



BUILD UP Skills – Greece

D4.2 Report on the priorities for training of the building workforce



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Further information

More details on BUILD UP Skills can be found at www.buildupskills.eu

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1 Strategic Approach

The development process of the National Qualification Roadmap, as followed by the BUS-GR consortium, was designed to ensure the broad consensus among stakeholders, while at the same time, the whole process aimed at preserving its strong consultative character with interested workers and craftsmen. The responsibility for the scientific development of the Roadmap lies with the consortium of BUS-GR, while the strategic directions are provided by the Strategic Planning Committee (SPC) assigned for this role.



Figure 1: Development process of the National Qualification Roadmap

An analytical allocation of tasks was applied in order to better coordinate the inputs required by the members of the NQP and the partners of BUS-GR. The SPC monitored and controlled the timetables of the activities, as well as relevant objectively verifiable indicators to monitor the normal progress of the project. In addition, to ensure the closer and more effective involvement of the NQP members, different sets of questionnaires were developed and distributed to the platform’s members, investigating and recording their views and priorities. The results of this research were discussed extensively in a following meeting of the NQP in order to clarify any possible concerns, and conclude on the main priorities of the Roadmap.

The procedure for the determination of an Action Plan to support the National Roadmap’s implementation, as it was conducted, is graphically presented in Figure 2. Initially, 3 major axes were formulated, over which emphasis should have been given, to accomplish the objectives of the National Roadmap. These axes, then, were specialized and – under each one of them - a number of measures to overcome specific barriers, reported also by the members of the NQP, are proposed. Finally, the priority measures identified are decomposed and analysed to specific actions providing a detailed action plan towards 2020, completing thus the National Qualification Roadmap.

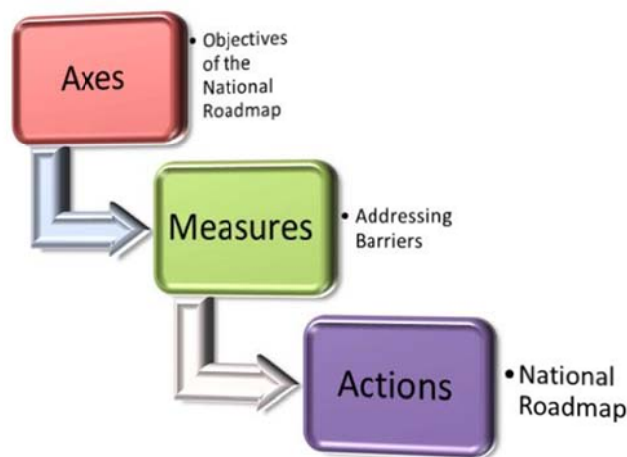


Figure 2: The three stages determining the Action Plan under the National Roadmap

Based on the above approach, a draft version of the National Qualification Roadmap was developed. In this draft outline, a summary report on the most important findings of the work done in the original work packages, such as the status quo analysis, the needs and barriers analysis up to 2020 and the priorities for the continuous vocational training (professional development) and up skilling of craftsmen, was included. It also included the results derived from the NQP's consultation meetings, the field research conducted through questionnaires and the suggestions received through the electronic consultation platform (Figure 3).

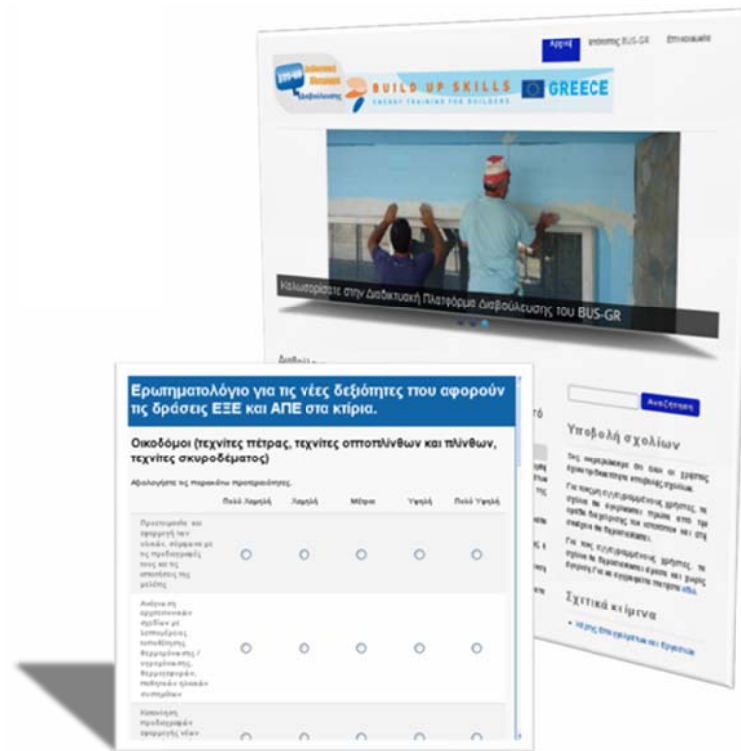


Figure 3: Website of BUS-GR initiative and the embedded online consultation platform

The steps that formed the basis for the determination of priorities in the National Roadmap regarding (i) the proposed strategic measures and (ii) the new essential qualifications and skills to be acquired by Greek craftsmen are presented in the following paragraphs:

➤ **Step 1: Selection of the building sector professions to be prioritized for inclusion in the National Roadmap**

A first critical step towards the determination of the priorities to frame the National Roadmap is the evaluation of the related construction professionals on the basis of their need for further qualifications. The question “*Which technical professions of the construction sector should be prioritized for inclusion in the Roadmap?*” was posed - with the aid of a properly designed questionnaire – even from the kick-off meeting of the NQP established in the frame of BUS-GR. The NQP members’ responses concerning the occupations that should be trained in priority on the RES and EE technologies / techniques are illustrated in the following tag cloud.



