



nZEB training in the Southern EU countries Maintaining building traditions

**SouthZEB
WP1 – Deliverable 1.1 Final
Publishable Report**

March 2017



Co-funded by the Intelligent Energy Europe
Programme of the European Union

Client report number
WP1-Deliverable 1.1

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1. Acknowledgements

The report has been developed as part of the project “nZEB training in the Southern EU countries – Maintaining building traditions”, SouthZEB. The partners participating in the project and formulating the consortium of the project are mentioned in the following list, as well as their logos. More information on the partners can be found in the website of the project: www.southzeb.eu.

S/N	Partner	Country	Logo
1	University of Patras	Greece	
2	KEK Eurotraining	Greece	
3	Distretto Tecnologico Trentino Habitech	Italy	
4	Cyprus University of Technology	Cyprus	
5	EEG Energy Efficiency Group Cyprus Ltd	Cyprus	
6	Building Research Establishment Ltd	United Kingdom	
7	University of Minho	Portugal	
8	Instituto Superior Técnico	Portugal	
9	BEST Institut für berufsbezogene Weiterbildung und Personaltraining GmbH	Austria	

Table 1: Partners of the consortium and relevant logos

This report has been prepared by the University of Patras and reviewed by all partners of the consortium.

2. Abbreviations

nZEB:	Nearly zero-energy building
EPBD:	Energy Performance of Buildings Directive
RED:	Renewable Energy Directive
EASME:	Executive Agency for Small and Medium-sized Enterprises



3. Executive Summary

The SouthZEB project aimed to fill-in the gap in the knowledge of the professionals regarding the design and construction of nearly Zero Energy Buildings (nZEB) in the Southern European countries, maintaining the building traditions.

The project lasted for 36 months and the participating countries were: Greece, Cyprus, Italy, Portugal, United Kingdom and Austria. From the above-mentioned countries, the target countries of the project were: Greece, South Italy, Cyprus and Portugal, whereas the front-runner countries in nZEB issues were North Italy, Austria and United Kingdom. The main objectives of the project were the development of ten (10) training modules and relevant assessment exams that would lead to certification and the conduction of 40 workshops (10 in each target country) for the certification of at least 150 “nZEB trainers” and 4 large pilot seminar campaigns (1 in each target country) for the certification of at least 1500 “nZEB designers”. Moreover, through the project a portal would be developed in order to gather all currently available nZEB design simulation tools and funding schemes on the improvement of the energy performance of buildings in national and EU level. The portal shall also include an E-learning platform that would allow the distance learning of the professionals, containing all the training modules developed.

During the implementation of the project, several issues occurred regarding the development of the training modules, which were properly addressed and modifications took place in relation to the initial design in order the content of the courses to reflect better the needs of the local market. The training modules and the relevant assessment tests were subject to several reviewing sessions in order to ensure the high quality of their contents and were translated in Greek, Italian and Portuguese besides English in order to be used in the training sessions.

The training sessions were successful in all target countries, since the goals set were all met. More specifically, the professionals certified as “nZEB trainers” summed up to 165 and the professionals certified as “nZEB designers” to 1556. However, the difficulty in initially attracting the professionals in the trainings was stated by all partners responsible for this procedure.

Moreover, the SouthZEB portal was developed, as well as its individual sections, whereas its functionality and user-friendliness was tested at different levels and throughout the implementation of the project. The E-learning platform was also developed containing all the training modules in all the aforementioned languages. The partners noticed the low impact the E-learning platform had on the professionals, which resulted to reduced user registrations in relation to the expected ones.

Based on the above, the project is considered to be successful in meeting its main objectives. Thus, based on the success of the project and the high quality of its outputs the partners mutually agreed to maintain its results and update the syllabus of the training modules and the information in the SouthZEB portal till 2020 and proceed to trainings and certification of the professionals and then, in 2020 a new discussion will be performed taking into account the experience gained till then and the response of the professionals.



Co-funded by the Intelligent Energy Europe
Programme of the European Union



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1 Introduction

1.1 The SouthZEB Project - Background

The building sector in Europe is the main energy consumer absorbing approximately 40% of the primary energy consumed in total and is also responsible for 36% of CO₂ emissions in the European Union. About 75% of the buildings are energy inefficient and more specifically about 35% are over 50 years old and, depending on the Member State, only 0.4 – 1.2% of the stock is renovated each year. Based on the previously mentioned figures, the EU Commission issued relative Directives in order to enhance the use of the renewable energy sources in the energy mix of each Member State (Renewable Energy Directive (RED, 2009/28/EC)) and to improve the energy performance of buildings (recast of the Energy Performance of Buildings Directive (EPBD-recast, 2010/31/EU)). The Directive 2010/31/EU, EPBD recast was issued taking also into account the various climatic and local conditions. Moreover, it sets thresholds regarding the energy performance of new buildings and buildings radically renovated in the EU and defines a common methodology among the Members of the EU. More specifically, the Directive includes two main mechanisms that shall be quite decisive for the building sector:

- The principle of nearly-zero energy buildings. According to Article 2.2, a nearly zero-energy building is a building that has a very high energy performance, as determined in accordance with Annex I of the Directive. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby. In Annex I, it is stated that the energy performance of a building shall be determined on the basis of the calculated or actual annual energy that is consumed in order to meet the different needs associated with its typical use and shall reflect the heating energy needs and cooling energy needs (energy needed to avoid overheating) to maintain the envisaged temperature conditions of the building, and domestic hot water needs. It is also mentioned that by 2020 all new buildings constructed in the European Union after 2020 should reach nearly zero energy levels, which means that in less than 3 years all new buildings should demonstrate very high energy performance and renewable energy sources should cover at a great extent their low energy needs.
- The concept of cost-optimality, which provides guidance for the specification of the energy performance requirements for buildings and building elements. The European Commission then issued the Regulation No 244/2012 which provided guidelines by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements. The methodology specifies how to compare energy efficiency measures, measures incorporating renewable energy sources and packages of such measures in relation to their energy performance and the cost attributed to their implementation and how to apply these to selected reference buildings with the aim of identifying cost-optimal levels of minimum energy performance requirements. The guidelines provided are not legally binding, however they provide relevant additional information to the Member States and reflect accepted principles for the cost calculations required in the context of the Regulation.

However, most of the Southern European countries are still poorly prepared for nZEB implementation mainly due to legislative reasons, since the definition of the nearly zero-energy building is still pending. In the project, the countries participating are Greece, Cyprus, Italy, Portugal, United Kingdom and Austria, from which the target countries are Greece, Cyprus, South Italy and Portugal, whereas the

remaining countries (United Kingdom, North Italy and Austria) participate as front-runner countries in the nZEB and training issues. Figure 1 displays the participating countries of the project.

