nZEB Training Needs in the Southern EU Countries – SouthZEB project

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ABSTRACT: The recast of the energy performance of buildings directive stipulates that by 2020 all new buildings should reach nearly zero energy levels (2019 for buildings owned or occupied by public authorities). Therefore technicians involved in the design, conception and approval of such buildings should be able to understand and apply nearly zero-energy buildings (nZEB) concepts both towards new buildings and the refurbishment of existing ones. However the number of architects and engineers that are able to deal with new technologies and standards might not be adequate to the increasing market demand. Additionally, at European Union (EU) level there are differences in commitment to the EU targets and the construction of nZEB. In this context, arose the SouthZEB project, that is an Intelligent Energy Europe (IEE) funded project, that aims to fill this gap and address the need to develop training schemes to professionals involved in nZEB building process, transferring successful practices and knowledge from front runners to target – Southern EU – countries that are less advanced in this area. This paper presents the project aims and overview.

Keywords: nZEB, energy efficiency, training, southern EU countries, building traditions

1 INTRODUCTION

1.1 nZEB Context

The reduction of energy use and carbon emissions are important goals for the European Union (EU) due to Europe's energy dependency, increase of energy costs and climate change mitigation. Being the building sector responsible for 40% of the energy consumption and 32% of the greenhouse gas emissions in Europe (Boermans et al., 2011), buildings are an important target for the reductions of energy use and greenhouse gas emissions.

The reduction of energy consumption and the use of energy from renewable sources in the buildings sector are important measures needed to reduce EU energy dependency and greenhouse gas emissions. The mitigation potential of emissions from buildings is important and as much as 80% of the operational costs of standard new buildings can be saved through integrated design principles, often at no or little extra cost over the lifetime of the measure.

Utilizing the full potential for energy savings within the European building sector can bring significant benefits: boost the ailing European economy and increase EU energy security.

Improving the buildings energy performance is therefore an important part of the EU 2020 and 2030 energy targets as well as of the roadmap for moving towards a competitive low carbon economy in 2050 (European Commission, 2010; European Commission, 2014a, b). The targets defined for 2020 are 20% reduction in energy consumption, 20% reduction in greenhouse gas emissions and 20% increase in renewable energy use (European Commission, 2010). The EU framework on climate and energy for 2030 is committed to reducing, until 2030, EU domestic greenhouse gas emissions by 40% when compared with the 1990 level and 25% reduction in energy consumption (European Commission, 2014a). This target will ensure that EU is on the cost-effective track towards meeting its objective of cutting emissions by at least 80% by 2050 (European Commission, 2014b). The Commission also proposes an objective of increasing the share of renewable energy to at least 27% of the EU's energy consumption by 2030 (European Commission, 2014a).

The EU legislative framework has been significantly strengthened by the recast of the Energy Performance of Buildings Directive (EPBD-recast, 2010/31/EU) and by the Renewable Energy Directive (RED, 2009/28/EC) (European Parliament, 2010; European Parliament, 2009). Both Directives set conditions for moving towards nearly zero-energy buildings (nZEB) by 2020. All Member States must integrate these requirements into national legislation as well as to set appropriate market instruments and financial frameworks for widely implementing these ambitious targets.

Following the subsidiarity principle and also acknowledging the variety in building culture and climate throughout Europe, the EPBD-recast requires EU Member States to elaborate national definitions and to draw up national plans for nearly zero-energy buildings, reflecting specific national and regional conditions. Therefore, it is critical to have sustainable, robust and feasible country definitions and EU standards to support the successful implementation of the Directive, for realizing the savings potential and maximize the socio-economic benefits.

The EPBD-recast introduced the concept of nZEB implying, for new buildings, very high energy performances and low energy needs that must be suppressed by renewable energy sources harvested on-site, after the end of 2020 (2019 for buildings owned or occupied by public authorities) (European Parliament, 2010; Boermans et al., 2011). This means that in five years, all new buildings will have to demonstrate very high energy performance and their reduced or very low energy needs will be significantly covered by renewable energy sources.

The EPBD-recast also requires that buildings have to be cost-effective during their life cycle and establishes a methodology for cost optimal calculations. This methodology is intended to guide member states in the process of establishing minimum energy requirements for buildings and buildings components (Boermans et al., 2011; Ferreira et al., 2014a, b, c).