Figure 4: Occupations of high priority for training over RES and ES/EE in the constructions sector, according to the stakeholders

Source: BUILD UP Skills-Greece - Status Quo

➤ **Step 2: Determination of the proposed measures and prioritization**

Following consultations amongst the NQP members and further discussions made between the members of the Strategic Planning Committee, a process and evaluation methodology concluding to a global evaluation system of the proposed measures were mutually decided. The proposed measures are assessed over a set of evaluation criteria to determine the priorities of the Roadmap up to 2020. The evaluation system is analysed in three dimensions that are further divided to form the distinctive evaluation criteria.

The contribution of each measure in each dimension was evaluated in a qualitative scale and in a second phase the measures were categorized into High Priority, Medium Priority and Low Priority, depending on the overall score they obtained. The final classification of the measures was discussed and endorsed during discussions with stakeholders and the SPC meetings.

The procedure is described in more detail in Paragraph 1.2 and in Section 2 of the Deliverable. It must be also mentioned that, the Action Plan of the National Qualification Roadmap that was developed at the end of the procedure is constituted of the high priority measures and actions, as these were confirmed through the above process.

➤ **Step 3: Evaluation and prioritization of “new” skills**

This step is the logical continuation to the mapping of the necessary qualifications and skills of the building workforce, in order to be able to implement appropriately the RES systems and the EE technologies/techniques, that was performed in Task 4.1 of BUS-GR by CRES. An Occupational & Functional Map (OFM), as the one made for the Renewable Energy Sector in the UK by EU Skills in 2007, was developed for the ‘blue collar’ workers of the buildings sector in the frame of the Deliverable 4.1. This OFM is actually a matrix with 5 columns, from which the 1st one indicates the level of qualification, the 2nd the relevant occupations, the 3rd one includes the principal role/function, while the 4th column indicates the dominant generic skills (to varying levels) and the 5th one the indicative qualifications expected by employers.

At this point, all the new skills that were identified and recorded in D4.1 are evaluated by stakeholders, along with all the extensions, corrections and additions that occurred during the consultation processes.

1.1 Axes for attaining the objectives of the initiative

In the context of the 2nd and 3rd consultation meetings that were organized in the premises of GSEVEE on the 11th of July 2013, a fruitful dialogue was conducted among the National Qualification Platform (NQP) members, which was initiated in the frame of the BUS-GR Project in order to focus on the critical parameters related to the planning and development of the National Roadmap. Following the discussions and the findings of the Status Quo Analysis (Status Quo – Gap Analysis), three specific major axes were identified, on which light should have been shed to find solid solutions towards the attainment of the objectives of the National Roadmap.

These three axes are the following:

1. Ensure the required number of workers/technicians in the construction sector.
2. Enhance the skills of workers/technicians in the construction sector.
3. Overcome the institutional barriers and ensure the sustainability of the initiative.

The set of measures associated with these three major axes are described in the following paragraphs of this Section, while in Section 3.3 the whole evaluation procedure made for these measures is described, along with the resulted classification and the relevant priorities as derived.

Furthermore, in the framework of the same (2nd & 3rd) and the 4th (and last) NQP consultation meetings, a number of suggestions for measures of strategic (political) character were proposed for inclusion in the Roadmap. These suggestions for measures are not directly related to the goals of the initiative BUS-GR but are explicitly linked to the satisfaction of the national targets "20-20-20". However, since these suggestions are not related with this Deliverable, they are omitted from it. They are briefly described in Section 3.4 of the National Roadmap.

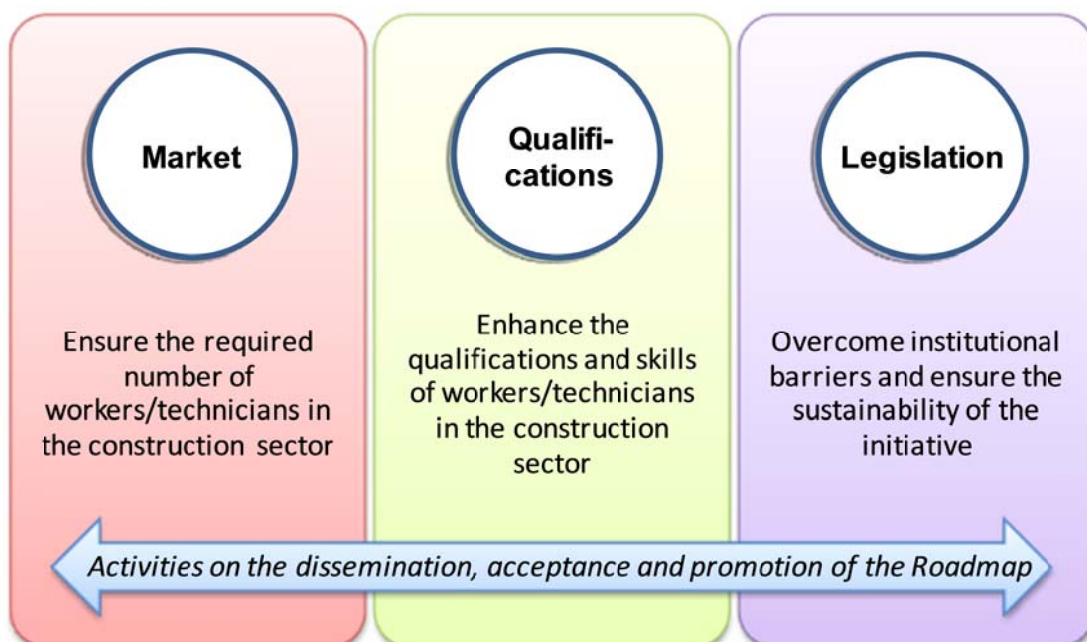


Figure 5: The three axes framing the attainment of the objectives of BUS-GR

The proposed sets of measures are supported by a series of horizontal actions, concerning the information and awareness rising of:

- Workers and craftsmen in the constructions sector on the necessity for continuous updating and enhancing of their skills and the benefits arising from the recognition of their qualifications
- Citizens in order to inform them of the benefits of preferring certified technicians.

