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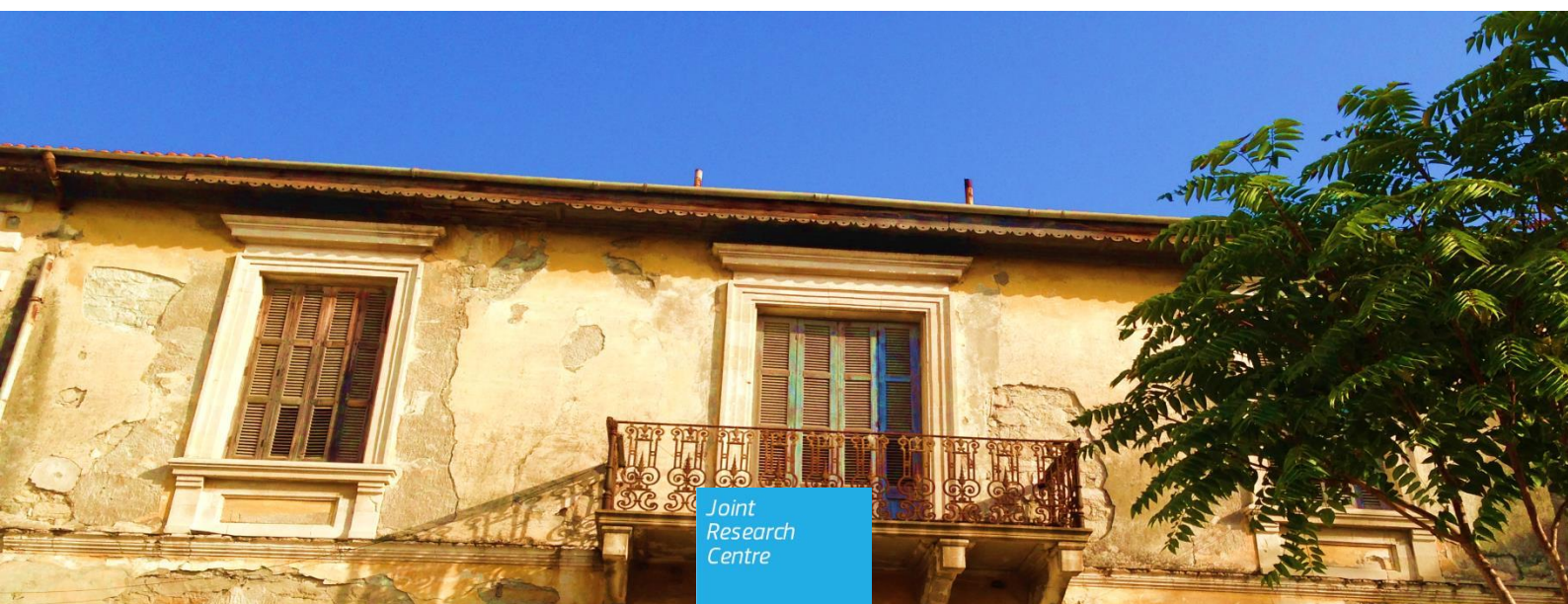
Final Report

Transition towards NZEBs in Cyprus (D2.5)

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Abstract

This Final Report consists of findings of both JRC Technical Report "Barriers towards Nearly Zero Energy Buildings (NZEBs) in Cyprus" and the JRC Technical Report "Training of professionals for energy efficiency in buildings in Cyprus" and it is aimed at providing a framework for a transition towards NZEBs in Cyprus.

Information on NZEBs definitions in Member States with a particular focus on Cyprus is provided as well as best practices measures and policies related to buildings' renovation that can be considered in the Cypriot framework. Barriers towards NZEB implementation are identified specifically for Cyprus.

The report highlights that the current policy framework has made relatively little progress towards providing effective solutions to these barriers as little attention has been drawn on how to solve them. After the analysis of the situation, possible recommendations, policies, and measure to overcome these barriers have been suggested. Best practices are identified in other EU Member States to highlight good case studies that could be applicable to the Cypriot context.

Training of professionals, identified as essential to meet challenging energy efficiency and building renovation goals especially for NZEBs, is also analysed in depth. After the first phase of the BUILD UP Skills Initiative, a comprehensive Intelligent Energy Europe initiative to increase the number of qualified workers in the building workforce in European countries, some specific training programs and schemes have been developed and implemented in Cyprus, especially within the framework of EU-funded projects.

The assessment of the current national situation highlighted some areas with potential for improvement (e.g. modular training, engagement of building owners, employers and other stakeholders, interdisciplinary training) which should be addressed in a near future. In particular the conception and development of a comprehensive and long term strategy is recommended, rather than a set of specific isolated pilot projects in order to build competences and being ready for the challenges posed especially by NZEBs requirements.

1. Overview and background

The JRC has provided technical assistance to European Commission Structural Reform Support Service (SRSS) within the framework of the Administrative Arrangement no. SI2.211494. As part of this wider project, we reviewed and analysed the situation in Cyprus regarding Nearly Zero Energy Buildings (NZEBs) with the aim of suggesting strategies to promote the transition toward Nearly Zero Energy Buildings (NZEB) for improving the energy efficiency and reducing the cost of energy bills in the buildings sector in the framework of the Directive 2010/31/EU.

This research activity aimed specifically at supporting the Cyprus authorities to fulfil the requirement of article 9 of the EPBD (Directive 2010/31/EU). According to this article Member States (MS) shall ensure that by 31st of December 2020 all new buildings are NZEB. In order to achieve this target MSs have to take the following measures: i) draw up national plans which shall include detailed application in practice of the definition of NZEB, intermediate targets for improving energy performance of new buildings by 2015 and information on the policies and financial or other measures adopted. The first plan had to be submitted to the European Commission (EC) by September 2012; ii) develop policies and take measures such as setting of targets in order to stimulate the transformation of buildings that are refurbished into NZEB.

