sustainable building.

2.4.1.2 Assessors of the achieved EE

Assessor of the achieved energy efficiency cross-checks and assesses design works, realization and set-up for energy efficient buildings.

Assessment is the result of a complex process of evaluation of finished buildings providing information/confirmation on the energy performance quality of the buildings.

From the rigorously prepared assessment one can recognize whether a building complies with actual requirements on energy performance of buildings. The total energy demand of primary energy as well as CO₂ emissions are calculated and formulated together with a recommended set of actions on how to improve the total score. The assessment and improvement recommendations deal with:

- Building envelope structures;

- Heating systems and preparation of hot water;
- Ventilation and air conditioning;
- Lighting appliances and electrical installations.

This applies to all new buildings and also to renovated existing buildings.

2.4.2 Established relevant training institutions

2.4.2.1 Slovak Chamber of Civil Engineers (SKSI)

With more than 5,500 members – Chartered Civil Engineers and other professionals and companies from the construction industry – SKSI is the largest professional organization in the construction sector in Slovakia. SKSI, a successor of the Engineering Chamber founded in 1913, was renewed under the law in 1992 to represent engineers and defend their rights and their professional, social and economic interests.

As a mandated authority, SKSI ensures the quality of planning, designing, management, realization, operation and maintenance of buildings and constructions while protecting public interest and safety in the built environment. SKSI supports and encourages the professional growth of Chartered Engineers as well as of all other construction professionals. SKSI promotes lifelong learning and professional development of the construction professionals.

SKSI was leader of the ingREeS project, mentioned earlier, and operates the national qualification and further training scheme for middle and senior level construction professionals on energy efficiency and use of renewable energy sources in buildings of the same name. The project ingREeS succeeded in including the topics relevant to energy efficiency and use of renewable energy sources in buildings in the mandatory certification of civil engineers required by Slovak law.

2.4.2.2 Institute of Education and Services (UVS)

The Institute of Education and Services (UVS) has been established in 1970 as an independent organization of the Ministry of Construction Industry. UVS was transformed to a limited company on 1 June 2002.

UVS as a commercial and independent institution offers a wide range of educational activities, such as training and re-training courses and programs accredited by the Ministry of Education of SR and by the Office of Work Safety of SR. UVS also hosts seminars, workshops, business negotiations, company presentations and international conferences.

The key objective of UVS is to provide lifelong learning of adults in the following areas: in the building sector and construction industry, in the European integration and regional policy, and in technology.

UVS has long-time experiences with publication activities and has published more than 600 publications mostly on construction, building sector, regional development, etc. UVS has been processing and publishing special teaching texts for secondary schools in the building sector for more than 20 years. With respect to education processes UVS has expertise in creating teaching aids, special publications, video programs, etc.

2.4.3 Analysis of trainings of established training institutions

2.4.3.1 ingREeS training modules offered by SKSI



Figure 2: ingREeS training modules (Doktor, Final Publishable Report, Deliverable 1.5 2018)

The training programs are built up by training modules. The modular structure of the further training scheme gives the programs flexibility, the possibility to add new modules, easy update opportunities to include the newest knowledge and know-how. The ingREeS program includes the following training modules:

- AM1 – Energy Certification and Building Certification;
- AM2 – Life Cycle Assessments;
- AM3 - 2nd Generation of EPB standards and nZEB;
- BS1 – Integrated Buildings Design;
- BS2 – Renewable Energy Technologies;

- BS3 – Advanced Building Methods and Tools;
- BS4 – Non-residential High-Performance Buildings;
- CD1 – Basic Climate Adaptive Design;
- CD2 – Advanced Climate Adaptive Design;
- CD3 – Internal Comfort and Indoor Air Quality;
- CD4 – Green Construction Products;
- CD5 – Building Physics and Energy Efficiency;
- LQ1 - Project Life Cycle Management;
- LQ2 – Recycling and Waste Management On-site;
- LQ3 – Quality Control;
- LQ4 – Legal Requirements.