To achieve the settled targets it is also mandatory to improve the performance of the existing building stock, respecting its characteristics and of the surroundings, due to its large dimension and poor energy performance as well as due to the small rate of construction of new buildings all around Europe turning the action only on these new buildings would be insufficient. Renovation towards nZEB is now a goal of the European countries. The renovation of existing buildings is an opportunity to improve their energy performance that is frequently missed. This happens due to the higher initial costs but also due to the lack of know-how and awareness (from owners, tenants and other stakeholders) regarding the cost effectiveness of the energy renovation measures, especially if a life cycle cost approach is considered (Ferreira et al., 2014a, b, c).

The nZEB performance is achieved by: reducing the buildings' energy needs, through passive approaches (improving insulation levels, optimizing solar gains, using external shading systems and night cooling etc.); selecting efficient appliances and systems (lighting, heating, cooling, ventilation systems); and on-site production of renewable energy to reduce the remaining (very

low energy consumption of the building) non-renewable energy use. Solar thermal and photovoltaic systems and geothermal and biomass energy sources are the most common energy sources used in buildings.

To achieve nearly zero-energy levels, the use of energy efficient technologies and materials is necessary. These technologies and materials must respond to the exigencies of the nZEBs and satisfy the nZEB market demand. Thus the investments in new energy efficient technologies have to satisfy the additional demand created by new nZEBs (Ecofys, 2010). Apart from market barriers, there are also barriers regarding the know-how of professionals and the number of architects and engineers that are able to deal with new technologies and standards.

The design of an nZEB requires an integrated design approach to minimize the building's energy consumption while meeting all the occupants' needs (European Commission, 2011b, Brunsgaard et al., 2014). Thus architects, civil, mechanical and HVAC engineers, energy experts and installers should know the specificities related to the design of a nZEB (new technologies and standards) and work together in multidisciplinary teams from the beginning of the design phase, requiring know-how and skills (Löhnert et al., 2003; Brunsgaard et al. 2014). However, the integrated approach and the knowledge of the exigencies of designing a nZEB is not common for architects and engineers among most European countries, leading in many cases to inefficient solutions, non-optimized buildings and higher costs due to extra measures for integration of energy efficiency measures and renewable energy systems. Additionally, for an effective renovation of the building stock, a life cycle cost approach is needed where the cost optimal renovation solutions must be identified. Thus, it is essential that technicians, stakeholders and building owners are aware of the challenges associated to the renovation of buildings towards a nZEB target and are aware of the most adequate techniques and solutions.

In the next few years there will be about 2 million residential and non-residential buildings newly built per year in the EU (Euroconstruct, 2010). Depending on the size of the project, an expert can manage various projects per year. However, the gap between the number of existing and needed architects and engineers prepared to deal with the design of new or retrofitted nZEB is a considerable barrier to implement the nZEB requirements in the near future. Technically every architect/engineer should be able to build a nZEB; however in practice that requires keeping up with standards and requirements that have to be fulfilled to build at nZEB levels. In this context, there is a substantial need for professionals such as architects and engineers specifically trained and educated in nZEB design approach and able to work in integrated multidisciplinary teams, addressing the integration of sustainable energy in buildings and built environment, not only to design buildings meeting current EPBD requirements, but especially for buildings within the nearly zero-energy concept.

The training programs for architects, engineers, but also for regional decision makers, should take into consideration the local building culture and climate issues. Especially for the countries in the Southern Europe, where many villages or city areas have very strict architectural regulations, climate and cultural traditions should be taken into account.

Training programs are essential to overcome the abovementioned barriers. SouthZEB - nZEB training in the Southern EU countries: Maintaining building traditions – is an Intelligent Energy Europe (IEE/13/393) financed project that comes to fill-in the gap between the needed and existing number of nZEB experts and to address the need of developing training and assessment schemes for intermediate and senior professionals involved in the nZEB building process (engineers, architects, municipality employees and decision makers). This project is especially focused on the transfer of successful practices and knowledge from countries where nZEB practice is more advanced to the EU countries less developed in this area. Some countries have shown significant commitment to the EU targets and have focused on nZEB prior to the others (Austria, France, Germany, United Kingdom). In most of the countries in South Europe though,

there is still a lot to be done. In Greece, Cyprus, Spain, Portugal, for example, very few measures have been taken even towards the definition of low energy buildings and their specifics.