The Ministry of Energy, Commerce, Industry and Tourism (MECIT) after consultation with the stakeholders has prepared the technical definition of NZEB in Cyprus, which is expected to become a legal document in 2014. Also, in September 2012 it has developed an action plan for NZEB. Financial incentives regarding NZEB are proposed in the framework of Structural Funds for the period 2014 – 2020, but only for residential buildings that are refurbished.

The following aspects are identified as crucial in the transition toward nZEB, both for all new buildings to be NZEB by 2020 and for increasing the number of buildings that are refurbished to NZEB:

- Design of financial and other incentives
- Identifying regulatory and non-regulatory barriers and ways to overcome them
- Information to consumers and stakeholders
- Training of professionals of the building industry

These points were translated into sub-activities, which have been addressed by the JRC:

- 1) Analysis of existing financial incentives for the NZEBs.
- 2) Identification of the regulatory and non-regulatory barriers for the transformation of the building stock towards NZEBs, including the assessment of the barriers for the adoption of renewable energy sources in buildings, and proposals for policies and measures to remove these barriers.
- 3) Identification of stakeholders relevant to the transition toward NZEB, preparation of communication and dissemination material for effective information to the stakeholders about the concepts, cost and benefits and technologies related to NZEBs.
- 4) Support for the training of the professional in the building industry and identification of the main training needs in the Cyprus construction industry.

The main findings have been collected in JRC technical reports. Since the activities 1 and 3 were already covered in the definition of an overall strategy for the renovation of the

Cyprus building stock and summarized in the JRC Technical Report "Long-term strategy for mobilizing investment for renovating Cyprus national building stock", the scope of the present Report is to collect and summarize the contents produced under activity 2 and 4, which consists of the Deliverables 2.2 and 2.4 of the Administrative Arrangement, published as JRC Technical Reports.

This Final Report is therefore organised as follows:

- chapter 2 reports the findings of the JRC Technical Report "Barriers towards Nearly Zero Energy Buildings (NZEBS) in Cyprus";
- chapter 3 collects the findings of the JRC Technical Report "Training of professionals for energy efficiency in buildings in Cyprus".

2. Barriers towards Nearly Zero Energy Buildings (NZEBs) in Cyprus

2.1 Background

European energy policies are focused on the reduction of energy consumption in buildings by 2020. The European Commission encourages Member States to decrease energy consumption in buildings and convert national building stocks from energy consumers to energy producers through retrofit measures and renewable energy sources (RES). The implementation of nearly zero energy buildings (NZEBs) from 2018 onwards represents one of the biggest opportunities to increase energy savings and reduce greenhouse gas emissions.

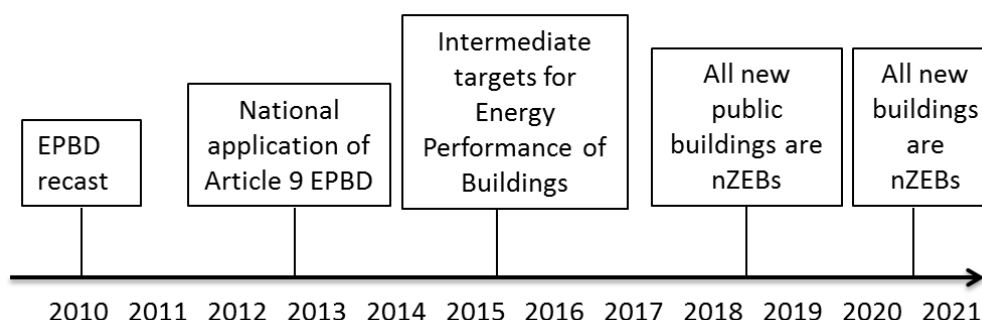
According to the Energy Performance of Building Directive (EPBD), Member States have to ensure that new buildings occupied and owned by public authorities are nearly zero energy buildings (NZEBs) after December 31, 2018 and that all new buildings are NZEBs by December 31, 2020. In the last year, many NZEB definitions have been implemented at national level.

In accordance with the EPBD, a NZEB is a building that "has a very high energy performance with the nearly zero or very low amount of energy required covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby". The first part of this definition establishes energy performance as the defining element that makes a building a 'NZEB'. This energy performance has to be very high and determined in accordance with Annex I of the Directive. The second part of the definition provides guiding principles to achieve this very high energy performance by covering the resulting low amount of energy to a very significant extent by energy from RES.

The EPBD also foresees the assessment of cost-optimal levels related to the establishment of minimum energy performance requirements in buildings. Intermediate targets for improving the energy performance of buildings have to be provided as part of National Plans for increasing the number of NZEBs. Member States also have to develop policies and take measures to stimulate the transformation of refurbished buildings into NZEBs.

The current situation towards the establishment of applied national NZEBs definitions in European Countries has improved recently. The timeline for the implementation of NZEBs according to the EPBD recast is illustrated in Figure 1.

Figure 1: Timeline for NZEBs implementation according to the EPBD recast.



The progress of Member States towards the establishment of NZEB definitions has been evaluated by the Commission based on the National Plans and the templates, the Commission report of 2013 and its update of October 2014, as well as information from the EPBD Concerted Action (CA), Energy Efficiency Action Plans (NEEAP), and National Codes. Among the aspects taken into account there are: building category, typology, physical boundary, type and period of balance, included energy uses, renewable energy sources (RES), metric, normalization, and conversion factors.

