A New Learning Programme to Facilitate nZEB Implementation

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Abstract. The goal of nearly zero-energy can be achieved nowadays with existing technologies and practices, but the concept is still unfamiliar and elusive in most of the European countries, considering the whole process chain, despite all previous initiatives in this direction. At this moment there are still barriers in the value chain, making the nZEB concept difficult to arrive at the final users. The nZEB market analysis at European level reveals a significant gap between the countries with a high level of implementation and those which are not so well performing, and which remain more and more behind. To overcome this, a new learning programme to facilitate the nZEB implementation, has been launched in 2021 with the main objective to create support mechanisms and stimulating the development of skills frameworks by new market driven mutual recognition training and certification scheme for nZEB deployment that will facilitate the necessary legislative changes.

Keywords. nZEB, nZEB learning programme, nZEB implementation
DOI: https://doi.org/10.34641/clima.2022.430

1. Introduction

Buildings account for 40% of total energy consumption in the EU and generate 36% of the greenhouse gases in Europe (1). These are resulted from construction, usage, renovation and demolition of these buildings.

According to the European Energy Efficiency Plan 2011 (2), the greatest energy saving potential in order to lower the energy consumption lies in buildings. This is because 75% of the EU's building stock is still energy inefficient and the rate of building renovation remains very low at around 0.4% to 1.2% per year. To meet EU climate and energy objectives, the current rates of renovations should at least double. Also, the annual new buildings growth rate is assessed at around 1% in the European residential sector (3). The decrease in the rate of new constructions in the last decade is mainly due to the financial crisis of the construction sector.

The Energy Performance of Buildings Directive (4) (EPBD)'s specific concept, "nearly Zero Energy Buildings" (nZEBs), has now become a critical requirement for the building sector, along with the challenge for the architects and designers who are divided between keeping up with indoor environment quality standards and solutions for decreasing energy consumption (e.g. airtight buildings). New harmonizing solutions are thus required. Optimising indoor environmental quality with energy reduction is essential for the new buildings and in solving the problem for the existing buildings that are not meeting the expected performance. These buildings can drive occupants to take actions that may compromise the energy economy of the building. In the new context, occupant's comfort and health is one of the key drivers to stimulate the renovation and quality new construction market.

The goal of nearly zero-energy can be achieved nowadays with existing technologies and practices, but the concept is still unfamiliar and elusive considering the whole process chain, despite all previous initiatives massively financed by European Union. There are still barriers in the value chain, making the nZEB concept difficult to arrive at the final users. This discrepancy is even higher when compared within different countries.

A significant problem in the nZEB process is the performance gap between the designed and actual

energy performance in buildings. Main reasons behind that are: inadequate design, bad quality of the construction work, lack of soft landings, lack of continuous commissioning after the installation has been handed over, lack of proper use of systems and implemented technology, lack of understanding of how the technologies work, too general information in O&M manual, difficulties in changing users' previous behaviour etc. Even if, due to EPBD implementation, the public buildings should already be nZEB, the designers still do not know how to apply the nZEB requirements as indicated in the legislation because these are still not clearly linked to the current construction laws.

Results show that feasibility studies will not be focused on nZEB criteria but rather on the classical building functionality. Moreover, based on the feasibility study, tender specifications are further created for design and execution contracts, but usually the design is considered only based on classical construction requirements. Thus, the result is a technical design which is not for nZEB, even if it should be, and being at high risk during execution phase to be blocked by the beneficiary consultant or inspector. This is a classical story of the construction market in Romania. Bulgaria encounters same problems. It could have another version in Poland or Portugal. In Poland for example, the nZEB legislation is not really challenging. The nZEB uptake is driven by bottom-up initiatives, which however are not very frequent due to the lack of tender specifications with higher energy performance. On the other hand, some more advanced countries demonstrate a higher degree of nZEB level, despite of the existing specific barriers. These stories show how a two-speed Europe is represented in the nZEB and energy efficient construction field, leading to gaps and an unharmonized market.

Moreover, these barriers are considerably more important in the residential field, where the concerned end users do not have the information on materials, construction technologies (or renovation packages) and available funding opportunities. Thus, the market is missing important pieces from the nZEB puzzle, like skilled building professionals, across the whole building design, operation and maintenance value chain, ready to implement nZEB concept.