The training modules to be developed within SouthZEB will present the integrated approach that is needed in the design of nZEB and will be adapted to the participating countries' specific needs and regulations. A special emphasis will be given to the building traditions of these countries.

The consortium includes South EU countries that have not yet developed certification and training schemes for nZEB professionals notably Cyprus, Greece, Italy and Portugal, and also partners from the UK and Austria, two of the countries with the most advanced nZEB regulations that have already established governmental low energy building definitions. UK and Austria have also set-up training courses at NGO or private level.

The SouthZEB participants are: University of Patras (UPatras), Greece (Coordinator); Building Research Establishment Ltd (BRE), United Kingdom; University of Minho (UMinho), Portugal; Cyprus University of Technology (CUT), Cyprus; BEST Institut für berufsbezogene Weiterbildung und Personaltraining GmbH (BEST), Austria; Instituto Superior Técnico, Technical University of Lisbon (IST), Portugal; Vocational Education Training Center EUROtraining (KEK Eurotraining) (KEK), Greece.

1.2 SouthZEB Objectives

SouthZEB aims at supporting the building sector intermediate and senior professionals (engineers, architects, municipality employees and decision makers) in the Southern European countries (Cyprus, Greece, Italy - south and Portugal) to keep up to date with the market progression, notably supporting those professionals in their continuous development, particularly in designing and renovating nearly zero-energy buildings.

This will be achieved through the design and development of training and assessment programmes for the abovementioned professionals, focusing especially on the transfer of successful practices and knowledge from the front runners countries (United Kingdom, UK, Austria, AT and Italy (North), IT) and also from other countries advanced in the implementation of these concepts like Germany, DE, and France, FR) to the Southern EU countries.

SouthZEB will support a large scale roll-out of the developed programmes by training specialized trainers in their application for transferring knowledge to the stakeholders.

SouthZEB also intends to bring together engineers, architects, municipality employees and decision makers as well as their educators and certification authorities in the Southern EU countries, through a unique e-learning portal, available in five EU languages (English, German, Greek, Italian and Portuguese).

The project intends to increase the number of the building sector professionals able to design and build nZEB and monitoring the whole procedure at a technical and management level. SouthZEB will train at least 150 trainers and 1500 professionals, during the project. These, especially the trainers, will act as multipliers aiming at training and certifying at least 3000 professionals each year.

SouthZEB promotes the development of an ambitious and innovative energy efficiency policy for buildings in the target countries (CY, EL, IT, PT), which in most cases is still absent today. By developing training modules for decision makers in the preparation of appropriate funding schemes and other incentives for promoting nZEB, the SouthZEB initiative aims, in the long-term, the establishment of novel frameworks and schemes. More information is available at the SouthZEB project website: http://www.southzeb.eu/.

2 SOUTHZEB OVERVIEW

2.1 Work packages

The project will adopt an end-user-centred methodological approach. The design and development of the training modules, the portal and the workshops that have to be organized, will be cyclic, with several phases informed by practice to ensure that the end-user perspective is incorporated from the beginning.

The project has been structured into eight work packages, as shown in Figure 1 where it is demonstrated the progressive development of the project from developing an understanding of the situation on the implementation of the relevant directives, through development of the training courses and the dissemination and communication necessary to enable their effective delivery.