Progress may be seen in many EU Member States compared with the very first attempts to establish NZEB definitions. This has been with the assistance of greater guidance provided to EU Countries in the setting of consistent NZEBs requirements.

About the energy calculation, one of the main discussed topics, the analysis of national NZEBs definitions reveals that:

- The main included energy uses are: heating, DHW, ventilation, and cooling. Auxiliary energy and lighting are taken into account in almost all EU Member States. Several Member States also include appliances and central services.
- The most common choice regarding the energy balance calculation is the difference between the primary energy demand and the energy generated, over a period one year, and considering annual constant weightings/factors (e.g. primary energy factors);
- Single building or building unit are the most frequent indicated physical boundary for the calculation, but the overall impression is that the differences among building unit/site/zone/part need to be better addressed.
- As regards the normalization factors, conditioned area is the most agreed upon choice in EU Member States. Although other options, such as net floor area and treated floor are selected.
- The most common considered RES option is the on-site generation, but many countries also consider external generation and nearby generation (but probably not always with the same meaning).
- Almost all Member States prefer the application of low energy building technologies and available RES. The most used technologies are PV, solar thermal, air- and ground-source heat pumps, geothermal, passive solar, passive cooling, wind power, biomass, biofuel, micro CHP, and heat recovery.

A NZEB can be achieved by combining high efficient technologies with RES.

In principle the NZEB level for new buildings cannot be below (less stringent) than the 2021 cost-optimal level that has been calculated in accordance with Article 5 of the Directive. The cost-optimal level is the minimum level of ambition for NZEBs performance. The NZEBs level of energy performance for new buildings is determined by the best technology available and well introduced on the market at that time, financial aspects and legal and political considerations at national level. One of the key points around NZEBs at EU level is how to successfully stimulate cost-effective deep renovation of existing buildings to NZEBs.

The Directive requires Member States to define the detailed application in practice of "a very high energy performance" and the recommendation of "a very significant extent by energy from renewable sources, in line with their local characteristics and national contexts". This, together with the absence of a harmonised calculation methodology for energy performance, leads to applied national approaches not fully comparable. Moreover, within European Member States, the achievement of a NZEB clear definition is not fully reached and the implementation of NZEBs into construction practices and routines, especially at a refurbished level, is far to be obtained. Several obstacles for the transformation of the building stock into NZEBs can be identified at European level.

Barriers and challenges can be found in relation to both NZEBs renovations and new buildings. Most of these barriers are linked to residential NZEBs renovation and they appear common among all European Member States. Nonetheless, there are challenges

and barriers that are more country-specific. In December 2012, Cyprus transposed the recast of EPBD Directive in his national legislation by the Law 210(I)/2012 which amended the Law for the regulation of the energy performance of buildings. Based on this new legal framework, the cost-optimal levels of minimum energy performance requirements were calculated and revised, minimum requirements on thermal systems were implemented and measures to promote NZEB have been taken.

In August 2014, a ministerial order was issued defining the requirements that a building has to fulfil in order to be a NZEB and the cost-optimal calculation has shown that NZEBs are very close to the cost-optimal levels (especially for some types of buildings).

Moreover, in the last years Cyprus has put in place a series of energy efficiency legislations, including requirements for new constructions and renovations which are expected to reduce the energy consumption and overall energy dependence of the country in the coming years.

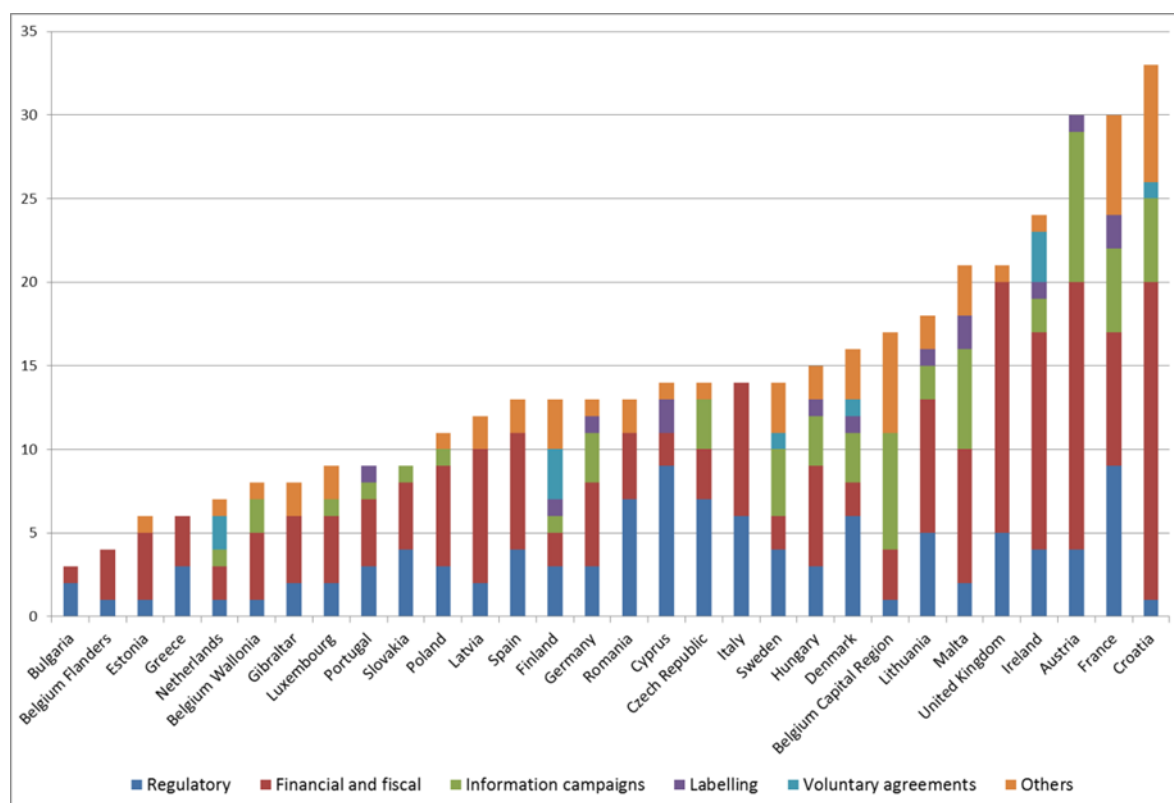
After transport, the residential and services sectors are the second largest energy consuming sectors in Cyprus at 289.7 ktoe and 199.8 ktoe respectively (in 2014). Moreover, Cyprus ranks the third most energy dependent EU Member State.