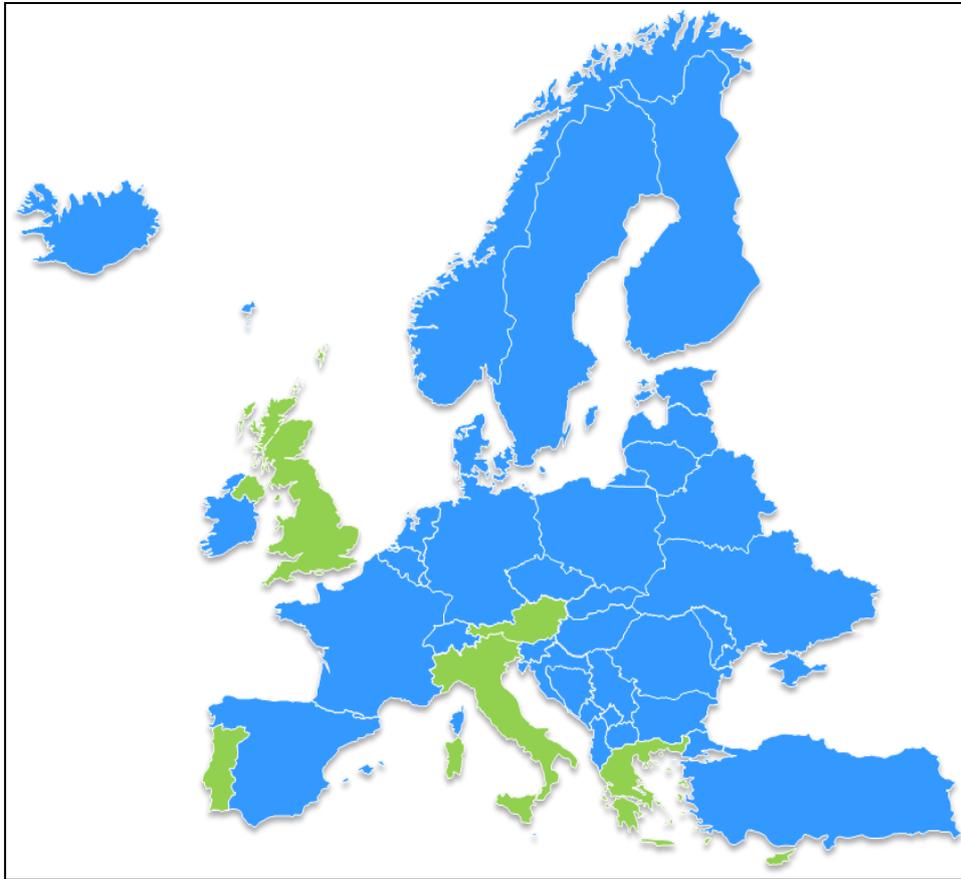


Figure 1: Participating countries in the SouthZEB project

Regarding the incorporation of the European Directive 2010/31/EU (EPBD-recast) concerning the energy performance of the buildings and the European Directive 2009/28/EC (RED) concerning the use of the renewable resources, steps have been done from all target countries, however there is still a lot that need to be finalized. In Greece, the RED Directive has been incorporated in the legislation since 2010 and there was an important increase in the use of RES technologies. The EPBD-recast Directive was incorporated on 2013, however till now there is not a concrete definition of the nZEB and the percentage of the renewable share in the primary energy of the buildings. Moreover, a National Plan for the progression towards nZEBs has not been finalized yet.

In Italy, according to the Constitution, the energy-related topics are shared between the State and the 21 Regions and Autonomous Provinces. Each regional authority may implement autonomous transpositions of the EPBD, as long as they do not contradict the general principles and requirements provided by national and EU regulations. The national regulation stays in force for those regions which have not published their own legislation. The RED Directive was incorporated in the legislation in 2011 and different mechanisms were developed in order to enhance the use of the renewable resources. Regarding the EPBD Directive, the first decree was enacted in 2005 and then several legal acts followed in order to specify all aspects of the EPBD transposition. Till now 11 Regions and Autonomous Provinces out of 21 have enacted their local transposition of the EPBD, whereas the rest follow the national legislation. Currently, a draft regulation has been developed to introduce newly



defined cost-optimal building performance requirements and the nearly-zero energy concept, as well as the new standard values for cooling, ventilation and lighting; the last one only for non-residential buildings.

In Portugal, the RED Directive was incorporated partially in 2010 in the national legislation and financial and fiscal measures were provided in order to increase the investments in the field of the RES in the country. Regarding the EPBD Directive, it was incorporated in the national legislation in 2013. The national plan for the progression to nearly zero-energy buildings is currently under development.

In Cyprus, the RED Directive was incorporated in the national legislation under a relevant law in 2013, in order to promote and encourage the use of RES in the country. The EPBD-recast Directive has been incorporated in the national legislation, whereas a concrete definition on the nZEBs exists since 2014. Moreover, the National Plan for progression to nZEBs has been developed.

Based on the aforementioned, from the total of the 4 target countries, only Cyprus has established the minimum requirements for a nZEB building, new-build and renovated. The definition includes annual primary energy of the building and percentage of the renewable sources in the energy mix of the building. The rest of the target countries have not established yet a concrete definition on the nZEBs. It should be mentioned though that the definition is under finalization in the other target countries. This constitutes an important barrier in the dissemination and the construction of nZEB buildings.

Besides the legal obstacles, there are also barriers in the know-how of the professionals, especially in the Southern Europe. Technically every architect should be able to build a nZEB; however, in practice this requires keeping up with standards and requirements that have to be fulfilled to build at nZEB levels. According to the European project ZEBRA2020, based on a total of 179 questionnaires collected in 8 countries: Austria, France, Germany, Italy, Norway, Poland, Romania and Spain, Figure 2 presents the results occurred regarding the availability of experts in three proposed phases (planning, construction and examination / certification) in nZEBs.



Figure 2: Statistical chart on the availability of nZEB experts in three phases of a nZEB (ZEBRA2020)

It should also be mentioned that from the aforementioned countries almost 50% of them have concrete definitions of nZEBs according to the ZEBRA2020 – Data Tool¹. Especially for the Southern European countries participating in the SouthZEB project, due to the lack of a concrete definition the statistics is considered to be lower.

¹ <http://www.zebra-monitoring.enerdata.eu/nzeb-activities/panel-distribution.html#nzeb-definitions-by-country.html>

Moreover, based on the findings of the ZEBRA2020 project it seems that the professionals choose to improve their knowledge in the field of high energy performance buildings through self-learning and professional experience, whereas more than half of the professionals questioned had attended more than one course every three years. Thus, it is evident that the professionals seek ways for improving their knowledge. Several attempts and projects have been performed in the EU, however mainly not in the South Europe. Some countries have already been focused on nZEB prior to others, for example Austria, France and United Kingdom. In most of the countries in South Europe though there are still steps that need to be done towards the nZEB implementation. The SouthZEB project aimed at filling this knowledge gap in the professionals and addressing the need to develop training and assessment schemes for professionals involved in the nZEB building process (engineers, architects, municipality employees and decision makers) in the 4 target countries: Portugal, South Italy, Greece and Cyprus, focusing especially on the transfer of successful practices and knowledge from the front runners to the EU countries less advanced in this area.



1.2 Objectives of the SouthZEB project

The objectives of the project were the following:

- The main objective of the project was to support the building sector intermediate and senior professionals (engineers, architects, municipality employees and decision makers) in the Southern European countries (aiming at Greece, Cyprus, South Italy and Portugal) to keep up to date with the market progression. In particular, the project aimed at supporting these professionals in their continuous development, so that they will be able to address the new Directives in their country.
- To design and develop training and assessment programmes for the aforementioned professionals, focusing especially on the transfer of successful practices and knowledge from the front runners to the South EU countries. For the development of the training modules special emphasis was given for the incorporation of the building traditions of the participating countries.
- To support a large scale roll-out of the developed programmes, by training specialized trainers in their application for transferring knowledge to the stakeholders.
- To bring together engineers, architects, municipality employees and decision makers through a unique portal, available in 5 EU languages.

The project's expected outcomes and results were the following:

- The development of ten (10) training modules, eight (8) of which would mainly be addressed to architects, engineers and municipality employees in the South EU countries and the rest two (2) to decision makers and field engineers.
- The development of ten (10) assessment exams, one for each of the training modules.
- A portal and an e-learning platform, which would be used for the application of the aforementioned training programmes remotely. It was expected at least 3,000 user registrations to be realized by the end of the project and at least 400 professionals to follow the online training courses.
- 10 "train the trainers" workshops in each target country on nZEBs (a total of 40 "train the trainers" workshops), during which the professionals would be trained and certified in the aforementioned training modules. It was expected at least 150 professionals to be trained and certified as trainers.
- 1 pilot training session in each target country (a total of 4 large pilot training sessions), during which the trainees would be trained in the aforementioned modules and get certified through the relevant assessment exams. It was expected at least 1500 professionals to be trained and certified as nZEB designers.
- Four new funding/ promotion schemes for nZEB designed to be prepared, one in each target country of the project.