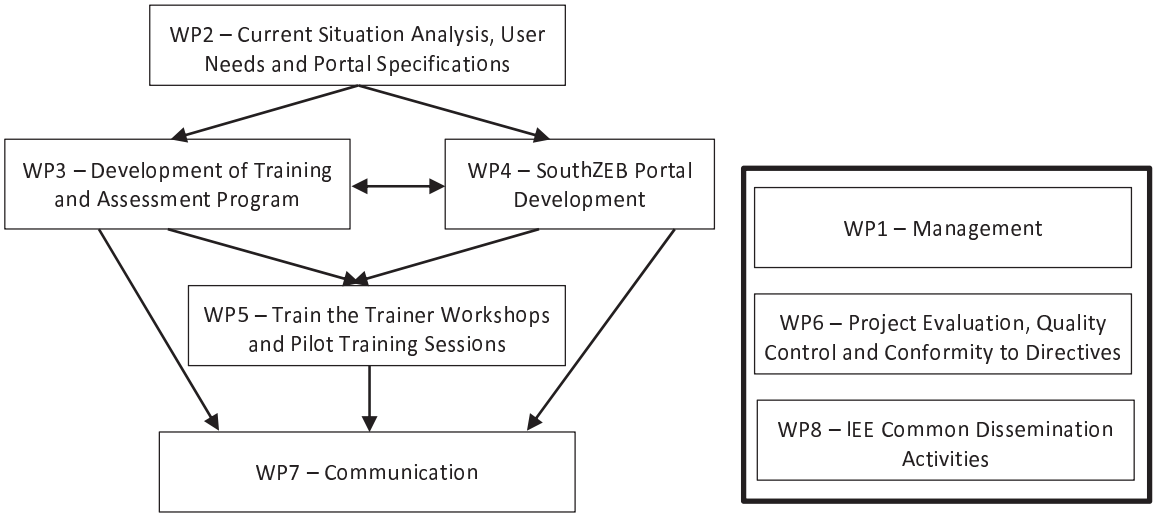

Figure 1 – SouthZEB Project: Work Programme

Initially, the current situation is to be analysed and data is to be collected regarding the building sector and specifically the progress versus the nZEB targets in the target countries (WP2). Current situation is also to be evaluated for the front runner countries for benchmarking purposes and for use in the training programmes design. Information is also to be collected regarding the progress in the implementation of the EPBD and also RED directives in all participating countries. The specific training and certification needs of the target groups (engineers, architects, municipality employees, decision makers) are to be investigated and categorized. Finally, the building traditions and architectural regulations in the target countries are to be studied and collected. These actions will also lead to the development of the SouthZEB portal specifications.

After studying the current situation and defining the needs for each target group and country, the SouthZEB assessment and training modules have to be developed (WP3). The courses are based on recognised continuous development courses for professionals in the front runner countries. National key stakeholders are to be involved in the development of the training modules. Ten training modules have to be developed: Basic module; Advanced module; Thermal bridging module; Thermal Comfort module; SouthZEB framework and local architectural regulations module; nZEB simulation and design software module; Low carbon technology and automation for nZEB module; Retrofitting towards nZEB module; module for construction management and field supervision of nZEB; module for decision makers - Preparation of funding schemes and other incentives for nZEB.

In WP4, the SouthZEB portal and its content is to be designed and developed. The most successful nZEB simulator tools must be gathered, evaluated and categorised, in order to be

presented in the portal. Towards the end of WP4, the end-users and other stakeholders have to evaluate the first operational version of the portal.

In the next project phase (WP5), train the trainer workshops have to be organised in all target countries, where the outputs of mainly WP3, but also WP4, are to be used. The trained trainers have also to demonstrate their newly acquired skills in training members of the target groups in pilot case study seminars. Members from all target groups are to be invited to participate in the training seminars, so that all modules will be used and afterwards evaluated.

Communication of results (WP7) is very important and is incorporated in the project methodology. Workshops, where the material and virtual environment are to be presented to sector stakeholders and trainers, are to be run in all participating countries. Results are also to be presented in international conferences and exhibitions.

Project management (WP1) and quality assurance (WP6), providing formative evaluation of the project's progress, act as umbrella Work Packages in order to ensure the smooth execution of tasks with high quality, within the time and resources constraints. The consortium is also going to be assisted by an Expert Advisory Board (EAB) and a Focus Group that should support the project by giving advice on the outcomes of WP2, WP3 and WP4.

Table 1 presents the overview of the deliverables of this project.

Table 1. Overview of deliverables.

WP	Del. N°	Deliverable name	Target group
WP1	D1.4	Final Report	-
	D1.5	Result-Oriented Report	-
	D1.6	Sustainability plan	-
WP2	D2.1	Report on the current situation regarding nZEB in the participating countries	
	D2.2	Specification of the training and certification needs for the target groups in the target countries	Building professionals, Authorities & decision makers
	D2.3	Specification of requirements for the SouthZEB portal	-
WP3	D3.1	SouthZEB training and certification framework	Building professionals, Authorities & decision makers, Property owners
	D3.2	SouthZEB training modules	Building professionals, Authorities & decision makers
	D3.3	SouthZEB assessment exams	
WP4	D4.1	SouthZEB portal	Building professionals, Authorities & decision makers, Property owners
WP5	D5.1	Train the trainer workshops report	Building professionals, Authorities & decision makers
	D5.2	Pilot training seminars report	
WP6	D6.1	Assessment plan	Building professionals, Authorities & decision makers, Property owners
	D6.2	Project Evaluation Report	
WP7	D7.1	Project website	Building professionals, Authorities & decision makers, Property owners
	D7.2	Communication plan	
	D7.3	Collection of all project publications	