Although legal obligations are provided in the National legal framework by transposing the provisions of the 2010/31/EU Directive, the Nearly Zero Energy Building (nZEB) concept does not seem to be easily applicable yet in many countries from EU. Previous research showed that defining the cost-feasible optimal integration of the technologies suitable for nZEB and the skills gaps experienced by the building sector are among the most important barriers. While the current qualification courses and training schemes are still generally, there are still at a level of not satisfactory and underdeveloped to face the challenge of effective nZEB implementation, the requalification to skilled professionals for renovations and the new constructions of buildings. Despite strong political push towards nZEB and deep energy renovation, the traditionally conservative real estate market is still slow in the uptake of the new building standards and practices, especially in the residential sector. Considering our built environment, the policy efforts are hardly being transposed to more sustainable and environment-friendly lifestyles, and the benefits of nearly zero-energy buildings in terms of comfort, health and well-being are still widely unknown for the broader audiences, being left out of the media attention.

It can be observed that there are several causes that contribute to the difficult application of nZEB criteria in buildings in EU member states. The need to address these issues has become a necessity to increase the level of application of nZEB. For this, a new programme to facilitate the nZEB implementation, has been launched and financed from 2021, in the frame of a H2020 project (5). The main goal of the project is to support the increase of the market readiness for an effective nZEB implementation and to stimulate the demand for energy related skills and is oriented toward three different pillars: awareness, training, and support, responding to the critical points of market barriers, as identified in most European countries.

The aim of nZEB Ready project is to leverage the market drive by responding to 3 key questions: "Why nZEB?"; "Who can provide nZEB?"; and "How to reach nZEB". Thus, the nZEB Ready project will prepare ready to use frameworks to answer the needs related to lack of awareness, lack of skilled professionals and lack of support instruments, implementing the nZEB ready labelled procedures in 5 pilot countries in order to obtain a broader range of results, representative at European level. The frameworks obtained will be validated by specific stakeholders which are already part of the advisory board of the consortium and will be the starting point for the nZEB readiness roadmap for further replication in a wider use at the European level.

2. Objectives of the learning programme

Usually, improvements in energy efficiency planning and investments can decrease the energy consumption in the construction sector and unlock the nZEB market, but the reality shows us that it is not enough. The nZEB market analysis at European level reveals a significant gap between the countries with a high level of implementation and those which are not so well performing and which remain more and more behind (6). For these countries, energy efficiency is still an area with great potential to reduce greenhouse gas emissions.

Concerning this aspect, the countries like Bulgaria and Romania are consistently underperforming.

Related to the nZEB market it can be seen the problems related to jobs and qualifications needed. Through the market sustainable initiatives, countries like Croatia and Poland would preserve jobs in the construction sector, create new jobs and stimulate both public and private investments, thus contributing to the green recovery which will further contribute to other sectors like innovation and the development of new technologies, the production of new sustainable materials, new systems based on renewable energy sources. Moreover, some countries such as Bulgaria, Poland and not long-ago Romania, have low levels of ambition for tackling the energy transition, being still highly dependent on fossil fuel.

As previously stated, an nZEB building is a very high energy performance building with nearly zero or very low amount of energy use that should be covered to a very significant extent by on-site or nearby energy production from renewable sources. On one hand, reaching the nZEB target is very complex in new buildings and the level of difficulty rises in case of energy renovation of existing buildings, where the implementation of the renovation measures is limited. The renovation process to high energy performance, or even new construction process, is reduced by social (lack of reliable information or doubts on the potential benefits), technical (lack of skilled workers and proper support tools) economic (energy savings are not clear and the investment results reduced), and financial (scarce capital or limited financing scheme available or knowledge) barriers.

We are proposing in this paper a new learning programme to facilitate the nZEB implementation, which its main objective is to create support mechanisms and to stimulate the development of skills frameworks by new market driven mutual recognition training and certification scheme for nZEB deployment that will facilitate the necessary legislative changes. It can be observed that the lack of skilled professionals is one necessary step to break the vicious cycle of a blocked nZEB market (Fig.1).

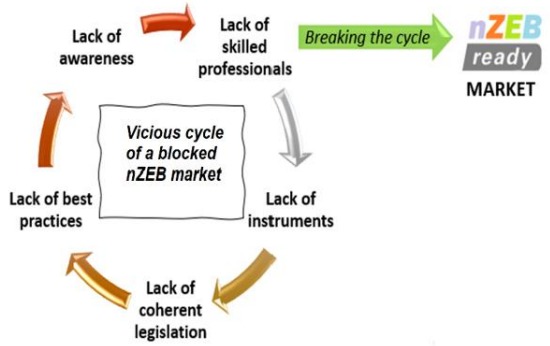

Fig. 1 – Breaking the vicious cycle of a blocked nZEB market (5)

Thus, the objective of the learning programme, namely the increasing the number of the skilled nZEB professionals is responding to the market barriers and needs, generated by the lack of skilled professionals which are essential in the nZEB construction chain, by expanding the pool of nZEB specialists for the design, execution, evaluation and validation of nZEB projects through dedicated training modules and replication activities. This will facilitate the increase of the available pool of skilled persons to be requested in nZEB tendering documentation.