The modules are building units of four training programs:

Table 5: Training programs within ingREeS (Doktor, Final Publishable Report, Deliverable 1.5 2018)

Programme Number	Target group	Total hours of learning	Inception and practical training in hours	Distance learning using IT in hours	Training included modules
1	Architects/Planners	86	14	72	BS3, BS4, CD1, CD2, CD3, CD4, CD5, LQ1, LQ4
2	Site managers and Site supervisors	50	10	40	CD4, LQ1, LQ2, LQ3, LQ4
3	Sustainability/Energy advisor	70	14	56	AM1, AM2, BS2, CD3, CD4, LQ3, LQ4
4	Assessor of the achieved EE	59	11	48	AM3, BS1, BS2, BS3, CD5, LQ4

2.4.3.2 StavEdu training modules offered by UVS

The StavEdu scheme offers ten cross-trade training programs of further education and training of craftsmen and on-site workers in the field of buildings on energy efficiency and use of renewables in buildings. The key objective of the cross-trade training programs is developing the key competencies of craftsmen and on-site workers in the field of buildings needed for energy renovation of buildings and construction new buildings to the standard of near zero-energy buildings. The training has three phases:

- Inception training focused on main issues of compliance (standards, technology requirements, legislation) identified by company experts;
- Theoretical part of the training;

- Practical training.

The further training programs are offered for the following crafts and on-site professions:

Table 6: StavEdu training programs summary (Doktor, Build Up Skills StavEdu Final Report (public) 2017)

Number of the programme	Targeted professions
SC1	Bricklayer, insulator, plasterer, concrete worker, scaffolding assembler;
SC2	Auxiliary production bricklayer (including dry mounting and wooden structures assemblers and installer of fillings for building openings), chimney-sweeper, carpenter/joiner, electrician, plasterboard fitter;
SC3	Assemblers of concrete and steel structures, assembler of building envelope, steel structure specialist;
SC4	Roofer, hydro-insulators, carpenter, tinsmith, slater;
SC5	Painter, paperhanger, tile setter, floorer, paver, mason;
SC6	Installer/plumber, installer of sanitary equipment, installer of heating, cooling and water preparation equipment, construction locksmith;
SC7	Crane and construction machinery operators;
SC8	On-site training on key energy savings measures for craftsmen and on-site workers.
SE1	Lighting systems in buildings;
SE2	Technical energy equipment in buildings.

The training programs SC1 to SC7 and SE1 provide 40 hours of training, including practical training in the working environment.

Within the training program SE2, the following modules are available:

- Module 1 for on-site workers with primary education (3 hours);

- Module 2 – an intermediate module for on-site workers with completed secondary technical education (8 hours);
- Module 3 for advanced on-site workers with completed secondary electro-technical education (24 hours).

Training programs offer assessment of the learning outcomes and certification of the qualification in energy efficiency and use of renewable energy resources in buildings.

2.4.3.3 Analyses of ULOs and needed modules/content

Table 7: Proposed Content and how it is covered by existing programs in Slovakia

Field of knowledge	Module Name	External training provider
Introduction and physical basics	CD5	SKSI
Basics of building physics	CD5	SKSI
Comfort	CD3	SKSI
Building materials	CD2, SC1, SC2	SKSI, UVS
Building components	SC1, SC2, SC3, SC4	UVS
Air and vapor tightness of buildings	CD2	SKSI
Water tightness of buildings	CD2, SC4	SKSI, UVS
Heating and cooling loads	SC6, BS4	UVS, SKSI
Illumination	SE1, BS1	UVS, SKSI
Quality assurance methods	LQ3	SKSI
Heating technology	SC6, BS1	UVS, SKSI
Ventilation technologies	CD3, BS1	SKSI
Control systems	BS1	SKSI
Air conditioning technologies	SC6, BS1	UVS, SKSI
Energy generating	SC6	UVS
Thermal activating of building components	BS4	SKSI
Energy balances and demand forecasts, energy certificates and certification programs	AM1, AM3	SKSI

Field of knowledge	Module Name	External training provider
Renovation concept	CD1	SKSI
General tasks for building inspector	AM3, LQ4	SKSI
Monitoring process	LQ1	SKSI
BIM	LQ1	SKSI
Building operation	LQ1	SKSI

2.4.4 Screening of training scene

ingREeS and StavEdu schemes are the only comprehensive and unbiased further education and training schemes available in Slovakia at this time. These two systems cover adequately the needs specified for Building Inspector by NEWCOM. Nevertheless, both systems are open to any new training institution that would implement the developed training programs or new programs that would complement and/or reinforce the objectives of developing skills and knowledge on energy efficiency and use of renewable energy sources in buildings.

2.4.5 Implementation of new modules/content

2.4.5.1 Implementation with training institution SKSI

SKSI continues in providing further training to civil engineers by delivering modules, as described earlier. The participants may take individual modules and/or programs. The combination of the modules CD2, CD3, CD5, BS1, BS4, LQ1, LQ3, LQ4, AM1 and AM3 provides the adequate training for civil engineers with master's degree.