The project lasted for 36 months. It was initiated on March 2014 and was concluded on March 2017.

The total costs of the project were estimated at 1,364,149 €. The contribution of the Executive Agency for Small and Medium-sized Enterprises (EASME) was equivalent to 75% of the abovementioned amount, i.e. to 1,023,111 €.



2 Development of the SouthZEB project

At the beginning of the implementation of the SouthZEB project, the current situation in the target countries was recorded and also the main technical and contextual characteristics of the SouthZEB platform were set. Moreover, the Experts Advisory Board of the project was set up via an internal voting procedure among the partners of the consortium. The Board consisted of 5 persons – experts in the field of the energy performance of buildings and more specifically of the following persons:

- Mr Athanasios Giannadakis, Greece
- Mr Helder Gonçalves, Portugal
- Mr Eduardo Maldonado, Portugal
- Mr Joseph Andrew Clarke, UK
- Mr Ioannis Michaelides, Cyprus

It is mentioned that these persons were nominated by members of the consortium.

For the coordination of the project, the partners communicated among them with emails. Moreover, teleconferences were conducted approximately one per 3 weeks / one month, which facilitated the solving procedure of the issues occurred during the implementation of the project. Furthermore, per 6 months a project meeting was held in a partner's country, each time in different country in order to elaborate, discuss in greater detail any issues that have come up and reach a conclusion.

At the initial phase of the project, the 1st meeting with groups, consisted of experts from the partners of the project, National Support Groups and professionals / stakeholders, was conducted in each target country. These groups, called focus groups played an important role in the formulation of the project's results, since they could fully understand the market and end-user needs and perspectives on nZEB and the potential future perspectives. The focus groups were used throughout the implementation of the project in order to ensure the relevance of the project outcomes to the current market needs.

In the 1st meeting, called 1st design meeting a draft description of the ten (10) training modules that would be developed was mentioned and discussed. Several opinions from all design meetings in the target countries were discussed, however the most important ones were the addition of a module related to the Thermal Comfort and the determination of the minimum number of training modules that lead to certification. More specifically, the participants in the 1st design meetings in all target countries stated their opinion regarding the initial design of the training modules and their content and expressed the need a new one addressing the concept of Thermal Comfort to be developed, which is very important in high efficient buildings and in which a knowledge gap is usually encountered. All partners acknowledged this need and in order to address it satisfactorily a modification on the initial Description of Work regarding the training modules was proposed by aggregating two training modules regarding thermal performance in one and introducing a new training module entitled "Thermal Comfort". Moreover, it was also proposed based on the views of the participants in the 1st design meeting the minimum number of training modules for certification to be 4 (out of 10), whereas the training modules 1, entitled "Basic Module" and 2, entitled "Advanced Module" to be compulsory for all professionals. Furthermore, it was proposed the training module 7, initially entitled "Production, distribution and regulation of energy in nZEB" to include additional information on the building automation systems and be renamed to "Low carbon technology and automation for nZEBs".

The aforementioned proposals were sent to the EASME and were approved. Thus, the following training modules were developed:

1. Training Module 1 – Basic Module.
2. Training Module 2 – Advanced Module.
3. Training Module 3 – Thermal Performance.
4. Training Module 4 – Thermal Comfort.
5. Training Module 5 – SouthZEB framework module and local architectural regulations.
6. Training Module 6 – nZEB simulation and design software module.
7. Training Module 7 - Low carbon technology and automation for nZEBs.
8. Training Module 8 – Retrofitting towards nZEB.
9. Training Module 9 – Construction Management and field supervision of nZEB.
10. Training Module 10 – Preparation of funding schemes and other incentives for nZEB.

Approximately on September 2014 the website of the project was created (www.southzeb.eu) and all information was translated to all participating countries of the project (English, Greek, Portuguese, Italian and German).

Afterwards, the partners initiated the development of the training modules' content. The material was developed, in English, in PowerPoint slides containing notes in sections that should be clarified from the teachers to the learners or in order to highlight some points. Moreover, the content of the training modules was adapted per approximately 20% to local issues, which was elaborated by all partners of the target countries. The material was developed taking into account the view of the participants of the focus groups, who for each training module expressed the desired topics that should be analysed. Thus, the content of the training modules that was developed reflected the needs of the market.

In order the high quality of the content developed to be ensured, it was mutually agreed the material to undergo a reviewing procedure. The review was implemented at 2 stages; in the 1st stage the responsible partner for the development of the training modules reviewed briefly the whole material developed, whereas at the 2nd stage approximately one training module was assigned to each partner of the consortium in order to be reviewed in detail. Besides the internal review, it was agreed to assign the review of approximately two training modules to each member of the Experts Advisory Board of the project, as external reviewers.

The comments that were received in each case were taken into account for the final version of each training module. The material developed included both theoretical and practical information. Relevant examples are presented as follows. All training modules were translated in all target countries' languages in order to be used in the workshops and seminars.