The objective to increase the number of skilled nZEB professionals is referring at both "blue collar" and "white collar" professions across the building design, operation and maintenance value chain (designers, architects, engineers and other building professionals). In the frame of this objective, an important goal is to achieve and to implement mutual recognition procedures. The lack of skilled professionals is a problem extended to European level, but more critical on several markets. Among these critical markets, the 5 pilot countries that are partners in the nZEB Ready project encounter different concerns related to market labour for the nZEB specialists (5).

3. Approach of the learning programme

The nZEB Ready programme will provide a complex set of learning/training frameworks for nZEB concept, design, evaluation, execution, and exploitation by gathering together the already existing courses from previous European initiatives with new courses addressing domains not covered yet, to fully complete an nZEB approach.

Iven the discrepancies in the nZEB application between European countries, the approach will be specific for each state depending on the needs identified for each of them but the whole courses/training framework will facilitate the mutual recognition of energy skills and qualifications in the building sector. Based on the common learning results obtained from the training programs it will be possible to develop nZEB ready energy skills passports/registers for building professionals at regional/national level and support for their take up at European level.

One of the sensitive points regarding the actual nZEB market and the real demand for nZEB skills is that even if regulations requesting nZEB construction already exist, they are not applicable because of the lack of methodologies or lack of nZEB professionals even at the public authority level. This learning programme will support the public authorities for the requirements for skilled professionals in public procurement by providing guidelines for tender documents oriented towards nZEB skilled professionals. There will be also provisioned training programmes dedicated to public authorities, especially in Romania and Bulgaria, to help the administration to better understand the need to properly enforce the nZEB regulation.

To increase the number of skilled building professionals and/or blue-collar workers the learning programme will contribute to substantially increase the number of

nZEB professionals. Modules dedicated to white collars (e. g. architects, auditors, or engineers) and modules dedicated to blue collars related to nZEB buildings are considered. This a critical issue of the nZEB application in European countries because it will produce nZEB skilled professionals available on the market. The implementation of a mutual recognition procedure of the skilled nZEB professionals will be possible relying on the competences validated by the specific training programs.

4. Implementation of the learning programme

The learning programme to facilitate nZEB implementation will be implemented and tested on different layers in the 5 pilot countries (Romania, Bulgaria, Croatia, Poland, and Portugal) considering the needs addressed locally. This will guarantee the replicability success of the solutions.

According to the study (7), most of the countries from the European Union already introduced concepts regarding the implementation of nZEB buildings in their regulations and national plans. From the Fig.2, we can observe that in practice no country implemented the principles 100%.

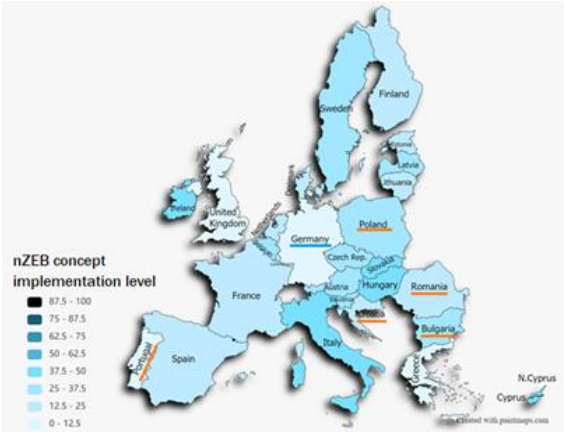

Fig. 2 – nZEB concept implementation across EU (5)

The project outcomes will be easily scalable to all member countries and easy to implement in any other country, regardless of the nZEB implementation level and knowledge. This is why the nZEB ready project has a key role in developing the nZEB market needs and skills all around Europe.

The 5 pilot countries were chosen based on a nZEB implementation questionnaire which revealed different needs and different problems on the local market, each indicating a certain level below the nZEB readiness level. Romania has a fair legislation, but it is not enforced accordingly. Moreover, there is an obvious need for new skills for the building designers and the nZEB concepts awareness must be increased to be properly implemented on a wider scale. Croatia has a good level of nZEB awareness and acceptance but needs to improve continuous learning programs regarding the nZEB design and construction skills. Portugal has nZEB regulation with specific requirements although still unclear, while the awareness level is moderate. Poland has fair regulations regarding the nZEB principles, but technical nZEB requirements are not ambitious and can be easily achieved.