The modules are provided in three different programs for targeted professionals. It is now possible to complete all the selected modules that would allow the civil engineer with master's degree to fulfil obligations of a Building Inspection, as defined by the NEWCOM project.

Nevertheless, the trainers (network of trainers is maintained by SKSI for delivering ingREeS training) will review new content developed by the NEWCOM project and complement the modules where necessary.

2.4.5.2 Implementation with training institution UVS

StavEdu training scheme will provide the opportunity for engineers without master's degree (bachelor's degree and secondary technical education graduates) to complement their training on energy efficiency and use of renewable energy sources. Following successful completion of the StavEdu training, they may complete the selected modules in ingREeS training, single module or any combination of the modules.

3 Strategic stakeholder collaboration

As the building inspection education and its content and modules are not yet established at the local markets, there must be intensive stakeholder interaction to start an initial promotion. The following points describe the addressed stakeholders in the partner countries and the interaction activities set so far and planned. These stakeholders are linked to the individual strategy of establishing content and modules of the building inspector education and vary therefore from country to country.

3.1 Austria

In Austria there were several talks with administration bodies and training institutions and housing cooperatives regarding the implementation, the needs and the promotion of the Building Inspector education. This could be a good entry point for the NEWCOM Building Inspection education offer.

3.1.1 Housing cooperatives

There were talks with housing cooperatives because they have direct benefit from increased building quality. Housing cooperatives employ site supervisors and they are interested in educating them with NEWCOM quality contents. A strategy is to establish in-house trainings for housing cooperatives that want to voluntarily increase the education standard of their site managers and / or foremen.

3.1.2 Building institutions

In Austria we are in contact with several building institutions. As mentioned, ARGE EBA is our main stakeholder for the Building Inspection education. There are also talks with TÜV-Akademie (Technical Inspection Association Academy), the BAUAkademie NÖ and others about a compact module "Quality Assurance" for site managers and / or foremen, which could take place during existing or upcoming courses in the year 2019 (also 2020). The idea

is to create a kind of guide with checklists for the project / construction manager, covering questions, such as "When is there something to do, claim or control?" and "Who is responsible for what?"

3.1.3 Existing networks: Energy consultant network (netEB) in Styria

The netEB is a network for energy consultants acting in the Austrian federal state of Styria. All consultants included in the network are appropriately trained and undergo a given quality control. Through regular training and information they are also up to date on all energy-relevant topics. They all agree to consistent quality guidelines, and the education follows the guidelines of the ARGE EBA education.

There are intense talks with this network where the Austrian partner EAST is also the coordinator. The goal is to implement NEWCOM aspects into continuing training for the members of the network.

3.1.4 Regional government – department for Energy Housing and Technics

The strategy is to implement a funding for a consultation services that is done by a person with a building inspection education. The promotion then is done by the governmental department that indirectly facilitates the building inspection education through the funding program. A market demand is created because it is more attractive for consultants to educate themselves as Building Inspectors because they then can offer an additional service on the market and that at reduced price thanks to governmental funding.

There had been several round table discussions and presentations with the representatives from the regional governmental department of Styria "A15 Energy, housing and technics", that are responsible for subsidies for housing, energy consulting and climate protection.

Funding is often connected to services done by a person that can provide certain certificates. In Styria several funding for consultations are connected to a membership of the consultant in a network called netEB (network energy consultancy).

Role model in this funding strategy was the regional government of Carinthia that offers a funding for services for a so-called “Sanierungscoach” (renovation coach). This “Sanierungscoach” is there to support a renovation in planning and execution when a comprehensive renovation is implemented. The following services can be funded with maximum 70% of investment costs and up to maximum 800€:

- Analysis of problems (moisture, drafts, structural damage ...)
- Assistance with grant applications
- Support for bid solicitation
- Advice on energetic issues during construction
- Assistance in the control and billing of construction works
- Assistance in compiling documents for the grant body

3.2 Hungary

Intensive negotiations are in progress with the Budapest University of Technology and Economics – Engineer Further Training Institution and the Hungarian Chamber of Engineers. Since for working as a building inspector trainings are not mandatory, most previously available trainings are terminated in Hungary. Only the successful completion of an exam is required according to the Hungarian Government Regulation 244/2006.(XII.5.). Due to this, the demand is low for building inspection trainings.