1.2 Determination of the Roadmap's strategic measures

In the above context, the measures identified as necessary **to ensure the required number of workers in the construction sector** are the following:

- | | |
|-----|--|
| M.1 | <i>Reintegration of the untapped - inactive labour force (unemployed, unskilled young people, older craftsmen, etc.)</i> |
| M.2 | <i>Enhancement of the attractiveness and image of the professions in the construction sector</i> |
| M.3 | <i>Motivation of young people to access the construction sector</i> |
| M.4 | <i>Fighting the black (uninsured) employment</i> |
| M.5 | <i>Provision of incentives to encourage skilled workers stay in the sector</i> |

Regarding the measures to be taken to **upgrade the skills of the workforce in the construction sector**, the most critical ones are the following:

- | | |
|------|--|
| M.6 | <i>Updating of the relevant occupational profiles and introduction of new ones (e.g. as for assemblers/installers of aluminum)</i> |
| M.7 | <i>Strengthening of the basic initial vocational education and training (IVET) of the labour force in the construction sector</i> |
| M.8 | <i>Configuration of appropriate continuous vocational education and training (CVET) programs, available to the labour force in the construction sector</i> |
| M.9 | <i>Introduction of quality assurance mechanisms with regard to the training processes and qualifications certification</i> |
| M.10 | <i>Development of a mechanism-framework to ensure the required number of trainers (pool of trainers)</i> |

The measures considered as essential for **overcoming the institutional barriers and ensuring the sustainability of the initiative** are:

- | | |
|------|---|
| M.11 | <i>Upgrading of the institutional framework over the cycle: Training – Certification – Regulation of the professions & of the professional qualifications</i> |
| M.12 | <i>Development of a monitoring mechanism to control and retroact over the implementation processes of the Roadmap.</i> |
| M.13 | <i>Development and application of the appropriate tools for the implementation of the Roadmap's action plans</i> |

All the suggested measures are supported by the following **horizontal measure**

- | | |
|------|--|
| M.14 | <i>Dissemination, acceptance and promotion of the Roadmap's scope, activities and outcomes</i> |
|------|--|

The aforementioned series of measures focus on addressing the main barriers to the enhancement of the professional skills of the constructions sector labour force and the attainment of the 20-20-20 national objectives as these were identified and registered by the NQP members and the bodies involved, as follows:

E.1	Financial (cost of training / certification, lack of funding, absence of economic incentives)
E.2	Insufficient institutional framework
E.3	Lack of appropriate vocational training programs
E.4	Lack of suitable infrastructures (appropriate training materials, inadequate facilities and equipment)
E.5	Inadequate force of trained trainers (absence of educational programs for training the trainers, inadequate number of trainers)
E.6	Low interest for up skilling (low status of relevant professions, insufficient added value for certified craftsmen)

The following Table presents the correlation and the impact of the proposed measures to the aforementioned barriers. As it is obvious, the majority of the proposed Measures address more than one of the identified barriers.

Table 1: Correlation between the barriers and the proposed measures of the Roadmap

	M.1	M.2	M.3	M.4	M.5	M.6	M.7	M.8	M.9	M.10	M.11	M.12	M.13	M.14
E.1	✓	✓	✓	✓	✓			✓	✓		✓		✓	
E.2	✓			✓		✓	✓	✓	✓	✓	✓		✓	✓
E.3	✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
E.4					✓		✓	✓	✓		✓	✓	✓	
E.5		✓			✓	✓		✓	✓	✓	✓	✓		✓
E.6	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓		✓

2 Evaluation-prioritization of the Roadmap's measures

This section highlights the need to assess all of the above measures, formed in the above paragraphs. Specifically, the development of an integrated evaluation system of the aforementioned measures, in order to form the priorities of the Roadmap towards 2020, is proposed. Initially, the problem, (i.e. evaluation and prioritization of the measures) is defined and described to support its further analysis. Then, it is decomposed into a limited number of dimensions, from which the individual evaluation criteria emerge.

The whole fabrication process of a consistent family of criteria is executed according to the classical modelling methodology of Roy 1985¹. This process has been recognized as essential and irreplaceable towards a substantiated and appropriate decision support in accordance with the Multicriteria Methodologies of Decision Making (MCDA-M, acronym of the Multicriteria Decision Aid and Making). This scientific field is continuously evolving and

¹ Roy, B. (1985), "Méthodologie multicritère d'aide à la décision", Economica, Paris.

developing over the last 40 years and has achieved its wide implementation and application in both managerial and political context decision-making problems (Figueira et. al. 2005²).

At an **initial stage**, following a consultation phase with members of the NQP and the relevant analyses by the SPC members, the process and the evaluation methodology of the Roadmap's measures was decided, with the use of a commonly accepted evaluation system. This system consists of three general dimensions that lead to the fabrication of the evaluation criteria, as shown in Figure 6.