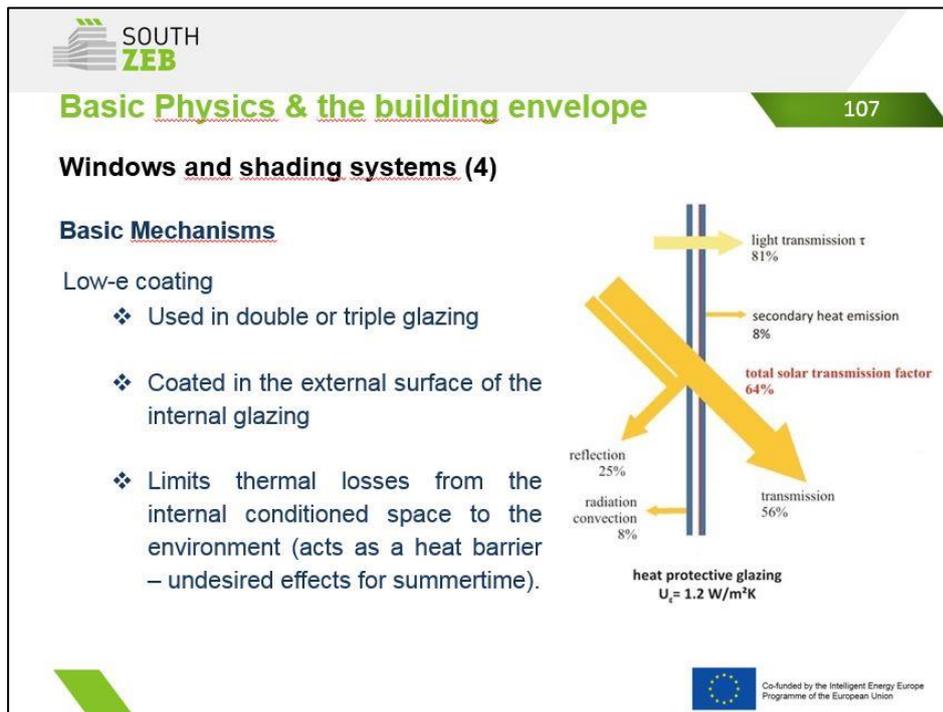


Figure 3: Indicative slide from Training Module 1

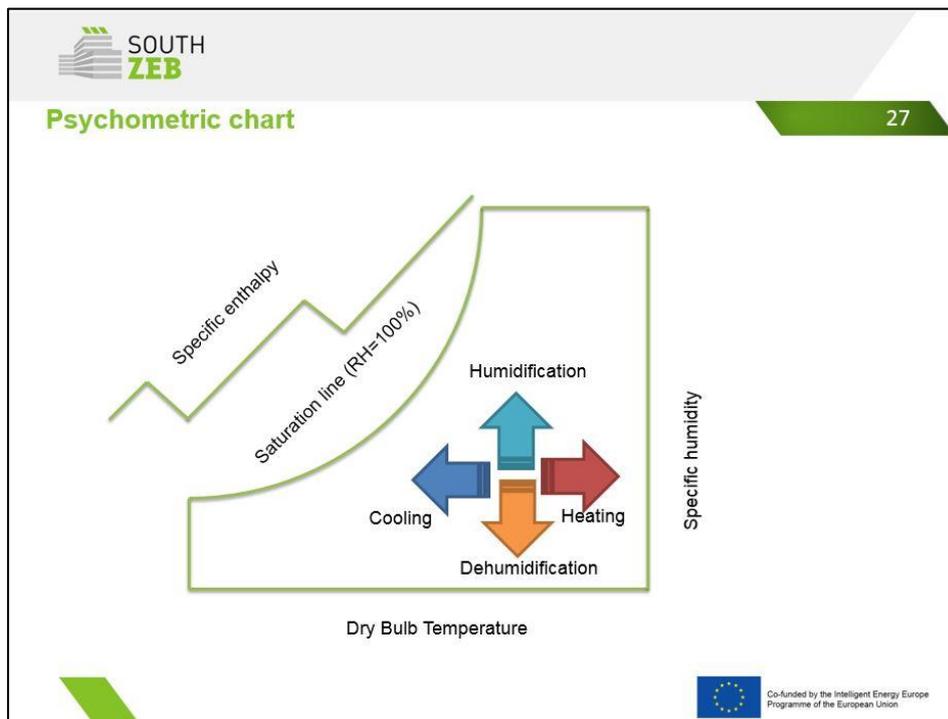


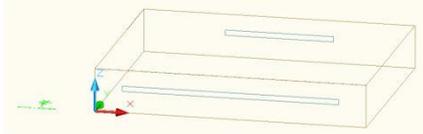
Figure 4: Indicative slide from Training Module 4



Auditorium Description

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Auditorium model:
 Area= 2000 m²
 Ceiling height: 8 m
 Windows: N (20 m²), S (40 m²)



Occupancy	900	Occupants
Lighting	15043	W
Equipment	1504	W
Minimum fresh airflow	11	m ³ /s

Field	Units	Obj1	Obj2	Obj3	Obj4	Obj5
Name		Exterior/WallConst	FloorConst	RoofConst	WindowConst	IntMassConst
Outside Layer		Insulator - 5cm	Insulator - 3cm	Insulator - 10cm	Glass:Simple - 6mm	LW Concrete - 15cm
Layer 2		P_Alve_Simp_Tijolo furado	HW Concrete - 20cm	HW Concrete - 20cm	WindowGas:Air - 1cm	
Layer 3		Wood - 1cm	Wood - 1cm	Wood - 1cm	Glass:Simple - 6mm	
Layer 4						


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Figure 5: Indicative slide from Training Module 6

Simultaneously, the assessment exams were also being prepared for each training module. The assessment exams would be used for the certification of the professionals following the workshops / seminars. The exams were assessed by all partners of the consortium but mainly by the responsible partners for the development of each training module. For each training module 100 multiple-choice questions were developed, whereas each assessment exam contained 30 questions from the total 100 questions. Relevant example is provided as follows:

9. Determine the thermal losses (Q) of the structural element, according to the figure below:

a. $Q = \frac{\lambda}{d} A(T_i - T_o)$

b. $Q = h_{so} A(T_{si} - T_{so})$

c. $Q = \frac{\lambda}{d} A(T_{si} - T_{so})$

d. $Q = UA(T_{si} - T_{so})$

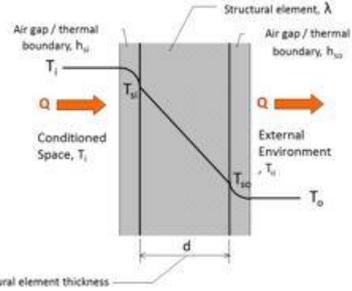


Figure 6: Indicative multiple-choice question of Training Module 1



1. A Building Envelope is defined as:
- a. **Every element of the building that connects the building's conditioned spaces with the external environment**
 - b. Every element of the building that connects the building's unconditioned spaces with the external environment
 - c. Every element of the building that connects the building's conditioned spaces with the internal environment.
 - d. Every element of the building that connects the building's unconditioned spaces with the internal environment.

Figure 7: Indicative multiple-choice question for Training Module 2

The project aimed, as already mentioned, at the certification of nZEB trainers and nZEB designers. The workshops would lead to nZEB trainer certification, whereas the seminars would lead to nZEB designer certification. The nZEB trainer would then provide training to professionals in order to be certified as nZEB designers. At that point, the partners had a discussion regarding the criteria for the eligibility of a professional to be accepted in the workshops and get trained to be a nZEB trainer and to be accepted in the seminars and get trained to be a nZEB designer. According to a questionnaire that gathered the opinions of all the partners of the consortium, it was finally decided based on the majority of the views stated the following criteria to be followed:

- For a professional to be eligible to follow the workshops for the nZEB trainer: to have a relevant degree, the occupational license and a minimum of 2,5 years of experience in the building industry.
- For a professional to be eligible to follow the workshops for the nZEB designer: to have a relevant degree and the occupational license.

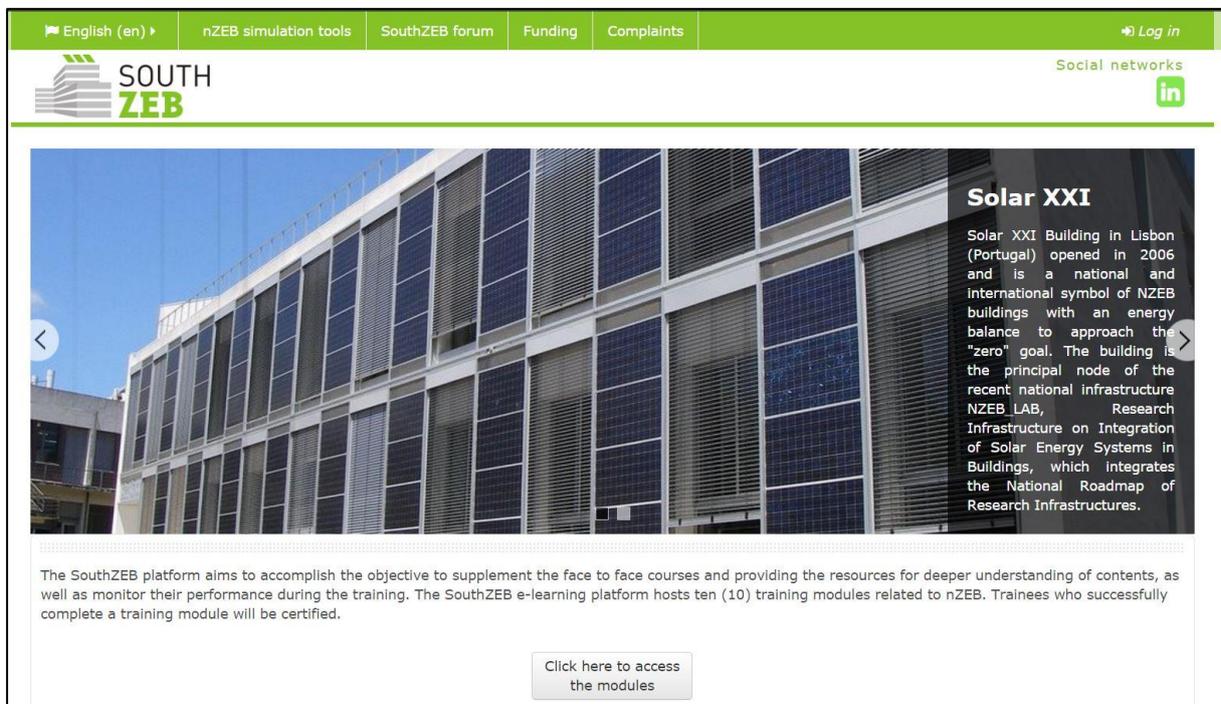
The selection of the candidates was decided to be realized based on their CVs that the candidates would send with their application to the workshops / seminars.