The Hungarian Chamber of Engineers is one of the most relevant stakeholders, not only because they are involved in the organization of the mandatory exams, but they also have their own trainings in several fields. The Chamber also has a recommended trainings database, where external trainings can be registered if their quality matches the requirements of the Chambers, which also helps the promotion of these trainings.

Épületszigetelők Tetőfedők és Bádigosok Magyarországi Szövetsége (ÉMSZ) - Hungarian Roofing Association is also an important stakeholder. The mission of ÉMSZ is to find and

efficiently apply those tools which support the development and value protection of building insulation and roofing profession. The Association also takes part in trainings and has many expert members in education as well, making the association a key stakeholder. They regularly organize events and conferences for engineers. For participating in these events, the engineers can get points which are mandatory for maintaining their Chamber's membership.

3.3 The Netherlands

In the Netherlands exploratory talks have so far mainly been focused on institutions that are active in the target group sectors for the NEWCOM building inspection training scheme.

3.3.1 Housing cooperation companies

Housing cooperation companies represent a significant part of the building stock. The housing cooperatives are not an essential target group, but they can be used to increase the likelihood of uptake of the new nZEB education schemes, since they are an important stakeholder who directly benefits from improved building quality. We will not organize a round table meeting for housing cooperatives especially with NEWCOM as focus, but we are contacting these cooperation companies for a similar session for another project. So, pitching NEWCOM at the same time is a simple addition. This meeting should coincide precisely with the NEWCOM session targets. As part of our strategy we will explore the possibilities to extend the skills of their internal quality and maintenance specialist.

3.3.2 Building institutions

The most relevant building institutions in the Netherlands are the ones that are involved with private quality control. This is a really fragmented playing field, which at the same time lacks real commitment since the regulations which will make private quality control obligated keeps getting delayed.

Organizations that are currently involved with private quality control trainings are: PAO Techniek en Management, BOB opleidingen, Berghouser Pont Academy, Envire, BNA

Academie, Bouwforum and HabiTask. We only have existing contact and ties with BOB opleidingen, we have not contacted the other fragmented parties yet.

However, there was an explorative conversation with one of the important organizations who are involved with developing tools for private quality control. KIK Campus is a cooperation to reach optimal usage/implementation of the KOMO quality control tools. Currently, there are multiple tools for quality control:

- KIK from KOMO;
- Tool by SWK and Woningborg focused on houses;
- Tool by De Tissen for technical inspection services focused mainly on specific components, consequence classes 2 and 3, in accordance with 5,019 as instrument.

Other organizations that are involved in this playing field are:

- VBKN through secondment and consultancy;
 - Vereniging Nederlandse Kwaliteitsborgers (+- 10 organizations);
- Nieman (education branch Bouwforum);
- gBOU already works with KIK substantially.

Public quality control and private quality control can strengthen each other in the aspects where they converge. KIK Campus wants to train quality controllers who are capable of more than just the public segment.

There already exist numerous certifications for quality control schemes, amongst others, a certification for external quality controller focused on authorization and control. There is also the KIK organizations (and persons) certification for working with the KIK tools⁵.

⁵ E.g.: KIK certification: training KIK & BRL 5019 for inspector. KOMO certificate on BRL 5029 "Quality Control for Builders", which is a process certificate for builders and installers.

KIK sees a single private quality controller as preferable. Based on design risk analyses the controller can discuss with the contractor how the quality can be controlled and recorded.

KIK Campus is willing to connect the different people and initiatives to get them involved for the stakeholder workshop. So, this first stakeholder involvement can be seen as a notably successful step.

3.3.3 Existing networks: EPA advisors

One of the most important existing networks in the Netherlands is that of the Energy advisors. This sector provides an extensive system for continued education and employs multiple thousands of advisors. A large part of these advisors are represented by branch organizations. One of those is FedEC, with which we had a first talk about the NEWCOM Building Inspection training.

FedEC already cooperates with a course by AcademyNL about energy-efficient buildings. Several NEWCOM aspects are already included in this course. Still, the number of attendees is moderate.

FedEC also organizes minor courses and collects materials according to questions they receive from their advisors. Most recent example was about insulation, where the advisors had problems to collect materials about this topic.

With regard to the NEWCOM training it is difficult to foresee if the advisors would follow a complete course; this will most likely only be the case for newcomers.

FedEC is critical about the marketing of a NEWCOM training, mainly because there is already a myriad of upcoming changes and obligations for the Energy Advisors; for instance, new trainings and directives which are mandatory.