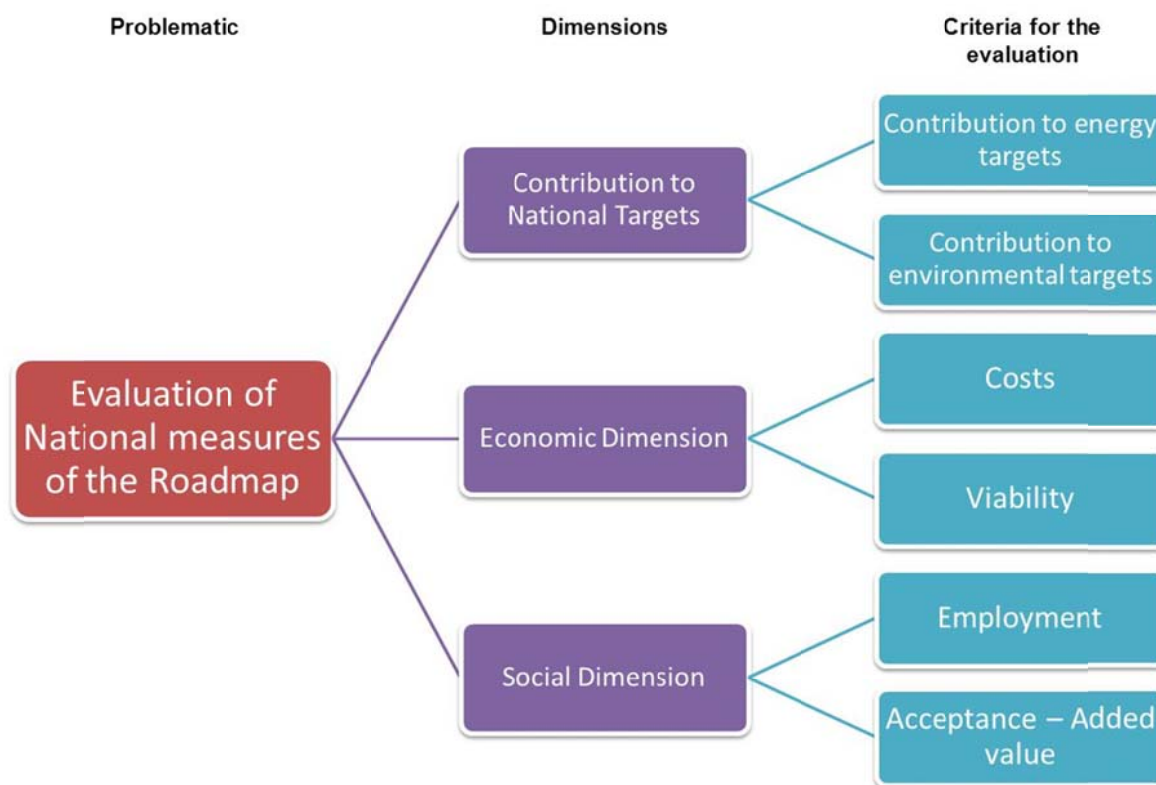


Figure 6: Dimensions and evaluation criteria of the Roadmap's measures

The dimensions selected for the integrated evaluation of the proposed series of measures are the following:

- I. The measure's contribution to the national objectives of Greece
- II. The economic dimension, referring to both the cost of the measures and the economic benefits arising from their implementation, and
- III. The fulfilment of the national social needs

Each dimension is then divided into the individual evaluation criteria that constitute it. These criteria, in order to be in accordance with the multicriteria theory, are required to be preferentially independent to the decision makers and to respect the monotonicity property (strictly increasing - decreasing).

The **second stage** consists of the assignment of scores of each individual measure on the set criteria. Then, these scores-ratings are aggregated evenly to extract each suggested measure's score on the dimensions level.

² Figueira, J., Greco, S., Ehrgott, M., Eds. (2005), "State-of-Art of Multiple Criteria Decision Analysis", Kluwer Academic Publishers, Dordrecht

The contribution of each measure over any defined criterion and dimension is expressed qualitatively, in a three stage distinct and ordered scale, with the aid of linguistic variables, as follows:

Table 2: Rating scale of the measures to export priorities

Rating	Contribution
+	Low
++	Medium
+++	High

The discrete and ordered scale with linguistic variables technique is widely used worldwide in a variety of classification problems due to the immediacy and clarity of the final results it provides.^{3,4}

The **third and final stage** of the evaluation procedure consists of the aggregation of the individual ratings for each measure provided by the members of the SPC, as extracted in the 2nd stage, to an overall one for each measure. Depending on their total scores over the three dimensions, the measures were finally classified into **3 categories**:

- (1) Measures of high priority,
- (2) Measures of medium priority, and,
- (3) Measures of low priority.

In Table 3 the results from the evaluation of the measures, which were obtained from their rating by the SPC members, for each dimension separately, are presented. Also, in the last column of the Table the overall measures' priorities – as were derived from the abovementioned procedure – are shown.

Table 3: Overall evaluation of the Roadmap's measures and prioritization

Measure Code	Roadmap's strategic actions	Evaluation Dimensions			Overall Measure's Priority
		National Targets	Financial Dimension	Social Dimension	
M.1	Reintegration of the untapped - inactive labour force	++	++	+++	High
M.2	Enhancement of the attractiveness and image of the professions in the construction sector	++	+	++	Low
M.3	Motivation of young people to access the construction sector	++	+	+++	Medium
M.4	Fighting the black (uninsured) employment	+	++	++	Low

³ Doukas H., "Modelling of linguistic variables in multicriteria energy policy support", *European Journal of Operational Research*, 2013, 227 (2), pp. 227-238.

⁴ Herrera, F., & Herrera-Viedma, E. (2000), "Linguistic decision analysis: steps for solving decision problems under linguistic information", *Fuzzy Sets and Systems*, 115, pp. 67-82.

M.5	Provision of incentives to encourage skilled workers stay in the sector	+	++	++	Low
M.6	Updating of the relevant occupational profiles and introduction of new ones	++	++	+++	High
M.7	Strengthening of the initial vocational education and training (IVET) of the labour force in the construction sector	++	++	++	Medium
M.8	Configuration of appropriate continuous vocational education and training (CVET) programs, available to the labour force in the construction sector	+++	++	+++	High
M.9	Introduction of quality assurance mechanisms with regard to the training processes and qualifications certification	+++	++	++	High
M.10	Development of a mechanism-framework to ensure the required number of trainers	++	+++	++	High
M.11	Upgrading of the institutional framework over the cycle: Training – Certification – Regulation of the professions & of the professional qualifications	+++	++	+++	High
M.12	Development of a monitoring mechanism to control and retroact over the implementation processes of the Roadmap.	+++	++	++	High
M.13	Development and application of the appropriate tools for the implementation of the Roadmap's action plans	++	+++	++	High
M.14	Dissemination, acceptance and promotion of the Roadmap's scope, activities and outcomes	++	++	+++	High

Therefore, the measures that should be prioritized and are the ones on which the Action Plan of the Roadmap focuses are the following:

Table 4: Summary of the high priority measures

<ul style="list-style-type: none"> ✓ <i>M.1:</i> Reintegration of the untapped - inactive labour force. ✓ <i>M.8:</i> Configuration of appropriate continuous vocational education and training (CVET) programs, available to the labour force in the construction sector. ✓ <i>M.10:</i> Development of a mechanism-framework to ensure the required number of trainers. ✓ <i>M.12:</i> Development of a monitoring mechanism to control and retroact over the implementation processes of the Roadmap. 	<ul style="list-style-type: none"> ✓ <i>M.6:</i> Updating of the relevant occupational profiles and introduction of new ones. ✓ <i>M.9:</i> Introduction of quality assurance mechanisms with regard to the training processes and qualifications certification. ✓ <i>M.11:</i> Upgrading of the institutional framework over the cycle: Training – Certification – Regulation of the professions & of the professional qualifications. ✓ <i>M.13:</i> Development and application of the appropriate tools for the implementation of the Roadmap’s action plans.
<ul style="list-style-type: none"> ✓ <i>M.14:</i> Dissemination, acceptance and promotion of the Roadmap’s scope, activities and outcomes. 	