Cyprus is the European country with the higher share of recent dwellings (i.e. built after 2000). However less than 10% of the residential buildings stock is equipped with wall, roof or basement insulation, while over 50% of the buildings remain without any insulation. On the other hand the solar thermal installations are mandatory for all new residential buildings. This makes Cyprus one of the worldwide leaders in this area.

According to the NEEAP Guidance, Member States were requested to provide within their Renovation Strategies an overview of the policies measures to stimulate cost effective deep renovations of buildings, in particular to: i) give an appraisal of existing measures/policies in the Member States; ii) provide an analysis of existing barriers to deep building renovation; iii) give an appraisal of relevance of policies used in other territories; iv) provide a design of new policy landscape that addresses barriers and enables the delivery of the required ramp up in deep renovation activity, with a particular focus on those measures which need to be introduced within the next 3 years.

Overall, Member States addressed quite exhaustively Article 4(c) requirements, providing a comprehensive set of policy designed to address the identified barriers, with 23 strategies that resulted to be fully compliant, 6 partly compliant and only 1 non-compliant (i.e. Belgium Wallonia). As shown in Figure 2 there is a great heterogeneity of policy packages in different Member States, both in terms of absolute number and in terms of policy type, with a predominance of financial/fiscal and regulatory measures.

Figure 2: Number of all the measures in the building sector (implemented and planned) by country and type.



Under the Article 19 of the EED, Cyprus has notified the existence of the Special Fund for Renewable Energy Sources (RES) and Energy Savings (ES), established under the 2003 Law on Encouraging and Promoting the Use of Renewable Energy Sources and Energy Saving (Law 33(I)/2003). The grant schemes offered under the Special Fund support renewable energy and energy conservation measures available to households, public authorities and commercial companies. No specific design parameters for groups that face issues related to the split incentive barrier are currently offered by the grant schemes, so it is not possible to evaluate how successful they have been in practice in tackling split incentive issues. Although landlords can, in theory, apply for an upgrade of their rental properties, in practice the split incentive barrier remains an important hurdle. Moreover, each beneficiary can submit only one application, which means that landlords will likely choose to upgrade their owner-occupied property before upgrading their rented one. In terms of SMEs, a subsidy can be given to SMEs to upgrade a building that they either own or rent.

2.2 NZEBs definitions

In Europe and in Cyprus as well, buildings are a strategic focus of past and ongoing policies aiming to achieve a sustainable and competitive low-carbon economy by 2020.

An official NZEB definition has been launched by the Legislative act August 1st 2014 in Cyprus. This definition includes all buildings (single family houses, apartment blocks, offices, educational buildings, hospitals, hotels/ restaurants, sport facilities and wholesale/retail) and it differs only between residential and non-residential buildings. It considers private and public buildings, indicating single building or building unit as physical boundary and one year as calculation period for the balance. Heating, DHW,

ventilation, cooling, air conditioning, auxiliary energy are included within energy uses, both for residential and non-residential buildings. For system boundary energy generation, on-site and nearby are considered. In relation to RES generation, solar thermal, geothermal, passive solar, passive cooling, heat recovery, and PV are included.

Cyprus definition appears in line to that of other Member States. Table 1 reports a qualitative evaluation of the current status of NZEB development in EU Member States and compliance with the EPBD requirements. It includes the main aspects discussed in this report, such as the NZEB applied definitions, the inclusion of RES in the NZEB concept, intermediate targets (qualitative and quantitative) as well as measures to promote NZEB renovation. For this evaluation three colours have been used: a satisfactory development of the specific NZEB issue has been indicated with green, a partial development with orange and a lack of definition or of clarity with red.

Table 1: Assessment of NZEBs development in Cyprus and other Member States (green: satisfactory development; orange: partial development; red: not defined/unclear).

MS	NZEB Definition	RES included in the NZEB concept	Qualitative and quantitative intermediate targets	Measures promoting deep or NZEB renovation
CY				
AT				
BE Brussels				
BE Flanders				
BE Wallonia				
BG				
CZ				
DE				
DK				
EE				
EL				
ES				
FI				
FR				
HR				
HU				
IE				
IT				
LV				
LT				
LU				
MT				
NL				
PL				
PT				
RO				
SI				
SK				
SE				
UK				

Most MS refer both to new and retrofit, private and public, and residential and non-residential buildings in their definitions. Results illustrate that most common choices include demand/generation as balance, performed over a year using conditioned area as normalization factor and static conversion factors as time dependent weighting. Nevertheless, many countries have not yet defined the selected type of balance. Single building or building unit are the most frequent indicated physical boundary, and on-site the most common considered RES options.

Progress at EU level shows that Member States use the existing flexibility to adapt to national circumstances. Different system boundaries and energy uses are the cause of high variations within the described definitions. The level of energy efficiency, the inclusion of lighting and appliances, as well as the recommended renewables to be implemented vary from country to country.