The focus groups were called to participate in the 2nd Design Meeting in order to discuss, provide their opinion and validate the decisions made by the partners regarding the design of the SouthZEB portal, so that their view could be considered during its development. The 2nd Design meeting was realized on February and April 2015 in all target countries. Overall the partners aimed at making sure that all parameters have been considered and that the e-learning platform would be structured in such a way as to be user friendly and attractive to the users/ learners. The views expressed during the 2nd Design meeting were taken into account during the implementation of the portal, whereas special toolkits were also developed in order to ensure the proper functionality of the portal and its user-friendliness. The toolkits contained a System Integration Testing in order to examine the proper operation of all sections of the portal and afterwards a User Acceptance Testing. These tests were executed when the SouthZEB portal beta version was finalized (approximately on October 2015). The User Acceptance Testing was to be executed by persons / professionals who would use the SouthZEB portal and its purpose was to examine the proper functioning of the different user rights and its user-friendliness. For this purpose, a 3rd Design meeting was realized in all target countries with the focus groups, who were called to test the SouthZEB portal according to specific guidelines. The comments and the results of the tests were gathered from all target countries and were properly edited in order to highlight the most common and most important findings. The report prepared for this purpose was considered for the finalization of the SouthZEB portal.

Several sections constitute the SouthZEB portal. Initially, one of the most important sections is the E-learning portal, which includes the material of the training modules developed in order to allow for distance learning during the implementation of the seminars. The E-learning platform enabled professionals with limited time to attend the courses prepared via self-studying and get certified through physical attendance. Moreover, the portal includes a nZEB simulation and design tools section, which contains a list of the most commonly used simulation and design tools for a nZEB, as well as the reference link in order to be downloaded and a funding opportunities section, which includes the available funding schemes on the field of the energy performance and RES per target country and on EU level. Furthermore, a forum was also developed in order to allow the exchange of views and experiences of the SouthZEB portal users. Last but not least, it was decided by all partners to add a complaints section, through which the user is able to record complaints, which are sent to the Coordinator of the project for proper handling.

The SouthZEB portal was translated in all target countries' languages.

Indicative figures are presented as follows.



The screenshot shows the SouthZEB portal home page. At the top, there is a navigation bar with links for 'English (en)', 'nZEB simulation tools', 'SouthZEB forum', 'Funding', 'Complaints', and 'Log in'. The SouthZEB logo is on the left, and 'Social networks' with an 'in' icon is on the right. The main content area features a large image of the Solar XXI building in Lisbon, Portugal, with a text overlay that reads: 'Solar XXI Building in Lisbon (Portugal) opened in 2006 and is a national and international symbol of NZEB buildings with an energy balance to approach the "zero" goal. The building is the principal node of the recent national infrastructure NZEB_LAB, Research Infrastructure on Integration of Solar Energy Systems in Buildings, which integrates the National Roadmap of Research Infrastructures.' Below the image, there is a paragraph: 'The SouthZEB platform aims to accomplish the objective to supplement the face to face courses and providing the resources for deeper understanding of contents, as well as monitor their performance during the training. The SouthZEB e-learning platform hosts ten (10) training modules related to nZEB. Trainees who successfully complete a training module will be certified.' At the bottom of this section, there is a button that says 'Click here to access the modules'.

Figure 8: SouthZEB portal - Home Page



English (en) | nZEB simulation tools | SouthZEB forum | Funding | Complaints | Guest

SOUTH ZEB Social networks

Home | Cou | Trail | Mandatory

Course categories: Training Modules / Mandatory

Search courses:

Training Module 1: nZEB Basic module

- Teacher: Susana Lucas
- Teacher: Elson Almeida
- Teacher: Patricia Botelho
- Teacher: Hugo Cortes
- Teacher: João Costa
- Teacher: Maria Farinha
- Teacher: Tiago Fonseca
- Teacher: Vitor Gil
- Teacher: Ricardo Leão
- Teacher: Américo Nunes
- Teacher: Arménio Oliveira
- Teacher: Rafael Raposo
- Teacher: Rodrigo Rodrigues
- Teacher: Alda Serradeiro
- Teacher: Alexandre Soares dos Reis
- Teacher: Test User

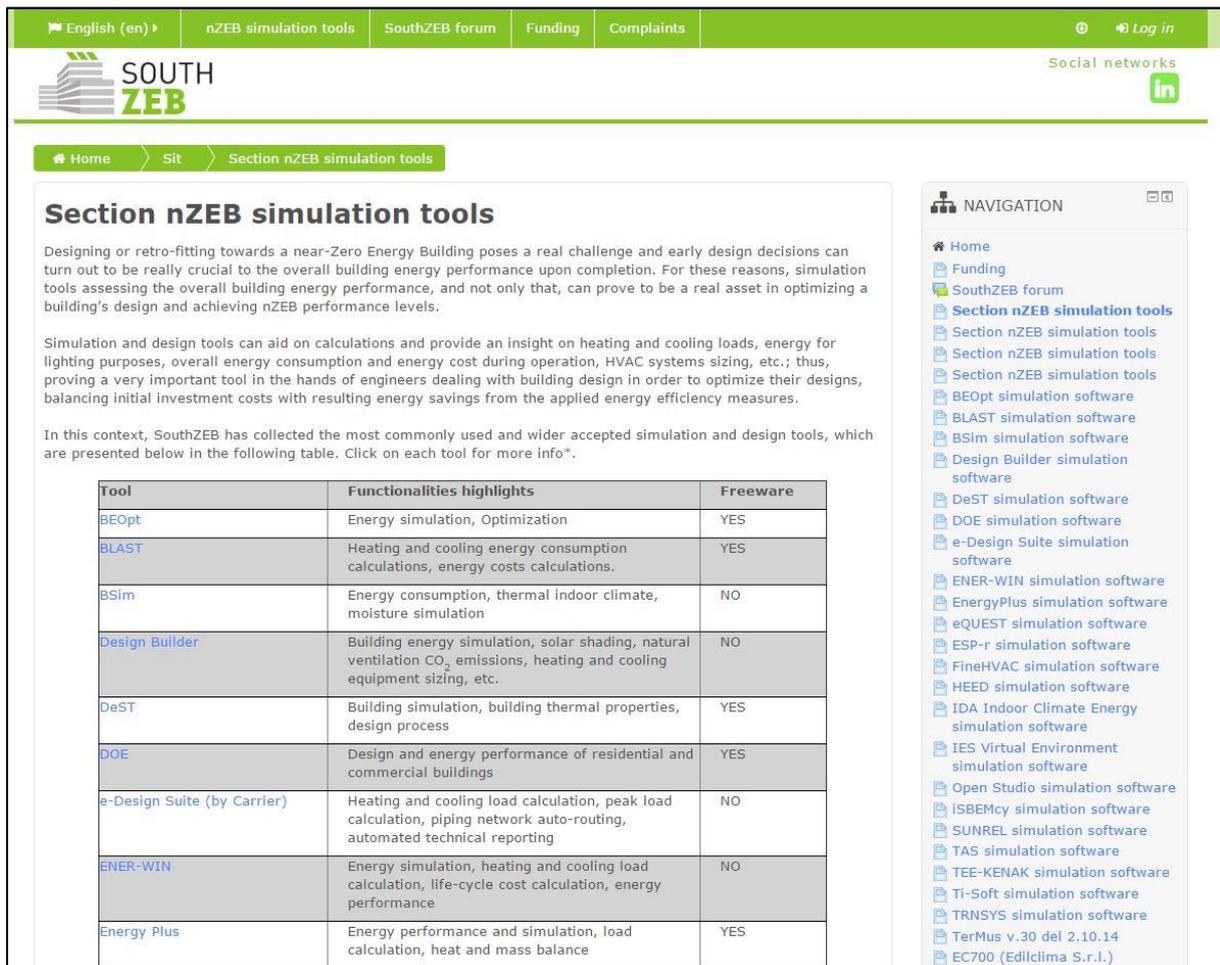
Training Module 2: nZEB Advanced module

- Teacher: Susana Lucas
- Teacher: Elson Almeida
- Teacher: Ana Bastos
- Teacher: Patricia Botelho
- Teacher: Manuel Carvalhosa
- Teacher: Cristina Caxias
- Teacher: Hugo Cortes
- Teacher: Filipe Cunha
- Teacher: Maria Farinha
- Teacher: Agostinho Gonçalves
- Teacher: Ricardo Leão
- Teacher: Américo Nunes
- Teacher: Arménio Oliveira
- Teacher: Carla Pires
- Teacher: Rafael Raposo
- Teacher: Virginia Rebocho
- Teacher: Alda Serradeiro
- Teacher: Alexandre Soares dos Reis
- Teacher: Test User