So, if the NEWCOM training will be a commercial course (with corresponding fees), the estimated interest of advisors will be low. If it is a subsidized course (or with low costs), interest might be a little bit higher.

FedEC feels that education initiatives need a sustainable approach which also accounts for maintenance and keeping the training up to date. This prevents that the training is merely a single initiative which starts to get outdated from the moment it is released.

A guarantee like obligatory continued education might also be an option.

FedEC is really prepared to be involved with generating ideas about the approach, contents and marketing of the NEWCOM training. In conclusion of this first talk, it can be said that they have a constructive mindset, but are not solely positive about the NEWCOM training initiative. Still, it is too early to completely discount this branch just yet.

3.4 Slovakia

The key stakeholders in further education and training of construction professionals and craftsmen are the Association of Construction Entrepreneurs of Slovakia (ZSPS) and the Slovak Chamber of Civil Engineers (SKSI).

ZSPS was established in 1990 as independent, voluntary, non-political interest group of construction entrepreneurs/companies associating entrepreneurs and companies specialized in delivering works and services in the area of civil engineering; ZSPS is represented in many international, European and national institutions and organizations.

ZSPS promotes common and specific interests of its members and joint projects to create transparent and fair market conditions vis-à-vis European and national authorities and institutions, European and national legislators, professional bodies and organizations, and creates platforms for facilitating dialogue among stakeholders, decision makers and rule makers. It promotes projects and actions aimed at supporting investments in the skills, and cooperates with professional and certification bodies to promote quality management systems. It facilitates research, technical development and innovations in the construction industry. Moreover, ZSPS provides information, consultancy, and educational and training services: it also leads the National Sector Skills Council in the construction sector.

ZSPS led the StavEdu project and is “owner” of the National Qualification and Further Training Scheme for Craftsmen on Energy Efficiency and Use of Renewable Energy Sources in Buildings established by this project.

ZSPS work closely with the Slovak Innovation and Energy Agency (SIEA) that is focused on energy-related crafts (energy equipment of buildings, renewable energy installers, etc.).

SIEA has been established in 1999 as executive agency of the Ministry of Economy. It is the competence center for energy efficiency, energy innovations and renewable energies. SIEA also acts as implementation agency for EU Structural Funds and other funding mechanisms.

SIEA acts as the national energy agency and has very good knowledge of the Slovak energy market and its participants, the decision makers, companies, professionals, associations and all those who are involved in the area of energy as well as energy efficiency and renewable energy sources. Special emphasis is laid on the area of trainings and information seminars for professionals as well as for general public dealing with the rational energy use and wider exploitation of renewable energy sources. Fulfilling the tasks of the Slovak Ministry of Economy SIEA takes part in the preparation of energy policy, energy acts and decrees and follows and monitors development in the energy sector both on the demand and supply sides.

The key training institute of ZSPS is UVS, mentioned in section 2.4.2.2.

The training for construction professionals is delivered with support of many organizations that provide help to the content of the training, trainers for delivering training, necessary teaching aids, models and equipment for practical training, as well as infrastructure and access to real working environment. The network of supporting organizations is open for new organizations and currently includes:

Table 8: Regional network of supporting organizations for the UVS in Slovakia

No.	Name of the organization	City
1	Stredná odborná škola stavebná, Nitra	Nitra
2	Innovia, s.r.o.	Trnava
3	Stavoinvesta Dunajská Streda, s.r.o.	Dunajská Streda
4	Ipeľské tehelne, a.s.	Lučenec
5	STU BA, Stavebná fakulta	Bratislava
6	Slovenergookno, n.o.	Bratislava
7	SCHIEDEL Slovensko, s.r.o	Zamarovce
8	STRABAG Pozemné a inžinierske staviteľstvo, s.r.o.	Bratislava
9	Chemostav, a.s.	Poprad
10	Stredná odborná škola stavebná - ÉSzKI	Nové Zámky
11	Cech strechárov Slovenska	Bratislava
12	Kerkotherm, a.s.	Košice
13	STU BA, Stavebná fakulta	Bratislava
14	IMOS – Systemair, a.s.	Kalinkovo
15	HERZ, spol. s.r.o.	Bernolákovo
16	Ústav vzdelávania a služieb, s.r.o.	Bratislava
17	VIEGA, s.r.o.	Praha
18	ZEUS PB, s.r.o.	Dunajská Streda
19	Beztech, s.r.o.	Miloslavov
20	TERRASTROJ spol. s.r.o.	Bratislava
21	KUHN – SLOVAKIA, s.r.o.	Senec
22	MTS – com, s.r.o.	Stupava

These organizations will be the supporting stakeholders for delivering the needed training, including training of trainers within the NEWCOM project. These stakeholders were successfully tested by the StavEdu scheme and are therefore the foundation of the success of the NEWCOM training and certification.