In particular, the requirements provided by Member States in terms of primary energy show a significant variability and reflect different national and regional calculation methodologies and energy flows. National energy policies have evolved with new legislation and methodologies introduced with technical regulatory measures to improve the energy efficiency of buildings and RES generation.

The proportion of renewable energy production in Cyprus has been defined as a percentage: 25%. Other countries have indicated more ambitious values, such as Germany (60%), and Denmark (56%). Therefore this percentage might be reconsidered also in the light of the Cyprus climate that encourages solar renewable production.

The reduction of energy demand through energy efficient measures and the utilization of RES to supply the remaining demand have reached common agreement towards the implementation of the NZEB concept across Europe.

In relation intermediate targets for improving the energy performance of new buildings by 2015-2016, most EU Member States, including Cyprus, presented only qualitative targets (e.g. strengthening building regulations, obtaining energy performance certificates by a certain year). This justifies the red colour given to Cyprus in relation to these targets in Table 1. The targets appear extremely variable, and the quantitative targets (about the number or share of NZEBs) are almost never defined (e.g. 60.000 new NZEB dwellings by 2015 in the Netherlands). Intermediate targets are under consultation in Cyprus and the design parameters have to be finalized. However, in many MS there are no targets, or they are not consistent with long-term climate mitigation targets. Targets are necessary to evaluate the impact of a policy instrument. Interim targets are necessary to design suitable instruments and to monitor their attainment. For example, in Germany there are targets for the reduction of the energy demand of the building stock: by 2050 a reduction of primary energy consumption by 80% shall be achieved.

Information collected on energy performances in Cyprus and other Member States are reported in Table 2.

Table 2: Building energy performances in Cyprus and other Member States.

Country	Residential buildings [kWh/m ² y or Energy Class]		Non-Residential buildings [kWh/m ² y or Energy Class]	
	New	Existing	New	Existing
CY	100	100	125	125
AT	160	200	170	250
BE	45 (Brussels region) 30 (Flemish region) 60 (Walloon region)	~ 54	95-2.5°C (Brussels region) 40 (Flemish region) 60 (Walloon region)	~ 108
BG	~30-50	~40-60	~30-50	~40-60
CZ	75-80% PE	75-80% PE	90% PE	90% PE
DE	40 % PE	55% PE	n/a	n/a
DK	20	20	25	25
EE	50 (detached house)	n/a	100 (office buildings)	n/a
			130 (hotels, restaurants)	n/a
		n/a	120 (public buildings)	n/a
		n/a	130 (shopping malls)	n/a
	100 (apartment blocks)	n/a	90 (schools)	n/a
		n/a	100 (day care centres)	n/a
		n/a	270 (hospitals)	n/a
FR	40-65	80	70 (offices without AC)	60% PE
		n/a	110 (offices with AC)	n/a
HR	33-41	n/a	n/a	n/a
HU	50-72	n/a	60-115	n/a
IE	45 (Energy load)	75-150	~ 60% PE	n/a
IT	Class A1	Class A1	Class A1	Class A1
LV	95	95	95	95
LT	Class A++	Class A++	Class A++	Class A++
LU	Class AAA	n/a	Class AAA	n/a
MT	40	n/a	60	n/a
NL	0	n/a	0	n/a
PL	60-75	n/a	45-70-190	n/a
RO	93-217	n/a	50-192	n/a
ES	Class A	n/a	Class A	n/a
SE	30-75	n/a	30-105	n/a
SI	45-50	70-90	70	100
SK	32 (apartment buildings)	n/a	60-96 (offices)	n/a
	54 (family houses)	n/a	34 (schools)	n/a
UK	~ 44	n/a	n/a	n/a

It is evident that Member States mainly focused on the requirements for new buildings and rarely introduced different limits for the existing ones. The EPBD requires adjusting the major renovations to the new constructions, but some Member States decided to introduce less stringent (and probably realistic) requirements. This is the case of Bulgaria, Germany, France, Ireland and Slovenia.

In Cyprus, the provided values appear higher compared to many other Member States, and new minimum energy performance requirements (last revision before NZEB becomes mandatory) should be issued in 2016. Furthermore, Cyprus gives the same reference value between new and existing residential buildings. In relation to non-residential buildings, Cyprus can divide buildings in sub-categories as other Member States did.

According to the Commission Recommendation of 29 July 2016, regarding the Guidelines for the promotion of NZEBs, reference values of new buildings for the Mediterranean climate are:

- Offices: 20-30 kWh/(m²y) of net primary energy with, typically, 80 — 90 kWh/(m²y) of primary energy use covered by 60 kWh/(m²y) of on-site renewable sources;
- New single family house: 0-15 kWh/m²y) of net primary energy with, typically, 50-65 kWh/(m²y) of primary energy use covered by 50 kWh/(m²y) of on-site renewable sources.

The values are derived from projecting the 2020 prices and technologies, benchmarks for the energy performance of NZEB for the different EU climatic zones.

The majority of EU Governments, Cyprus included, decided also to consider higher energy requirements for the non-residential buildings (which typically consume more energy for cooling and lighting), but in few cases different energy limits for different non-residential categories have been defined. Considering the great variety of the non-residential building stock, this approach (applied by Estonia, France and Slovakia) should be recommended in Cyprus as well.

Most residential buildings are equipped with thermal solar systems for warm water, while the use of solar energy for electricity generations is significantly limited in all dwellings despite the significant potential that exists in Cyprus. Around 5% of owner-occupied dwellings do not use any type of solar energy technology as opposed to 10% rented buildings. Renewable energy technologies such as solar thermal and PV systems are more cost-effective in the Cypriot Mediterranean climate (characterised by higher solar radiation) than in other climates. Therefore, these technologies can have a higher contribution to tighter energy performance requirements.