3 Prioritization in qualifications and skills development

It has become apparent from the findings of the Status Quo analysis that there is a great need for training of the workforce in the constructions sector in Greece. The meetings of the NQP and the interviews / meetings with the social actors and professional associations and federations highlighted that the ability of workers to cope effectively with EE / ES applications and RES installation in buildings should be strengthened and enhanced through procedures of continuous training and certification of their vocational qualifications, as well as through effective monitoring mechanisms.

The following two paragraphs expand on the listing, evaluation and prioritization of new skills to be acquired by the labor force of the Greek constructions sector, as well as the need for the certification of these qualifications (3.1 and 3.2 respectively).

3.1 Listing, assessment and prioritization of the necessary skills to be acquired by craftsmen in the construction sector

A first analysis of the skills considered as essential to build high energy efficient as well as nearly zero energy buildings (NZEB) in Greece was presented within the corresponding deliverable of the project “Occupational & Functional Map for the building workforce regarding the RES and EE”. It was then communicated to the members of the NQP and uploaded on the electronic consultation platform for further analysis and feedback by other interested stakeholders. In a second phase, these new skills proposed were thoroughly

discussed with the NQP's members, and the respective associations and federations of craftsmen. The final mapping of these "new" skills, as occurred after the incorporation of comments and suggestions during the 2nd, 3rd & 4th consultation meetings of the NQP, is presented in Tables 6 and 7.

The next stage was the evaluation and prioritization of skills to be acquired by the workforce of the construction sector. This was implemented with the aid of a properly structured and designed questionnaire (in the form of the two aforementioned Tables) that was submitted to vocational federations and associations for completion. The same questionnaire was also uploaded on the e-consultation platform for completion by other interested individuals and stakeholders. Each of the interested parties had the possibility to evaluate the suggested skills, using a five grade rating.

Table 5 presents the correlation between the evaluation scale of the new skills within the questionnaire [1-5] and the priority of the relevant skills.

Table 5: Evaluation scale for the prioritization of the new skills

Skill rating	Priority
1	Very Low
2	Low
3	Medium
4	High
5	Very High

Then, all the ratings on each individual skill are aggregated and their final evaluation / priority level emerge (from very high to very low priority). The final new skills ratings (for prioritization purposes), as calculated from the completed questionnaires and the online questionnaires made available in the BUS-GR e-consultation platform, are presented in Tables 6 and 7.

For clarification and facilitation purposes the skills are divided into two evaluation categories:

- (a) Skills related to Energy Saving (ES) and Energy Efficiency (EE) interventions in buildings, that are outlined in Table 6, and
- (b) Skills related to the installation of RES systems in buildings, which are outlined in Table 7.

These two major Tables have also been discriminated and divided according to the specific application of each skill in the building stock (i.e. Efficient heating & cooling) and the respective targeted occupations (i.e. plumbers and heating systems installers/ maintainers). The construction sector professions as presented in the questionnaire and in the following Tables are categorized according to the ISCO-08 classification.

It should also be noticed that within the same questionnaire that was distributed and used for the purposes of the relevant consultation, there existed two more questions (columns) per individual profession / craft and per new required skill in relation to the ES/EE and RES applications in buildings. In these questions the stakeholders were asked to determine whether each specific skill is covered and taught in the Secondary vocational education and/or IVET (Yes / No), as well as whether these skills constitute part of the existing CVET programs (Yes / No).

Based on the responses received to the above two questions, as well as according to the research in the frame of the Status Quo Analysis on the Initial Vocational Education and Training (IVET) in Greece, it was discovered that almost none of the required "new" skills, related to the BUS-GR professions in the issues of RES and EE, are taught to the Secondary

level vocational education system and/or the current IVET system in Greece. Similarly, very few of these skills are covered in the already existing (and limited nonetheless) CVET programs, and actually sporadically.

Most of the skills, being part of a CVET program, were identified in programs targeting the professionals that want to become PV systems installers. However, they do not belong (yet) to an "institutionalized" qualifications certification procedure. As a result, a great need, for reformation of the curricula regarding IVET and materialization of new qualification programs in the case of CVET, arises.

Table 6: Listing and prioritization of the new skills on ES/EE applications in buildings per occupation involved

ES/EE applications in buildings	Involved occupations	Key (new) skills required related to ES/EE	Priority Rating
A1. Insulation / weatherization / air tightness	A1.1. Masons using bricks and stones, or other materials (drywall construction), concrete workers, plasterers and other relevant professions	A1.1.1. Understanding of ELOT recommendations regarding the thermal insulation of external walls	5
		A1.1.2. Preparation and application of materials, according to the specifications and requirements of the study	5
		A1.1.3. Reading of architectural designs with details of installation of thermal insulation / waterproofing, and thermal bridges avoidance	4
		A1.1.4. Application of passive solar shading systems and / or passive cooling / ventilation	3
		A1.1.5. Execution of works in accordance to the safety regulations of materials suppliers	4
		A1.1.6. Proper implementation of the requirements of planning legislation and regulations pertaining to the installation of thermal insulation and compatibility with the control requirements	4
	A1.2. Roofers	A1.2.1. Understanding of ELOT recommendations regarding the thermal insulation of rooftops and roofs	5
		A1.2.2. Understanding of ELOT recommendations regarding the waterproofing of rooftops and roofs	5
		A1.2.3. Preparation and application of materials, according to the specifications and requirements of the study	5
		A1.2.4. Reading of architectural designs with details of installation of thermal insulation / waterproofing and thermal bridges avoidance	4
		A1.2.5. Manufacture of structures for integration / support of solar panels (thermal, photovoltaic) on roofs	3
		A1.2.6. Application of systems for direct solar gain on roofs combined with shading systems	3
		A1.2.7. Execution of works in accordance to the safety regulations of materials suppliers	3
		A1.2.8. Proper implementation of the requirements of planning legislation and regulations pertaining to the installation of thermal insulation and compatibility with the control requirements	4
	A1.3. Insulation technicians, buildings and other construction works erection and maintenance artisans, other technicians of buildings and other construction works	A1.3.1. Understanding of ELOT recommendations regarding the thermal insulation of external walls	5
		A1.3.2. Understanding of ELOT recommendations regarding the thermal insulation of rooftops and roofs	5
		A1.3.2. Understanding of ELOT recommendations regarding the waterproofing of rooftops and roofs	5
		A1.3.4. Preparation and application of materials, according to the specifications and requirements of the study	5
A1.3.5. Reading of architectural designs with details of installation of thermal insulation / waterproofing, and thermal bridges avoidance		4	