2.2 Major outputs and expected results

The major project outputs are the following:

1. ten training modules: Eight training modules for Architects, Engineers and Municipality Employees in the South EU countries. The modules are based on recognised and successful professional development courses. Special emphasis is paid to the building

traditions of the participating countries. Two special training modules are developed for construction management and field supervision of nZEB as well as for training the decision makers in the preparation of appropriate funding schemes and other incentives for promoting nZEB.

2. ten assessment exams, one for each of the above training modules. The exams lead to certificates, recognised by the local authorities.
3. a portal and e-learning platform that is used for the application of the aforementioned training programmes remotely. The portal is to be the one-stop point for most of the currently available nZEB design simulator tools, most of which have been prepared in the context of previously funded EU projects, but have never been assessed and organised into a unique structure.
4. forty "train the trainer" workshops on nZEB, during which the trainees familiarize with the aforementioned modules and portal. The workshops result in certification of the participants, through examination.
5. four large pilot training sessions (one in each target country), of more than 250 hours each, during which the trained trainers will act as multipliers and transmit their knowledge to target end-users. All ten training modules developed are to be offered.

The expected results can be summarised as follows:

- train at least 150 trainers, using the aforementioned modules and portal;
- train at least 1.500 professionals (engineers, architects, municipality employees and decision makers) on nZEB;
- register at least 3.000 users in the portal by the end of the project;
- gather at least 400 professionals following the training programmes remotely (e-learning), through the platform;
- prepare four new funding/promotion schemes for nZEB design, one in each of the South European participating countries (EL, CY, PT, IT).

3 CURRENT SITUATION IN THE TARGET COUNTRIES

The focus of the SouthZEB project is the South EU countries, specifically those that have not yet developed certification and training schemes for nZEB professionals such as Greece, Cyprus, Portugal and Italy. In Italy the situation is slightly more advanced than in the rest of the target countries, but only for the Northern part of the country.

3.1 Greece

According to the latest Energy Efficiency Watch country report (EEW, 2013a), both, the National Energy Efficiency Action Plans (NEEAP) and the expert survey indicate that Greece has neither an ambitious nor an innovative energy efficiency policy. Many aspects of the policy package can still be strengthened. According to the NEEAP, the interim saving target for 2010 (2.8% savings) has been clearly exceeded (savings of 5.1% to 10.9% were reached). However, the main reason for these energy savings is the economic recession which has hit Greece very hard during the reporting period. It is not possible to clearly separate the impact of the economic recession and the savings attributable to political measures in the second NEEAP. With regard to Energy Service Directive (ESD) target achievement, 45% of the surveyed experts state that the ESD target will not be reached.

Regarding the buildings energy performance and the stakeholders training, which are the key issues addressed by the SouthZEB project, Greece has set minimum energy performance standards for buildings. These are complemented by economic and financial support and energy performance certificates. Innovative systems in buildings are planned to be demonstrated on

the basis of voluntary agreements. The NEEAP does not mention audits or buildings specific advice. Furthermore, buildings specific information campaigns as well as education and training for professionals of the buildings sector are not mentioned. This is a major issue for this sector that this project will address. Additionally, the same report highlights the complete lack of energy advice and audits for the buildings sector.

3.2 Cyprus

Based on the official report produced by Energy Efficiency Watch for Cyprus (EEW, 2013b), the situation is slightly better than in Greece, but there is still significant room for improvement. Cyprus has the target to achieve 10% energy savings by 2016 compared to the ESD reference period. The intermediate target of 3.3% for 2010 has been exceeded (3.57%) and it is expected that also the target for 2016 will be reached on the basis of the measures implemented from 2004 to 2010. Additional measures that allow exceeding the target will be implemented according to the NEEAP. However, the policy ambition of Cypriot energy efficiency policy can only be assessed as low. None of the policy packages reaches more than a medium result. The policy packages for transport, industry and appliances display particularly high potential for improvement according to the NEEAP analysis.