2.3 Best practices policies designed to target building renovation

Most Member States, including Cyprus, did not describe in a detailed way policies and measures that would lead to the NZEB level in refurbishments. Among the best practices for the transformation of the existing building stock towards NZEB there are: technology awareness, incentive schemes, financial instruments, taxation mechanisms. Economic instruments include energy saving obligation schemes, market instruments such as public private partnerships to stimulate building renovation or one stop solution centres giving advice on energy renovation.

In most Member States a wide range of policies has been selected to increase the number of NZEBs (e.g. awareness raising and information, education and training, strengthening building regulations and energy performance certificates, chosen by Cyprus and: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Sweden, Slovenia, United Kingdom). However, policies sometimes seem rather general and addressed to 'all buildings'. Their specific support to NZEB is not always sufficiently clear, nor is to what extent they contribute in practice to achieving the NZEB target in a country. Therefore, a stronger connection between policies, measures and NZEB is recommended. Reported policies appear in line with the EPBD requirements, but rarely do these legislative and normative measures explicitly refer to a clear definition of an NZEB renovation.

Refurbishment into NZEBs means a refurbishment of a magnitude that allows the energy performance requirements of a NZEB level to be met. This does not prevent having different timelines and financial support for existing buildings, in recognition of the longer period required for NZEB levels to be cost-optimal in the case of existing buildings.

In order to summarise recent improvements towards the effective support of deep and NZEB renovations, additional data sources have to be considered. For the present analysis we refer to: i) the ODYSSEE-MURE database¹ includes around 2000 energy efficiency policy measures (including their impact); ii) the GBPN on-line Policy Tool for Renovation² which captures the performance of current best practice in some EU Member States and enables their comparison; iii) the third NEEAPs provided by EU Member States in mid-2014 which include descriptions of the new measures adopted; iv) the first renovation strategies in line with Article 4 of the Energy Efficiency Directive which Member States were due to provide by 30th April 2014.

Successful policy measures can be selected from ODYSSEE-MURE, which includes about 225 measures explicitly related to the renovation of the residential and non-residential existing building stocks. Selecting the most recent ones (those adopted in the last 10 years), excluding the legislative-normative ones and focusing on those with a medium or high impact, around 50 interesting ongoing or proposed measures can be recognised. They are listed in Table 3.

Table 3: Best practices ongoing and proposed on building renovation with medium or high impact, extracted from the ODYSSEE-MURE database, to be considered for the Cyprus context.

¹ <http://www.measures-odyssee-mure.eu/>

² <http://www.gbpn.org/databases-tools/purpose-policy-tool-renovation>

MS	Sector	Measure title	Status	Type	Starting Year
AT	Residential	klima:aktiv building - new standards for efficient buildings	Ongoing	Information-Education	2005
BE	Residential and Tertiary	Brussels - Develop and promote exemplary buildings - BATEX (with virtually zero consumption and of high environmental quality)	Finished	Financial	2007
BG	Residential	EU-related: Energy Performance of Buildings EPBD (Directive 2010/31/EU) - National Program for Renovation of Residential Buildings in the Republic of Bulgaria, 2006-2020	Ongoing	Financial	2007
	Residential	Support for energy audits in multifamily buildings at guaranteed implementation of the recommended measures	Ongoing	Financial	2012
	Residential	Support for energy efficiency in multifamily buildings	Ongoing	Financial	2012
	Residential	Energy renovation of Bulgarian residential buildings	Ongoing	Financial	2012
	Tertiary	National Strategy for financing the building insulation for energy efficiency 2006-2020 - services	Ongoing	Financial, Legislative-Informative, Legislative-Normative	2006
DE	Residential	Tax incentives for Energy renovations	Ongoing	Financial	2015
	Residential	KfW Programme "Energy-efficient refurbishment" (former CO2 Building Rehabilitation Programme)	Ongoing	Financial	2009
DK	Residential	Strategy for energy renovation	Ongoing	Information-Education, Legislative-Normative	2014

MS	Sector	Measure title	Status	Type	Starting Year
EE	Residential	National Development Plan for Housing Sector 2008-2013	Ongoing	Financial, Information-Education	2008
	Residential	Building design and construction supervision support for apartment associations for making preparations for major renovation	Ongoing	Financial	2010
	Residential	Support scheme for reconstruction of apartment buildings	Ongoing	Financial	2010
	Residential	The programme of renovation loan for apartment buildings (under the Operational Programme for the Development of the Living Environment)	Ongoing	Financial	2009
	Residential	Provision of national guarantees for construction and renovation to achieve energy savings	Proposed	Financial	
	Tertiary	A programme for reconstruction of public sector buildings	Ongoing	Financial	
ES	Residential and Tertiary	State Plan 2013-2016 for Rental Housing, Housing Rehabilitation, and Urban Regeneration and Renewal	Ongoing	Financial	2013
	Tertiary	Action Plan 2008-2012:Energy Saving and Efficiency Plans in Public Administrations	Ongoing	Information-Education-Training, Legislative-Informative	2008
FI	Residential	Window Energy Rating System	Ongoing	Information-Education	2006
	Residential	Coordinated energy advice to the consumers	Ongoing	Information-Education	2010