ES/EE applications in buildings	Involved occupations	Key (new) skills required related to ES/EE	Priority Rating
	completion, etc.	A1.3.6. Execution of works in accordance to the safety regulations of materials suppliers	4
		A1.3.7. Proper implementation of the requirements of planning legislation and regulations pertaining to the installation of thermal insulation and compatibility with the control requirements	4
	A1.4. Painters, dyers, polishers and related trades workers	A1.4.1. Understanding of ELOT recommendations regarding the thermal insulation of external walls	5
		A1.4.2. Understanding of ELOT recommendations regarding the painting of concrete surfaces and coatings and usage of the appropriate paints and coatings, depending on their properties	4
		A1.4.3. Preparation and application of materials, according to the specifications and requirements of the study	5
		A1.4.4. Reading of architectural designs with details of installation of thermal insulation / waterproofing, and thermal bridges avoidance	4
		A1.4.5. Execution of works in accordance to the safety regulations of materials suppliers	4
		A1.4.6. Proper implementation of the requirements of planning legislation and regulations pertaining to the coating works and the compatibility with the control requirements	4
	A1.5. Technicians for the preparation and erection of of metal structures	A1.5.1. Understanding of ELOT recommendations regarding the thermal insulation of external walls	5
		A1.5.2. Understanding of ELOT recommendations regarding the thermal insulation of roofstops and roofs	5
		A1.5.3. Understanding of ELOT recommendations regarding the thermal insulation of metal roofs	5
		A1.5.4. Preparation and application of materials, according to the specifications and requirements of the study	5
		A1.5.5. Reading of architectural designs with details of installation of thermal insulation / waterproofing, and thermal bridges avoidance	4
		A1.5.6. Implementation of passive solar systems for shading and/or cooling/ventilation	3
		A1.5.7. Manufacturing of structures for the integration/mounting of solar panels (thermal, PV) on roofs	3
		A1.5.8. Implementation of systems for direct solar gain in combination with shadowing systems	3
		A1.5.9. Execution of works in accordance to the safety regulations of materials suppliers	4
		A1.5.10. Proper implementation of the requirements of planning legislation and regulations pertaining to the installation of thermal insulation and compatibility with the control requirements	4
	A1.6. Woodworkers, carpenters, joiners	A1.6.1. Recognition of marking for the construction products and their consequent techniques of application	4
		A1.6.2. Proper installation and sealing of wooden frames	4
A1.6.3. Proper installation and sealing of wooden floors		4	

ES/EE applications in buildings	Involved occupations	Key (new) skills required related to ES/EE	Priority Rating
		A1.6.4. Proper implementation of the requirements of planning legislation and regulations pertaining to woodwork in construction sector	4
	A1.7. Technicians of processing, trading and installation of glazing panes	A1.7.1. Choosing the right energy glazing pane for each application	4
		A1.7.2. Proper installation of the energy glazing panes	5
		A1.7.3. Proper insulation of the energy glazing panes	5
		A1.7.4. Use of appropriate tools and equipment for the manufacture of glazing panes according to specifications	4
		A1.7.5. Understanding of the properties of glazing panes and monitoring the evolution of their specifications	4
		A1.7.6. Implementation of safety measures during transportation and installation of energy glazing panes	5
		A1.7.7. Provision of information on the implementation of safety energy glazing panes in high-risk areas	4
		A1.7.8. Broad technical understanding for the completion of the works and the quality control of the glazing panes	4
	A1.8. Assemblers and installers of aluminium and glass fittings	A1.8.1. Using the appropriate raw materials and equipment	4
		A1.8.2. Construction and installation of the products by an energy efficient manner (decrease of thermal losses and increase of air tightness - water tightness)	5
		A1.8.3. Quality control of final products and their installation in accordance with technical specifications	5
		A1.8.4. Fluency of calculation of heat losses from the manufactured and/or installed products	4
		A1.8.5. Understanding and integration of legal and regulatory requirements (CE) in the product delivered	4
		A1.8.6. Advising clients on the selection of best products according to their needs (type of construction, profiles, glazing panes, etc.)	4
A2. Efficient heating & cooling	A2.1. Plumbers and heating systems installers/ maintainers	A2.1.1. Hydraulic adjustment and balancing of heating installations, taking the necessary measurements	4
		A2.1.2. Fluency in the dimensioning of the facilities - Assessment of the benefit that will occur if the customer chooses an energy-efficient system	3
		A2.1.3. Construction and installation of thermal insulation materials on pipes - choice of diameter and thickness of the thermal insulation of the pipes	4
		A2.1.4. Taking measurements, analysis and adjustment of combustion air to optimize energy efficiency	5
		A2.1.5. Cleansing chimney and taking draft conditions measurements - implementation of relevant environmental legislation and requirements	5
		A2.1.6. Application of techniques of automatic thermostatic control system at central and local level	4