There will be learning and training programmes dedicated to white collars especially for designers, architects or engineers but also to execution engineers, programmes that will cover specific skills characteristic to nZEB buildings like blower-door testers or thermal bridge evaluators and programmes for public authorities represented mainly by local administration. These ones will be trained and will get access to specific procedures and know-how relevant for nZEB market helping them to decide correctly regarding building permits authorisation. The circle of learning programmes will be closed by the modules dedicated to blue collars regarding nZEB Ready competences. It is particularly important to outline that the level of knowledge is not the same in each country part of the consortium. The existing successful learning modules from some countries will serve to adapt new modules in the countries where they are partially or completely missing. There will be new learning modules provided where they are totally missing or where the existing learning programmes are not valuable or applicable anymore. Each of the five countries participating in the program will make an analysis of critical categories to be trained and their training needs. Each country will organise pilot learning modules for the selected target categories and regarding the selected training programs to prove the feasibility of the whole nZEB Ready curriculum. The learning results from the whole learning modules will cover the competences needed to be nZEB Ready recognised and to have the “nZEB Ready passport”. Finally, the nZEB Ready curriculum will be integrated in the nZEB Ready platform web-development to ensure the content dedicated to continuous learning training and certification program for mutual recognition.

Two main learning programs categories will be defined here based on the needs identified. The first program is dedicated to the nZEB auditors and to the nZEB designers, architects or engineers. The training program is addressed to architects and engineers which are already energy auditors, and the learning outcomes will allow the graduates to assess an existing building and, in addition to the energy audit of the building, will provide technical solutions to increase the energy efficiency of the house toward nZEB. The program is dedicated also to the design of nZEB addressing the three professionals’ categories involved in achieving the nZEB target: architects, civil engineers and MEP engineers. The purpose of this learning program is to cover the gap of knowledge between nZEB concept principles and normal building principles, which is designed on a daily basis in each country. The designers will need to focus on a new integrated design concept and to unify their knowledge to design nZEB buildings. There will be six course modules: Thermal bridges calculation, Mechanical ventilation system with heat recovery, Building air tightness evaluation, Solar Shading systems, Bioclimatic Design Renewable energy sources. Romania and Bulgaria will implement most of the training programs because the competences are missing there. Croatia and Poland are better covered in current practice. Portugal will also develop learning

programs for the missing competences identified. The second learning program is dedicated to execution civil engineers and MEP engineers, and it will be divided in two learning modules, one for each category. This program will provide learning outcomes for the stakeholders involved directly in the on-site execution: workers, site managers, site coordinators, site professionals, contractors etc..

Two dedicated specific modules for key specialists in the market needed for nZEB certifying will be developed: blower-door testers and thermal bridges evaluator - infrared evaluator. These very specific skills are needed to sustain the nZEB assessor to complete the building certificate. Not only engineers or architects but also skilled workers could be integrated within these modules. The learning outcomes will be strictly related to practical methods used to measure technical parameters. This kind of learning programs will be developed mainly in Bulgaria where they are rather missing and in Croatia where some adult learning programs or university learning programs exist but are not enough. In Romania and Portugal there are already developed continuous learning programs dedicated to the above professional skills, which needs however to be significantly improved. Even so, each partner from the consortium will develop pilot modules in its own country for blower-door testers and thermal bridge evaluators as it is outlined in the table below.

Specialized training programs for blue collars professionals to integrate the learning outcomes regarding the nZEB buildings corresponding to the appropriate level of knowledge. The learning program related to this task will be split in two modules: 1. Construction skills related to nZEB; 2. Mechanical, electrical and plumbing (MEP) skills related to nZEB. They will attend either the Construction skills module, or the MEP skills module depending on their specialization.

Not the least, Public Authorities Staff and other decision makers will gain a deep understanding of the impact of policy instruments for supporting nZEB initiatives and support their specific design. The decision makers involved will get access to specific procedures and know-how relevant for nZEB market. This participation can provide transparency and confidence in the long-term perspective of this sector. In particular, this learning program is dedicated to people working mainly in local or central administration services who are generally responsible for the building permit authorisation.

The last part of the learning programme consists in creating and developing content dedicated to continuous learning training and certification programs for mutual recognition. The learning programs curriculum will be integrated to an online platform locally by each participant.

5. Conclusions

A new learning programme to facilitate the nZEB implementation, has been launched in 2021 with the objective of increasing the number of the skilled nZEB professionals is responding to the market barriers and needs, generated by the lack of skilled professionals which are essential in the nZEB construction chain, by expanding the pool of nZEB specialists for the design, execution, evaluation and validation of nZEB projects through dedicated training modules and replication activities.

Modules dedicated to white collars and modules dedicated to blue collars related to nZEB buildings are considered as well as the modules dedicated to Public Authorities Staff in order to gain a deep understanding of the impact of policy instruments for supporting nZEB initiatives and support their specific design.

6. Acknowledgement

The acknowledgement can be used to mention support from a funding organisation or from people who are not named as co-author. If the research presented received an in cash or in-kind contribution from a funding agency, government, companies or anyone else, please mention that here.

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