SKSI is implementing the ingREeS training in close cooperation with two key stakeholders: ZSPS and the Faculty of Civil Engineering of the Slovak University of Technology in Bratislava (SVF STU).

SKSI and ZSPS were introduced earlier (in 2.4.2.1 and 3.4 respectively).

SVF STU was founded in 1938 as the first faculty of the Slovak University of Technology (STU). Its first departments laid the foundations not only for the present SVF STU, but also for technical education in Slovakia. Instruction was given by three departments: Department of Building Construction and Transportation, Department of Water and Cultural Engineering and Department of Geodesy.

Education at the Faculty has produced more than 31,000 graduates and 1,250 Ph.D. students. SVF STU is now the second largest engineering faculty at the University. Shaped by a number of outstanding personalities in science and technology, the Faculty has become a leader in research and education in the fields of civil engineering and geodesy in Slovakia.

The Faculty of Civil Engineering presently consists of 21 departments, the Institute for Forensic Engineering, the Computing Centre and the Learning Centre. More than 480 employees make up the Faculty's staff, which consists of 42 professors, 68 associate professors, 163 teaching assistants and 49 research assistants. Currently enrolled at the Faculty are approximately 3,300 undergraduate and 240 Ph.D. students. Degrees from the Faculty provide a passport to rewarding professional careers in civil engineering, architecture, geodesy and cartography.

SVF STU contributed to this report (interviews) and thus helped developing the implementation strategy presented in it. SVF STU will also lead the effort of reviewing any content developed by the project for other partner countries to prepare proposals for updating the ingREeS modules.

The further training has been implemented with the support of other stakeholders, such as:

- Ministry of Education, Science, Research and Sport of the Slovak Republic (responsible for lifelong learning, including further education and training);
- Ministry of Economy of the Slovak Republic (responsible for energy efficiency targets, including energy performance of buildings and renovation roadmaps);

- Platform “Buildings of the Future” (supporting energy renovations of existing buildings);
- Slovak Green Building Council (global stakeholder in energy efficiency and use of renewable energy sources in buildings supporting development of strategies in this area);
- Association for Supporting Renovation of Residential Housing (national stakeholder in promoting energy renovations of existing residential housing and supporting owners in implementing their objectives in this area);
- Institute for Passive Houses (national stakeholder providing advice on passive house concept implementation);
- Greenpeace Slovakia (global stakeholder in promoting environmental approaches in all sectors of the society and actions for combating climate change);
- National Qualification Platform (national platform set by Build Up Skills Pillar I project providing advice on training policies and supporting implementation of the measures agreed in the BUS National Roadmap);
- Technický a skúšobný ústav stavebný, n.o. (national stakeholder providing expertise on energy performance of buildings and relevant regulatory framework);
- Ekofond, n.f. (national stakeholder established by a key energy provider to support actions aimed at increasing energy efficiency, including energy efficiency of buildings).

These stakeholders also provide their experts for delivering training and professional sponsors of the developed further training programs.

4 Conclusion

This chapter summarizes the major findings in the partner countries of the NEWCOM project and derives a strategy applicable for Central Europe for the implementation of content from the developed Building Inspection education to sustainably increase the building quality. It also gives ideas about which target groups were identified as key stakeholders and how they can boost the implementation success.

4.1 Strategy for identifying specific national training needs and implementation of the Building Inspection (BI) education

A major strategy to establish the building inspector education in European countries is to develop modules as a supplement to already established courses.

Figure 3 shows the strategy for a sustainable implementation of modules developed within this report and the content of the NEWCOM Building Inspection education.