MS	Sector	Measure title	Status	Type	Starting Year
	Tertiary	Renovation of State Property Stock	Ongoing	Information-Education-Training	2009
FR	Residential	Zero-rated eco-loan	Ongoing	Financial	2009
	Residential	Social housing eco-loan	Ongoing	Financial	2009
	Residential and Tertiary	Energy Savings Certificates (ESC)	Ongoing	Financial	2006
	Tertiary	"Modernising building and cities" programme	Ongoing	Financial, Legislative-Informative	2008
HE	Residential	"Energy Savings in households" Program	Ongoing	Financial, Legislative-Normative	2010
HR	Residential	Plan for Energy renovation of residential buildings	Ongoing	Financial	2011
	Residential	Integral multi-dwelling unit renovation incentives	Ongoing	Financial	2014
	Residential	Energy renovation of public sector buildings programme	Ongoing	Financial	2014
	Tertiary	Energy reconstruction of commercial non-residential buildings	Ongoing	Financial	2011
	Tertiary	Energy renovation of commercial non-residential buildings	Ongoing	Financial	2012
HU	Residential	"Our Home" Renovation Sub-Programme: Mitigation of heat demand of residential buildings (family homes and multi-occupied residential buildings) with individual or central heating	Ongoing	Financial	2008

MS	Sector	Measure title	Status	Type	Starting Year
	Residential	Liveable Panel Dwellings Renovation Sub-Programme: mitigation of district heating demand in residential buildings built by industrialised technologies	Ongoing	Financial	2008
IT	Residential	Fiscal incentives for energy savings in the household sector	Ongoing	Financial	2008
LT	Residential	'Visagino Energizija', Visaginas town Programme for energy efficiency improvement in multi-apartment buildings	Ongoing	Financial	2011
	Residential	Programme for the renovation/upgrading of multi-apartment buildings	Ongoing	Financial	2005
	Tertiary	EU Structural Funds 2007–2013	Ongoing	Financial	2007
	Tertiary	Renovation of State institutions	Unknown	Financial	2014
LV	Residential	Grant scheme for renovation of residential buildings (2013-2016)	Ongoing	Financial	2013
	Residential	Information Campaign "Let's Live Warmer"	Ongoing	Information-Education	2009
	Residential	EU-related: Energy Performance of Buildings EPBD (Directive 2010/31/EU) - Energy Audits and Energy Certification of Residential Buildings	Ongoing	Financial, Legislative-Informative, Legislative-Normative	2009
	Residential	Increasing Heat Energy Efficiency in Multi Apartment Buildings (Measures to Improve the Thermal Stability of Apartment Blocks): EU programming period of 2007-2013	Ongoing	Financial	2009

MS	Sector	Measure title	Status	Type	Starting Year
	Residential	Increasing Energy Efficiency in Multi Apartment Buildings: EU programming period of 2014-2020	Proposed	Financial	2015
	Tertiary	Increasing Energy Efficiency in State (Central Government) Public Buildings: EU Programming Period of 2014-2020	Proposed	Financial	2015
	Tertiary	Increasing Energy Efficiency in Municipal Buildings: EU Programming Period of 2014-2020	Proposed	Financial	2015
NL	Residential	Reduced VAT rate on labour costs for insulation and glass and for maintenance an renovation of residential buildings (Verlaagd BTW tarief)	Ongoing	Financial	2009
SI	Residential	Financial incentives for energy-efficient renovation and sustainable construction of residential buildings	Ongoing	Financial	2008
	Tertiary	Financial incentives for energy-efficient renovation and sustainable construction of buildings in the public sector	Ongoing	Financial	2008

Most of the policies and measures also apply to public buildings. The scope of measures for public buildings varies substantially between Member States ranging from central government buildings only to all publicly-owned buildings or all buildings used for public purposes. Some Member States also have specific measures for public buildings. These are mainly monitoring campaigns (e.g. 'NRClick' is an energy accounting system for the comparison of different municipalities in Belgium) and demonstration projects (e.g. in Germany the Zero-energy building for the Federal Environmental Agency (Umweltbundesamt)).

To support NZEB-refurbishments, LU runs since 2008 a financial scheme supporting the renovation of residential buildings. Furthermore, bonuses are paid for deeper renovations (A, B and C standard) since 2012. The GBPN analysis focused on six Countries (DE, DK, FR, NL, SE and UK), identified: i) key themes and elements that support the development of policy packages that drive the existing building stock towards deep renovation; ii) current best practice elements of policy packages for the residential building stock. Each policy package was selected based on two main criteria: a demonstration of their policies including elements that cover energy renovations; and a reduction of residential energy consumption.

Ambitious plans and success stories are now highlighted, with special focus to policies and measures designed to target building renovations to NZEB or deep level (Table 4).

Some Member States link financial support for building renovation to the achievement of high energy classes equivalent to NZEB level. This approach can be considered a good practice to stimulate the transformation of national building stock towards NZEBs.

Different policy actions can be taken to help overcome the energy efficiency potential of the building sector. These actions include regulatory measures, information tools, financial models, and voluntary approach.

In the last decade, different Member States introduced measures addressed to the existing building stock and new forward-looking perspectives have been recently defined within the national renovation strategies developed in accordance with Energy Efficiency Directive Article 4.

In some countries with limited solar renewable energy potential (e.g. northern Europe), policies that support alternative measures are needed (e.g. biomass). Cyprus should design consistent mixtures of policy instruments (policy packages), depending only partially on public budgets. Reliable data to monitor policy impacts, including actual energy performance and indoor environment, are required above all for building stock refurbishment. The adoption of roadmaps and indicators is also a good tool to address specific needs and monitor implementation.

Table 4: Best practice measures selected by GBPN in a selection of European Countries.