NAVIGATION

- Home
- Site pages
- Courses
 - Miscellaneous
 - Training Modules
 - Mandatory**
 - TM1
 - TM2
 - Optional

Figure 9: Indicative figure of the E-learning portal



Section nZEB simulation tools

Designing or retro-fitting towards a near-Zero Energy Building poses a real challenge and early design decisions can turn out to be really crucial to the overall building energy performance upon completion. For these reasons, simulation tools assessing the overall building energy performance, and not only that, can prove to be a real asset in optimizing a building's design and achieving nZEB performance levels.

Simulation and design tools can aid on calculations and provide an insight on heating and cooling loads, energy for lighting purposes, overall energy consumption and energy cost during operation, HVAC systems sizing, etc.; thus, proving a very important tool in the hands of engineers dealing with building design in order to optimize their designs, balancing initial investment costs with resulting energy savings from the applied energy efficiency measures.

In this context, SouthZEB has collected the most commonly used and wider accepted simulation and design tools, which are presented below in the following table. Click on each tool for more info*.

Tool	Functionalities highlights	Freeware
BEOpt	Energy simulation, Optimization	YES
BLAST	Heating and cooling energy consumption calculations, energy costs calculations.	YES
BSim	Energy consumption, thermal indoor climate, moisture simulation	NO
Design Builder	Building energy simulation, solar shading, natural ventilation CO ₂ emissions, heating and cooling equipment sizing, etc.	NO
DeST	Building simulation, building thermal properties, design process	YES
DOE	Design and energy performance of residential and commercial buildings	YES
e-Design Suite (by Carrier)	Heating and cooling load calculation, peak load calculation, piping network auto-routing, automated technical reporting	NO
ENER-WIN	Energy simulation, heating and cooling load calculation, life-cycle cost calculation, energy performance	NO
Energy Plus	Energy performance and simulation, load calculation, heat and mass balance	YES

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- DOE simulation software
- e-Design Suite simulation software
- ENER-WIN simulation software
- EnergyPlus simulation software
- eQUEST simulation software
- ESP-r simulation software
- FineHVAC simulation software
- HEED simulation software
- IDA Indoor Climate Energy simulation software
- IES Virtual Environment simulation software
- Open Studio simulation software
- iSBEMcy simulation software
- SUNREL simulation software
- TAS simulation software
- TEE-KENAK simulation software
- Ti-Soft simulation software
- TRNSYS simulation software
- TerMus v.30 del 2.10.14
- EC700 (Edilclima S.r.l.)

Figure 10: Indicative figure of nZEB simulation tools section



SouthZEB forum

In this section you can find a virtual forum available in English, aiming to boost transnational exchange between all interested professionals, authorities, certification bodies, trainers, researchers and other relevant stakeholders across Europe, and promote discussions related with the building sector, explore ways of cooperation, sharing of good practices, opinions, know-how and create a showroom to researchers promote their projects/results.

Discussion	Started by	Replies	Last post
Futura legislação nacional nZEB - Debate	 Admin Portugal ist id	6	Sónia Garcia Fri, 3 Jun 2016, 3:55 AM

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- Section nZEB simulation tools
- BEOpt simulation software
- BLAST simulation software
- BSim simulation software
- Design Builder simulation software

Figure 11: Indicative figure of the Forum section



Funding

In this section you can find the currently available funding opportunities for the energy efficient and nZEB development sector, at both European and national level, particular in Cyprus, Greece, Italy and Portugal.

Further information sources about national and EU level financing tools can be found here:

- BuildUp portal
- DG Energy
- EASME Horizon 2020 Energy Efficiency
- ManagEnergy

CALL TOPIC	DEADLINE	ACTION	CALL ID	AGENCY	SCOPE	LINK
EE-04-2016-2017: New heating and cooling solutions using low grade sources of thermal energy	19 January 2017 17:00:00	IA Innovation action	H2020 ENERGY EFFICIENCY CALL 2016-2017 (H2020-EE-2016-2017)	Horizon 2020 'Secure, Clean and Efficient Energy'	EU	http://ec.europa.eu/research/particip/04-2016-2017.html
LCE-04-2017: Demonstration of smart transmission grid, storage and system integration technologies with increasing share of renewables	14 February 2017 17:00:00	IA Innovation action	H2020-LCE-2016-2017	Horizon 2020 'Secure, Clean and Efficient Energy'	EU	http://ec.europa.eu/research/particip/lce-04-2017.html
LCE-17-2017: Easier to install and more efficient geothermal systems for retrofitting buildings	07 September 2017 17:00:00	IA Innovation action	H2020-LCE-2016-2017	H2020 'Secure, Clean and Efficient Energy'	EU	http://ec.europa.eu/research/particip/lce-17-2017.html
LCE-21-2017: Market uptake of renewable energy technologies	05 January 2017 17:00:00	IA Innovation action	H2020-LCE-2016-2017	H2020 'Secure, Clean and Efficient Energy'	EU	http://ec.europa.eu/research/particip/lce-21-2017.html

Figure 12: Indicative figure of the funding section

Complaints

Discussion	Started by	Replies	Last post
Ενημέρωση για την εξέλιξη του σεμιναρίου	ΚΟΤΣΙΦΑΣ ΑΝΔΡΕΑΣ	0	ΚΟΤΣΙΦΑΣ ΑΝΔΡΕΑΣ Thu, 10 Mar 2016, 7:13 PM
Post your complaints here	Admin User	1	ΓΚΕΝΤΣΙΔΗΣ ΑΠΟΣΤΟΛΟΣ Sat, 5 Mar 2016, 7:49 PM

Figure 13: Indicative figure of the complaints section

The next issue raised before the implementation of the workshops was the determination of the passing mark at the assessment exam. This issue was discussed in the project meeting in Portugal

where all partners expressed their opinion and finally it was mutually agreed that the passing mark for the professionals attending the workshops for the nZEB trainers to be 80%, whereas for the professionals attending the seminars for the nZEB designers to be 60%.

Afterwards, the workshops were initiated in all target countries, which lasted approximately 4 months (from October 2015 – January 2016). The professionals that were certified as nZEB trainers were 165 as a total in all target countries. In order to ensure the high quality of the training procedure, specific toolkits were developed. More specifically, a questionnaire was developed to be fulfilled by all participants in order to receive the opinion of the participants on various pedagogical and logistic aspects of the workshops. Moreover, a questionnaire was prepared to be fulfilled by the teacher of the workshop in order to summarize the views of the participants in the workshops. Furthermore, an observation procedure was set, in order a third external person not participating in the workshop to record aspects of the training procedure. Last but not least, the procedure of the interview of approximately 10% of the participants was determined in order to receive comments without constraints. The comments received were properly edited in order to provide to the responsible partners of the workshops the most common findings and the issues that should be looked after for the implementation of the seminars. Indicative picture follow from the implementation of the workshops in the target countries.



Figure 14: Indicative picture of a workshop in Greece



Figure 15: Indicative picture of a workshop in Portugal

The seminars were initiated afterwards in all target countries. The seminars lasted approximately 1 year (January 2016 – December 2016) and a total of 1556 professionals were certified as “nZEB designer” in all target countries. For the evaluation of the training procedure during the seminars the abovementioned procedure was also followed and a relevant report was prepared after the proper edition of the data received. Moreover, the SouthZEB portal was also examined under the User Acceptance Testing from participants in the seminars in order to examine the functionality and user-friendliness of the portal from the view of persons already participated in the seminars through physical attendance. Indicative pictures from the implementation of the seminars in the target countries follow.