Regarding the professionals training, the Chamber of professional engineers (a SouthZEB project Associated partner) and the Chamber of Industry and Trade organize training programs that, amongst others, also deal with buildings. Nevertheless, the nZEB concept has not been yet dealt with appropriately. In fact, there is no mention of policies and even the definition of nZEB has not been made officially.

3.3 Portugal

The biggest issue in Portugal is the lack of detailed and comprehensive information regarding the progress of energy savings, including the building sector addressed in this project. Based on the report produced by Energy Efficiency Watch for Portugal (EEW, 2013c), only aggregated results have been presented, which makes it difficult to soundly assess the NEEAP. On the contrary to the NEEAP assessment, however, interviewed national experts stated that Portugal is among the countries where energy efficiency (EE) policies have progressed rather well since the first NEEAP. They see a relatively high overall ambition of EE policies, as 62% consider it at least ambitious in some sectors. About one third of interviewed experts think that the target will certainly or probably be achieved and report the successful implementation of the EPBD and a new legislative framework for Energy Service Companies (ESCOs). What is of major concern is the fact that, according to the report, there exist no organised education and training schemes on energy efficiency in the Buildings sector. In Portugal there are more than 1600 Certified Experts in the implementation of the Portuguese thermal regulation, but there are not certified nZEB or passive house planers and there aren't any passive house certifiers. Thus there is a lack of expertise in implementing the nZEB requirements in the near future. It is essential to implement nZEB training, taking into account the challenges related to the Portuguese climate conditions, construction solutions and building traditions. Additionally, there is a complete lack of information tools, demonstration actions and financial/ economic incentives. The SouthZEB project addresses the training issues, focusing on the specific case of Portugal and will also develop a portal that aims (among other goals) in bringing together stakeholders in the targeted countries and facilitate information organisation and sharing.

3.4 Italy

At present, the adoption of the Energy Performance of Buildings Directive in Italy is in progress but not many regions have already adopted or are currently in the process of requiring the adoption of this directive. Moreover, an important item that needs to be underlined is the

"refurbishment market": in Italy (data from Ministero del Tesoro) more than 4.5 million (42% of the total number of buildings in Italy) of residential buildings need refurbishment or maintenance work. Out of this amount of buildings, more than 50% of the buildings currently need strong emergency maintenance since they are in a dreadful state. Utilize innovative approaches and techniques for green design and construction, design according to bioclimatic basics, use natural, renewable, local and recycled materials, use of energy renewable systems, optimize energy performance, and many other strategies to be examined, could drive innovation into the building sector. In general, the situation in Italy is more advanced than the rest of the target countries (EEW, 2013d), especially in the sector of training and education. The main issues in Italy are: the south part of the country that is less advanced in the nZEB concept and training; and the overall ambition of the energy efficiency policies which are generally rather low. SouthZEB project addresses these needs and transfer the training programmes to the South, while offering also special courses for decision makers, in order to stimulate the development of ambitious and effective policies for the promotion of sustainable building in general and nZEB in particular.

4 CONCLUSION

The design of new or retrofit buildings to a nearly zero-energy level requires an integrated design approach to minimize the buildings' energy consumption while meeting all the occupants' needs and a life cycle cost approach to identify the cost optimal renovation. Thus, building professionals (civil, mechanical and HVAC engineers, architects, installers, municipality employees, decision makers) must know the specificities related to the design of nZEB (new technologies and standards) and work together in multidisciplinary teams from the beginning of the design phase, requiring know-how and skills. The integrated approach needed and the knowledge of the exigencies of designing nZEB yet is not common for architects and engineers among most European countries, leading to inefficient solutions, non-optimized buildings and higher costs due to extra measures for integration of energy efficiency measures and renewable energy systems.

Training building sector intermediate and senior professionals (engineers, architects, municipality employees and decision makers) in the Southern European countries to keep up to date with the market progression, supporting the continuous development of those professionals, particularly in designing and renovating nearly zero-energy buildings is essential to EU meet the EPBD and EU roadmap for moving towards a competitive low carbon economy in 2050.

In this context, SouthZEB project aims at supporting the building sector professionals in their continuous development, particularly in designing and renovating nearly zero-energy buildings taking into consideration local building traditions. This is achieved through the design and development of training and assessment programmes for the abovementioned professionals, focusing on the transfer of successful practices and knowledge from the front runners countries to the Southern EU countries.

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DISCLOSURE

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

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