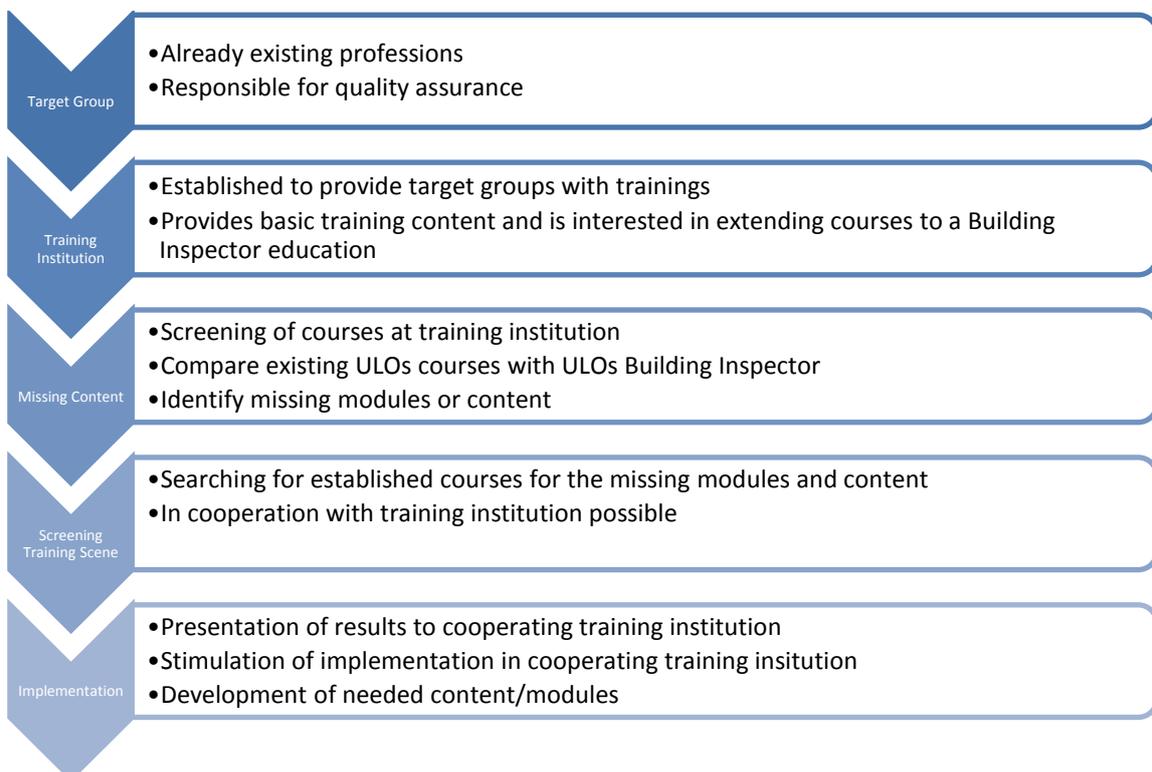


Figure 3: Roadmap for the implementation of missing content of the Building Inspection education

A primary task shall be an analysis of the target groups of already existing and established professions that are involved in the quality assurance process of buildings in all project phases. This consists of the job descriptions that offer consultation actions regarding energy savings, assessment of energy and sustainability, like:

- Energy consultants/auditors/advisors (AT, HU, SK, NL)
- Assessors of the achieved EE (SK)

Another group are the responsible persons on construction site to secure safety, quality, conformity to laws and regulations and the correctness of plans and designs. These persons can be employed both by the client or the contractor.

- Construction site supervisors (AT, SK)
- Construction foremen (AT)
- Responsible technical supervisors (for builder) (HU)
- Building inspectors (for client) (HU)
- (Building) commissioner, upskilled in building (NL)
- Private quality controllers, upskilled in installations (NL)

These target groups all have in common the objective of energy savings and quality control. However, not all of them are involved in all project phases and no profession is doing exactly the same as the developed NEWCOM building inspection is meant to perform. But these professions are a base to implement quality-improving content from the Building Inspection education to the national markets.

The analysis showed that there is at least an established training institution in every partner country for the mentioned target groups. The goal of the implementation strategy for the new modules is to get in intensive contact with these national training institutions. It is expected that they already provide a significant portion of the teaching content for the Building

Inspection course and are interested in expanding their educational offers. It was seen that this is the only sustainable way to ensure and support an implementation of a new education like the one of the Building Inspection.

Advantages when cooperating with established training institutions are:

- Stock of customers (trainees)
- Course materials available
- Infrastructure available
- Stock of experienced trainers (also relevant for the realization of a “Train-the-Trainer Course”)
- Established brand - reliable
- Already educated trainees with the potential to be “upgraded” to the Building Inspector education

In every partner country at least one training institution or a similar construct was found for cooperation talks and actions to implement the Building Inspection in the national systems. One very important cooperation action is the realization of a “Train-the-Trainer Course” per partner country, which is a core product of the NEWCOM project. These selected training institutions already provide courses or educate trainees that cover most of the ULOs of the Building Inspector education.