Figure 16: Indicative picture of a seminar in Italy



Figure 17: Indicative picture of a seminar in Cyprus

However, an issue was raised regarding the acceptance of the SouthZEB portal from the professionals. The procedure of distance learning seems to be quite strange yet to the professionals and most of them preferred the live interaction in the class instead of the E-learning platform. Although the issues related to the functionality of the portal were solved and the portal was working normally, the professionals especially in Italy seemed to be more cautious regarding its use and the benefits that it provides. Therefore, the number of the portal subscribers was not as high as it was expected.

It should be mentioned also that the partners faced difficulty in achieving the aforementioned targets and more specifically in attracting the professionals to the workshops and seminars. The main barrier was the lack of information of the professionals on the issue of the nearly zero-energy buildings, the legal obstacles that still existed in most of the target countries of the project and the lack of a National Plan and related funding schemes that would increase the design and construction of nZEBs in the target countries. Therefore, although the main objectives as mentioned before were achieved, all partners recorded the reluctance of the participants to follow the trainings at the beginning. It should be stated though that the participants of the workshops / seminars stated after the training their satisfaction with the quality of the courses.

At the end of the seminars, it was requested by all participants in the workshops / seminars to provide their opinion regarding the development of a funding scheme that is related to the improvement of the energy performance of the buildings and the construction of nZEBs. In Greece, the schemes proposed were mainly focused on the relaunch of successful schemes of the past, as well as the enhancement of dissemination actions in order to raise the awareness of the citizens on existing schemes. Moreover, for the nZEBs fiscal incentives were proposed in relation to the reduction or exemption of taxes. In Cyprus, two funding projects, that relate to energy saving measures in residential buildings and in commercial buildings that have ended prematurely on June 2016 were mentioned and discussed. It was proposed these programs to be relaunched with simpler steps and procedures, as well as the funding of energy efficient measures without the individuals being obliged to reach a specific efficiency level. Moreover, it was proposed to increase the funding for the households in order to reach nZEB category and the maximum allowed capacity of the PVs under the net-metering scheme that is currently in action. In Italy, the new funding schemes which have been approved by the



national Italian government and Ministry of Economic Development were discussed and examined. The “**Conto Termico 2.0**” enables the rebuilding of the buildings in order to improve the energy performance, to reduce the costs of energy consumption as it provides high incentives (funding) towards the improvement of the energy efficiency of the buildings and towards nZEB buildings. The “**European Energy Efficiency Fund**” is an innovative public-private partnership that focuses on financing energy efficiency, small-scale renewable energy, and clean urban transport projects. The “**Fondo Italiano per l’Efficienza Energetica**” is devoted entirely to investment projects in energy efficiency projects in partnership with ESCos. In Portugal, a questionnaire was sent to the participants of the workshops and seminars and to the members of the focus group and based on the answers received the existing funding schemes in Portugal were evaluated as well as the funding schemes in other countries. It seems that the schemes “Portugal 2020” and “FEE” are considered to be a good model for future schemes. Based on the general typologies of funding scheme in other countries, the most ranked choice was the “Tax incentives and exemptions”, followed by the “Financial Incentives”, whereas in the specific funding schemes the most ranked was ‘Energy efficient technologies / renewable energy systems’, which is included in the typology “Loan/Finance Schemes”.

During the implementation of the project, all partners proceeded to dissemination actions in order to make the project known to the professionals and also attract people to participate in the training procedures. The dissemination actions included participation in forums and international conferences, publication of relevant articles regarding the SouthZEB project, publication of 4 newsletters during the progression of the project and delivery of the project brochure to professionals and building associations. The project brochure was designed at the beginning of the project and it was then translated to all languages of the participating countries in order to be better addressed in each country.

Concerning the quality of the training modules that were developed, as well as the rest of the deliverables of the project the review of the external experts – members of the EAB was requested. Based on the answers received, the high quality of all documents prepared was highlighted, in accordance with the level of the participants and taking into account the fact that the training modules refer to at least graduates of a relevant field. It was also mentioned that the modules add value to the knowledge already existing, whereas they are also well-organized and emphasis is also provided in practical issues. Regarding the SouthZEB portal, it was stated that it seems appropriate, well-functioning, user-friendly and very useful to the professionals regarding the sections developed of the SouthZEB portal. In general, the deliverables prepared were considered satisfactory and the project is considered to be successful in meeting its main objectives.

At the end of the project the partners discussed its sustainability. All partners acknowledged the high quality of its outputs, however the difficulty in attracting the professionals as stated before was also mentioned. Therefore, it was mutually agreed to maintain the results of the project and update the syllabus of the training modules and the information of the SouthZEB portal till 2020 and to perform another round of training and certification under a specific fee that shall be used for the maintenance of the SouthZEB portal, the logistics for the training / certification and the manpower for the updates required. At that point, based on the experience gained till then and due to the fact that most possibly no legal barriers will exist in the target countries and funding schemes will have been developed by the governments to increase the number of the nZEBs, the sustainability of the project will be further discussed.

3 Results of the SouthZEB project

The results of the SouthZEB project are the following:

1. Project's website translated in all languages of the participating countries: www.southzeb.eu.
2. The development of ten (10) training modules in PowerPoint slides and relevant assessment exams. For each training module, a pool of 100 multiple-choice questions was developed, whereas each assessment exam contained 30 questions from the aforementioned pool. The modules developed are the following:
 - a. Training Module 1 – Basic Module. The basic concepts and definitions of buildings, building envelope, electrical, mechanical and HVAC systems employed in buildings, as well as, the methodology on the energy assessment of buildings and the key parameters and minimum requirements leading to the certification of a nearly Zero Energy Building (nZEB) are addressed in the module.
 - b. Training Module 2 – Advanced Module. The advanced concepts of nZEB design and building, including technical physic notions (like humidity, building materials, construction techniques, ventilation and the use of energy sources) are presented. The passive use of renewable energy (e.g. passive solar gains) is also presented. More specifically, the various arguments of nZEB design and building, including technical focus on principles of bioclimatic design, passive systems, building materials, renewable energy sources, construction and measurement techniques, ventilation, natural lighting and the processes of energy audit and commissioning are elaborated in the module.
 - c. Training Module 3 – Thermal Performance. The building fabric performance is analysed in the module. More specifically, the drivers for, and benefit of, improving building fabric performance are presented as well as the risks that poor building fabric design and/or construction can present. Moreover, the way the building fabric performance can be assessed is presented including information on the evaluation and calculation of thermal performance, which is reinforced via a number of practical exercises.
 - d. Training Module 4 – Thermal Comfort. The concepts of thermal comfort, its assessment methods and the way thermal comfort is related and can be achieved in energy efficient buildings and especially in nZEB is presented, focusing on the thermal environment of buildings through presentation of concepts, experimental analysis and practical exercises. It includes sections on applicable standards; the definition of thermal comfort for a human body and how to model it; factors and values that form the perception of thermal comfort; different ways of thermal comfort assessment according to international standards; optimal value ranges for thermal comfort depending on the level (category) of the requirements of the space; the users' expectations and adaptation; adaptive models of thermal comfort; acceptable range of temperatures; thermal comfort models and temperature range and their effect on energy performance of buildings; thermal comfort monitoring and measurement.
 - e. Training Module 5 – SouthZEB framework module and local architectural regulations. The SouthZEB approach for the verification and certification of nZEB in the target countries is presented, as well as the provision the SouthZEB has for building



traditions, whereas special sections have been developed for the different target countries in order to present the local regulations and the user acceptance of technical solutions to nZEB.