ES/EE applications in buildings	Involved occupations	Key (new) skills required related to ES/EE	Priority Rating
		A2.1.7. Application of techniques of weather temperature compensation of water central heating	4
		A2.1.8. Application of techniques for automatically controlling of temperature and recirculating the domestic hot water	4
	A2.2. HVAC (heating, ventilation and air conditioning) installers	A2.2.1. Specialising in air handling units (data selection, control technology, three-way valves to regulate air temperature, filters, recirculation provisions, elements with heat recovery exchangers)	4
		A2.2.2. Application of construction techniques and vents installation (angular, curves, intersections) and thermal insulation of vents (thermal insulation materials)	5
		A2.2.3. Application of construction techniques and installation of flow and return pipes, hot / cold water circulators, valves and other hydraulic equipment	5
		A2.2.4. Application of measurement techniques and receiving facilities HVAC	5
		A2.2.5. Fluency to alternative technologies of heating / cooling / air conditioning (air systems, fan elements systems, mixed systems, induction systems)	4
	A2.3. Installers combined heat and power (CHP) systems	A2.3.1. Installation of piping and plumbing equipment for the distribution of produced heating water, circulator pumps, heat exchangers cogeneration plant diode valves and automations to regulate the supply of heating water, temperature-controlled of supplied water	2
		A2.3.2. Proper use and installation of electrical equipment and related automations (electric panel, provisions of synchronization of the product stream CHP with the mains power, protection provisions of the CHP unit and automatic outage)	3
		A2.3.3. Application of techniques for sound insulation of cogeneration machinery spaces (soundproof shell, soundproofed machinery space, soundproofed air supply ducts in the machinery space)	4
		A2.3.4. Application of technologies of absorption chillers (methods and technologies for monitoring temperature and flow of the water according to the demand of cooling loads, data linking techniques and sequencing operation of absorption chillers)	4
	A3. Savings in electrical power (in addition to heating and cooling applications)	A3.1. Electricians	A3.1.1. Identification, prioritization and selection of the electrical charges which may spooler during peak periods (lighting, refrigerators, etc.)
A3.1.2. Installation and electrical connection of peak supervisors (electrical panel supervisor, technologies to appeal the actions of supervisor) - interconnection of electrical loads			3
A3.1.3. Advising clients on choosing energy efficient appliances and technologies for lighting and other electrical uses			4

Table 7: Listing and prioritization of the new skills on RES installations in buildings per occupation involved

RES applications in buildings	Involved occupations	Key (new) skills required related to RES in buildings	Priority Rating
B1. Heating/ Cooling	B1.1. Installers / maintainers of solar thermal systems	<i>B1.1.1.</i> Fluency with all types and technologies of solar thermal space heating systems and domestic hot water, conventional solar water heaters, central solar systems, solar thermal technology type COMBI	5
		<i>B1.1.2.</i> Understanding of the basic specifications of the solar panels, heat sinks and hydraulic equipment	3
		<i>B1.1.3.</i> Proper implementation of configuration techniques and hydraulic interconnection of solar panels (choosing the appropriate piping type, fluid solar flow control per solar collector array, solar thermal field insulation pipe)	3
		<i>B1.1.4.</i> Implementation of interconnection techniques of heat sinks hot water storage (simply containers, thermal stratification containers) with central heating and domestic hot water production installations	4
		<i>B1.1.5.</i> Understanding and selecting the correct position and inclination of the support structure of solar panels for greater energy efficiency	3
		<i>B1.1.6.</i> Advising the client on the correct equipment supply and the efficient and safe use of it	4
	B1.2. Installers / maintainers of wood pellet and other solid biomass heating systems	<i>B1.2.1.</i> Selection and proper dimensioning of the chimney according to the type of the boiler and burner biomass, chimney placement-path according to the requirements of building regulation	3
		<i>B1.2.2.</i> Taking measurements and analysis of biomass burning and lumps, flue gas and gaseous pollutants, adjust burner and combustion air, emission control in accordance with environmental legislation	5
		<i>B1.2.3.</i> Taking measurements for determination of moisture content, calorific value, the apparent density and energy potential of biofuels	4
		<i>B1.2.4.</i> Implementation of handling and storage biomass techniques and determination of available biomass fuel sources locally (fuel type, suppliers, prices)	4
	B1.3. Heat pump installers / maintainers	<i>B1.3.1.</i> Understanding the operating principles of a heat pump and its characteristics sizes, of the available heat pump technologies and the heat exchanger types	5
		<i>B1.3.2.</i> Understanding and proper dimensioning and installation of the heat pump and the containers of storage and inertia from the side of the heat exchanger and from the side of the load	3
<i>B1.3.3.</i> Implementation of appropriate construction techniques for the heat exchanger piping network of each type		5	
<i>B1.3.4.</i> Testing and inspections, operation startup, cleaning and maintenance of heat exchangers, inspection and maintenance of compressors		5	

RES applications in buildings	Involved occupations	Key (new) skills required related to RES in buildings	Priority Rating
B2. Electricity	B2.1. Installers / maintainers of solar photovoltaic (PV) systems	<i>B2.1.1.</i> Application of installation techniques, mounting PV frames with the most efficient energy, in relation to the available space and in accordance with the existing standards	2
		<i>B2.1.2.</i> Conducting the electrical connections according to the specifications for the respective electrical voltage, and synchronization of PV systems with the network	3
		<i>B2.1.3.</i> Advising on the efficient operation and maintenance of optimal performance of the installation	5
		<i>B2.1.4.</i> Ensuring of the necessary health and safety conditions at work up on roofs and to protect against risks of electrocution	3
		<i>B2.1.5.</i> Understanding the function and ability to connect smart meters and micro-inverters in PV systems	4
		<i>B2.1.6.</i> Operation startup, conduction of electrical audits and inspections, operation monitoring and failure recovery of the installation	4
		<i>B2.1.7.</i> Fluency in designing and installing hybrid and autonomous systems	3
	B2.2. Installers / maintainers of small scale wind energy systems	<i>B2.2.1.</i> Implementation of mounting and supporting wind turbines techniques, according to the type of W/T, ground type and maximum aerodynamic loads	4
		<i>B2.2.2.</i> Taking measurements to estimate the wind speed and the energy efficiency of the wind turbine	3
		<i>B2.2.3.</i> Reading topographic maps and aerial photographs to select appropriate types of support	3
		<i>B2.2.4.</i> Understanding of planning legislation and regulations for the installation of small wind turbines on roofs	2
		<i>B2.2.5.</i> Implementation of wind turbine electrical connections techniques to the network (Panel of W/T and overcurrent protection, overvoltage and shutdown)	3
		<i>B2.2.6.</i> Understanding of the function and ability to connect smart meters in wind energy systems	5
		<i>B2.2.7.</i> Ensuring the necessary health and safety conditions at work up on the roofs	5