A next step should be to screen their existing courses according to the ULOs of the Building Inspection education and identify possible missing content. The previous knowledge required to enter the course should also be considered. This gives a picture of what modules and contents are missing in the current courses at the relevant training institutions. This step also gives a good overview of what materials and contents are available in the training institutions as a base for the development of new content.

In addition, there shall be a screening of the national training scenes for courses from other training providers covering the missing ULOs. This can also happen in cooperation with the training institutions. With this action an overview can be obtained about at which other providers this specific content is taught and if the content is embedded into large course programs or stand-alone solitary courses. If the relevant content is taught in solitary stand-alone courses, it can be more effective to get in contact and cooperation with these training institutes instead of putting effort in developing and establishing everything new.

The analysis of the partner countries within this project revealed that there is a major overlap of content not provided in an adequate way in the partner countries. It was identified that there is a lack of courses in the fields of:

- Air and vapor tightness of buildings
- Water tightness of buildings
- Quality assurance methods (measurement techniques and interpretation)
- Thermal activating of building components
- Heating technology (infrared technology)
- General tasks for building inspections
- Monitoring process
- BIM
- Building operation

A presentation and explanation of the elaborated results and the developed content shall then be done at the training institution to stimulate the implementation of appropriate new modules. Within this step the benefits thanks to the offering of additional training content is shown to the training institutions. These modules are the missing link to a holistic Building

Inspection education. Needed modules or content can then be provided for - or created by the training institutions.

4.2 Strategic stakeholder collaboration

As the Building Inspection profession is not an established profession in the partner countries, there must be a strategy to create the need for it and to promote it on the market.

There are two types of stakeholder groups that are interesting for the implementation of the Building Inspection education: the group that is offering the courses to the trainees and the group that will be the customers of these professionalized specialists. Both sides must be involved and stimulated to get a successful implementation process.

To implement the relevant content, training institutions and existing networks of professions must be targeted. To create market demand, the future customers must be addressed. The USP of the Building Inspection is the increased and secured building quality during the whole lifetime of a building.

Within the NEWCOM project the following strategic stakeholders have been identified:

- **Training institutions**

Training providers are a key stakeholder group. If they are willing to implement new training content in their existing programs, they can set the fundament for success. They also act as multipliers for spreading the educational program. This group includes private institutions and universities.

- **Existing networks of trainees**

Existing networks of professions (e.g. an energy consultant network) with already educated experts can provide future trainees for the BI education. Networks of business associations, chambers, economic clusters are important multipliers and are mostly innovative, well connected, established and can exert influence. If they are interested and desire specific

training content, the training institutions will adapt their training programs. Often these networks are strongly connected with the training institutions and often also overlap.

- **Stakeholders which benefit from increased building quality**

This is a group of stakeholders that has direct benefits from a better building quality in terms of monetary, energy-related or marketing benefits. By addressing them, market demand for people trained with NEWCOM modules is created. This stakeholder group often acts as customer group and generates demand among its contractors (stakeholders with indirect benefit from building quality)

- Building owner
- Developer (incl. housing developer/cooperation)
- Investors

- **Stakeholders which indirectly benefit from building quality**

This is the stakeholder group that indirectly profits from the benefits of increased building quality. Often, they are the contractors and subcontractors from the group with direct benefits, which need external help to control the building quality.

- Site manager
- General contractors
- Construction companies
- Architects

- **Stakeholders which benefit strategically from building quality**

This group describes the stakeholders that want to perform strategies and actions to increase energy efficiency and building quality due to economic reasons and for public welfare.

- Governmental institutions

- Municipalities
- NGOs

If they are aware of the potential of NEWCOM modules and content to increase building quality, they can provide legislative frameworks to make competences of the Building Inspection education mandatory in certain professions. For example, they can impact the market by linking governmental funding with compulsory consultation actions that are performed by people specialized in NEWCOM content, as is already done in parts of Austria.

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ABOUT NEWCOM

NEWCOM sets up large-scale professional qualification and certification schemes for blue-collar workers and building professionals. The special focus is on the mutual recognition between different European Member States. These schemes will enable the building workforce to be qualified for the construction, renovation and inspection of the nearly zero-energy buildings 2020.

www.newcomtraining.com

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New qualification schemes
to build high quality

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