- f. Training Module 6 – nZEB simulation and design software module. Simulation tools for the design of nZEB and energy efficient buildings are presented, which help to predict building energy consumption and give the opportunity to compare different design options (use of envelope insulation, advanced glazing, natural ventilation, passive solutions, and high performance HVAC systems among many others).
 - g. Training Module 7 - Low carbon technology and automation for nZEBs. An overview of various low carbon systems suited to the target countries and highlights key design, installation, operation and maintenance issues, as well as an introduction on the way to assess the financial performance and cost-effectiveness of the different systems is presented. The module also introduces building automation systems, their purpose and classification and explains their importance in ensuring the successful integration and operation of the low carbon technologies and building energy systems. The module also introduces the concept of a cost-optimal assessment methodology and the requirement for policy-makers and designers to take into account the global lifetime costs of buildings to shape their energy design and performance. The global cost calculation method “EN 15459: Energy performance of buildings – economic evaluation procedure for energy systems in buildings” is also introduced.
 - h. Training Module 8 – Retrofitting towards nZEB. The way to retrofit the existing building stock towards nZEB considering both energy efficiency and indoor environmental quality is presented, focusing especially on how to address the existing building stock and the possibility of its conversion into nZEB. Assessment and energy audit techniques in existing buildings are also part of the training goals as well as the cost-optimality of nZEB renovation technical solutions.
 - i. Training Module 9 – Construction Management and field supervision of nZEB. The concepts of building information modelling, building envelope, mechanical, electrical and plumbing systems, renewable energy and energy storage and building automation systems are presented. It is structured in a way to approach the design and construction of these processes of a nearly Zero Energy Building.
 - j. Training Module 10 – Preparation of funding schemes and other incentives for nZEB. A range of tools, mechanisms and incentive schemes designed to facilitate the increased uptake of energy efficiency and low carbon technologies and/or green improvement plans for buildings is presented. These mechanisms can potentially inform the design of similar measures, by policymakers in the Southern countries, to assist the development of energy efficient design and nZEB solutions.
3. The creation of a SouthZEB portal, in which the access can be realized via the website of the project. The SouthZEB portal includes the following sections:
 - a. E-learning section. The E-learning section contains all training modules developed in order to allow the professionals to attend the modules remotely. The assessment exams are not available in the E-learning platform. The professionals should perform via physical attendance the exams in order to get certified.

- b. nZEB simulation and design tools section. This section includes the currently available simulation and design tools for nZEBs, containing a brief description of its use and the relevant link for its download. This section gathers all simulation and design tools in one unique place constituting a form of database in order to assist the professionals during the design of a nZEB.
 - c. Forum. The forum will be used in order to enable the users to exchange views and interact with each other on nZEB issues. The forum shall be a common place for the professionals to share experiences concerning nZEBs.
 - d. Funding opportunities section. This section contains information on the funding schemes currently available regarding the improvement of the energy performance of the buildings in each target country and in EU level in order to facilitate the professionals on the financial support programs.
 - e. Complaints section. This section was considered of high importance from the partners of the consortium and was added in the SouthZEB portal so that the users will be able to provide any complaints they had regarding the functioning of the portal in a specific section. The complaints will be sent to the Coordinator to be properly handled.
 - f. Regarding the number of the user registrations in the SouthZEB portal, the number achieved was approximately 700. The low number of the user registrations relate to the scepticism of the majority of the professionals attracted to the general idea of distance learning and the benefits that the rest sections of the portal could provide.
4. 10 workshops were realized in each target country (40 workshops as a total), which lasted 406 hours as a total and which resulted in the certification of 165 professionals as “nZEB trainer”.
 5. 4 large pilot sessions were realized (one in each target country), which lasted approximately 1 year (during 2016) and resulted in the certification of 1556 professionals as “nZEB designer”. Moreover, more than 400 professionals attended the training modules through the E-learning portal. The number differs per training module, whereas the range is 439 – 610 professionals per course.
 6. 4 new funding schemes were developed, one per each target country. In Greece, the funding schemes proposed were mainly related to the restart of previously existing successful schemes, as well as to the enhancement of the dissemination actions in order to raise awareness of the citizens on the energy performance of the buildings and actions for improvement. Regarding the construction of nZEBs, it was proposed the Government to proceed to fiscal incentives by reducing or even exempting relevant taxes. In Cyprus, the relaunching of the previous funding schemes regarding energy efficiency measures in residential and commercial buildings was proposed, but with simpler procedures. Also, it was proposed to remove the achievement of an energy efficient limit after the implementation of energy efficient measures in order to be funded and to increase the funding for the households in order to reach nZEB category and the maximum allowed capacity of the PVs under the net-metering scheme that is currently in action. In Italy, the new funding schemes “**Conto Termico 2.0**”, “**European Energy Efficiency Fund**” and “**Fondo Italiano per l’Efficienza Energetica**” were examined, which refer to incentives for improving the energy performance of the buildings, for clean transport energy and renewable projects and for energy efficiency projects in partnership with ESCos. In Portugal, based on a relevant questionnaire sent to the trainers, trainees and members of the focus group it was concluded



that the typology of funding schemes preferred are “Tax incentives and exemptions”, whereas regarding the specific funding schemes the most ranked choice was “Energy efficient technologies / renewable energy systems”.

4. Conclusion and recommendations

As a conclusion, the SouthZEB project aimed at filling-in the knowledge gap of the professionals regarding the design and construction of nearly zero-energy buildings in the Southern Europe countries, maintaining the building traditions and integrating the nZEB concept in these. The target countries of the project were: Greece, Cyprus, South Italy and Portugal, whereas the front-runner countries in nZEB construction and training procedures that also participated actively in the project by transferring good practices and expertise are: United Kingdom, Austria and North Italy. The project is considered to be successful, since it has met its main objectives and the deliverables prepared are considered of high quality.

More specifically, a large-scale training procedure was realized in the target countries. The ten (10) courses were drafted from the beginning and they were developed on a high-quality level as specified also by the review of the external reviewers – members of the EAB. The training modules reflected the needs of the market since the National Support Groups and experts formatting the focus groups were involved from the beginning of their development. Regarding the assessment exams, these were also developed in a satisfactory way in order to examine the knowledge gained through the trainings.

The training procedure consisted of two main periods: the 1st refers to the workshops, which lasted approximately 4 months and resulted in the certification of 165 professionals as “nZEB trainer” and the 2nd refers to the seminars, which lasted approximately 1 year and resulted in the certification of 1556 professionals as “nZEB designer”. The training procedure was also aided by the development of the E-learning platform, through the development of the SouthZEB portal.

At the end, new funding schemes were proposed by each target country, based on the opinion received by the participants in the seminars/workshops and the National Support Groups in order to enhance the improvement of the energy performance of the buildings and the design and construction of nZEBs.

The partners of the consortium have commonly agreed to maintain the outcomes of the SouthZEB project till 2020 and also the responsible partners in each target country shall proceed to additional trainings under a specific fee. In 2020, the partners shall discuss on the sustainability of the project under a new perspective taking into account the experience gained till then and the conditions prevailing in the target countries.

One issue that was noticed during the implementation of the project was that the E-learning platform did not have the expected impact on the professionals, thus the user registrations were lower than the anticipated ones. It should be mentioned that this may be due to the reluctance of the professionals in the use of the E-learning portal and their preference in physical attendance in the classes for the trainings. For this reason, it is recommended to enhance the existence of the E-learning platform during the dissemination actions combined with the fee that corresponds to each type of learning (physical attendance – distance learning).

Regarding the difficulty in achieving the targets concerning the number of the certified “nZEB trainers” and “nZEB designers”, it is considered that this will be reduced in the next months, after the legal obstacles have been removed through the enforcement of proper laws and the determination of concrete definitions on nZEB and the National Plans to achieve the goals stated in the European

Directive EPBD-recast. Moreover, it is expected that the governments in all target countries to prepare and promote relative funding schemes to increase the construction of nZEBs, therefore this shall play an important driver for the market towards this direction and for the professionals towards training on nZEBs.