3.2 Priorities on training and certification of the qualifications

Based on all the above and taking into consideration the importance of the various energy saving related interventions, in view of the currently existing energy saving targets of Greece as well as the rest of the commitments that exist, as derived from the relevant EU Directives, an effort is taking place so that the priorities regarding the training programs that must be realized during the time period of the 7 remaining years until 2020, are defined. Therefore, according to the National Energy Efficiency Action Plans (NEEAPs) that have been submitted to the EU from Greece, almost 60% of the energy saved for heating will derive from the building shell improvement actions (thermal insulation, glazing, frames).

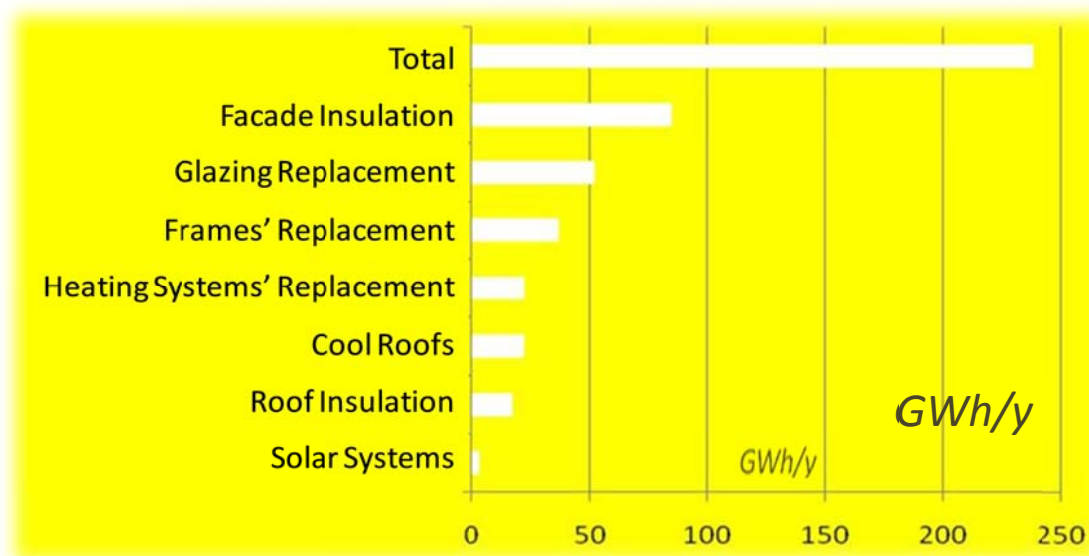


Figure 7: Graph quantifying the expected reconstruction works in buildings and the potential energy savings in units per year, due to the expected energy upgrading interventions in buildings in the frame of the “Building the Future” program⁵

The diagram of Figure 7 (used by a presentation of the “Building the Future” program – see also Section 7 of the *Status Quo Analysis*) is indicative of the expected penetration of the various ES technologies in the building stock of the country as regards the residential sector. Then, taking into consideration that the largest contribution to the energy saving targets of the country (in the case of energy performance renovation of buildings) will be due to facades and/or roofs thermal insulation, the glazing and frames replacement, as well as the thermal systems replacement, the workers of this sector who are dealing with such kind of tasks are the ones that should, by priority, be trained in the special relevant to ES issues - as these have been determined in Table 6 – and have also their qualifications certified.

Of course, undoubtedly the training and the certification of qualifications of the remaining specializations of the construction sector labour force that are involved in energy renovation/ updating of buildings (i.e. electricians) or in the construction of ‘nearly zero energy’ buildings (e.g. builders), are all of the same importance and priority. However, the above mentioned specializations should be strictly prioritized, in view of the declared energy saving targets of Greece towards 2016 and 2020.

⁵ “Building the Future, An Action for Sustainable Buildings and Green Development”, Centre for Renewable Energy Sources and Saving (CRES), 2011. (in Greek)

Regarding the small scale RES systems installers (i.e. in the residential and tertiary sector), and according to the requirements of RES Directive (2009/28/EC), in Greece – as well as in all EU Member States – certification schemes or equivalent characterization systems for the installers of small scale boilers and biomass heaters, solar PV and solar thermal systems, shallow geothermal systems and heat pumps, should have been created and be available until the 31st of December 2012.

The most recent relevant information regarding this issue⁶ is the initiation, by the Ministry of Environment, Energy and Climate Change, of a process to study, design and implement a national scheme for the certification of installers of small-scale RES systems. The scope of this act is the fulfilment of the requirements of Directive 2009/28/EC, and more specifically the delivery of the following:

1. An integrated plan of the procedures and required regulations for the certification or equivalent qualification schemes, for small scale RES systems installers.
2. A number of recognised training programs for the installers of small-scale biomass boilers and biomass stoves, photovoltaic systems, solar thermal systems, geothermal systems and heat pumps and their trainers, which will include educational material (theoretical and practical part) and material for the examination to grant the certificate of qualification or professional competence.

Consequently, the development as well as the delivery of recognized training programs for the installers with professional experience, so that the boiler installers or/and plumbers to be trained as boilers and biomass heaters installers, the plumbers and the cooling systems technicians as ground source heat pumps installers, and the electricians or the plumbers as solar PVs or solar thermal systems installers, is considered of high priority. Alternatively, according to the Appendix IV of the Directive 2009/28/EC, a number of vocational training programs might be provided to the aforementioned professionals. These programs will correspond and will be equivalent to a 3-years education in those skills that are considered as essential per each technology.

⁶ CA-RES, National Summaries 2013, *Second National Summary Report of Greece*: <http://www.ca-res.eu/index.php?id=384>