Measure type		Measure description	MS
Financial Instruments	Incentive Schemes	The KfWs Energy Efficient Construction and Rehabilitation (EECR) programme for residential properties provides subsidised lending for the renovation of existing building stock. The funding is set according to the level of energy efficiency achieved, KfW can finance up to 100% of the loan. When more than one element is improved, or a combination of measures are undertaken it is possible to receive a bonus. As required by the Government's Energy Concept 2050, from 2009-2012, funding of EUR 500 million was provided for the renovation of existing buildings.	DE
		The Green Deal works hand-in-hand with the UK's Energy Company Obligation and aims to improve the energy efficiency of most of the 26 million homes in the UK. It works within a framework of accredited market participants. Individuals pay a part of the cost of improving their homes by taking a loan that is paid back via the savings they make on their fuel bills. The scheme, established by the Coalition Government through the Energy Bill, is designed to run between 2013-2027 although recently the new UK government has put this under review.	UK

Measure type		Measure description	MS
Financial Instruments	Taxation Mechanisms	A fund for energy renovation has been made available in an effort to boost the sector. The renovation fund contains 1.5 billion DKK of subsidies for private building projects and is supposed to reduce the increasing unemployment rates in the construction sector. An income tax deduction (BoligJob-ordning) has been reintroduced in 2013 and 2014, which is estimated to amount to 1.5 billion DKK annually. The scheme will be unchanged and allows tax deductions for home renovation costs up to DKK 15,000 per person annually for renovation services.	DK
		The 'Haushaltsnahen Dienstleistungen' tax incentive allows for 20% of the labour costs (up to 6000 Euros, tax relief on up to 1,200 Euros) of certain home renovations associated with reducing the energy demand of the building, this tax relief will be available over a period of 10 years.	DE
		A Regulatory Energy Tax (REB) was introduced in 1996 for environmental reasons. Energy Tax is a tax on energy consumption that intends to improve the cost-effectiveness of measures aimed at energy saving and renewable energy. The Energy Tax significantly increases energy prices for small-scale consumers, such as households (up to 5 000 m ³ gas and 10 000 kWh) to promote energy efficiency. The energy tax applies to electricity and natural gas and has increased every year.	NL
Economic Instruments	Utility-Funded Energy Efficiency Programmes	In Denmark, since 1990, utilities have been providing their customers with energy saving advice and services. Since 1996 there has been a legal obligation placed on the utilities and the latest 2009 (Utilities' Saving Obligations Agreement requires for utilities to realise 6.1 PJ of saved energy. Each utility is allowed to decide on the way in which it will accumulate these savings, but the most common ways of doing this is through the provision of consumer advice, and financial incentives. Each utility must present documentation to prove that they have realised their targets.	DK

Measure type		Measure description	MS
		The Energy Company Obligation (ECO) was introduced in 2013 legally requiring the six biggest energy suppliers in the UK to deliver energy efficiency measures to the domestic energy users. The financial support provided to households is provided when the energy companies and individuals communicate to identify and apply suitable saving measures. Up to 100% of the cost for improvements will be provided by the energy companies.	UK
Economic Instruments	Market Instruments for Energy Efficient Renovations	The ESCO market is perceived to have grown in 2008 in comparison to the period 2005- 2007, this is due to a policy framework (including incentives) and to demonstration projects. France's National Energy Agency (ADEME) with the Grenelle programme, has been able to create a market for energy renovations in the public sector with PPPs and private investments. There are other programmes available that aim to increase energy efficiency such as the white certificates. The ESCOs market is under further development through a new programme called "Marché Public" that offers smaller amounts (< €5 million) for project financing.	FR
Information and Capacity Building	Training and Education Campaigns	The German Energy Agency (Dena, Deutsche Energieagentur) is a "centre of expertise for energy efficiency, renewable energy sources and intelligent energy systems" (Dena). With regards to energy efficiency in buildings it organises campaigns, distributes information to the public, supports the building sector (architects or craftsmen) to work in line with current standards and regulations and develops standards and labels for efficiency.	DE
		The Swedish Energy Agency supports local authorities by training them to provide energy efficiency measures. A number of policy packages are available for the residential including information tools and economic incentives. An interesting measure is the creation of procurement groups that directly address both property owners and tenants to help them to develop options for improving their energy efficiency.	SE

Measure type		Measure description	MS
Information and Capacity Building	One Stop Solution Centre	KfW & Dena both act as one-stop-shops in Germany whereby advice is given on all energy saving activities.	DE
		The agency RVO.nl on behalf of the Dutch government provides market parties with information and tools on energy renovation projects, including deep renovation. RVO.nl also has a helpdesk for entrepreneurs. The program Energy Leap specialises in deep renovation.	NL

About the new policy measures that the EU Member States are implementing (or aim to implement) to reduce the energy consumption of the existing building sector, information can be found in the third NEEAPs, that MSs provided by April 2014. Table 5 lists the main news, distinguished by Member States and typology.

Table 5: Examples of new measures on building renovations included in the 3rd NEEAPs.

MS	Measure Type	Description
BE	Financial	In the Brussels Capital Region of Belgium, new financial incentives are tested through a "pilot" initiative to building landlords ("Répercussion du coût d'occupation"), providing economic incentives covering part of the implementation costs to stimulate energy savings under this measure, the rental charge and energy bills are merged and a calculation tool is offered to estimate the repercussion on occupation costs of these actions. In Wallonia, a 0% interest loan scheme named Ecopack started in May 2012

MS	Measure Type	Description
	Information-Education	<p>The "Energy House" initiative in the Brussels-Capital Region of Belgium (known as Maison de l'Énergie – Energie Huis) has consisted in the creation of an organization that are disseminating information and advice to energy end-users regarding available energy savings. Experts of the "Energy House" go to energy end-users houses, provide advice and perform small regulation and adjustments of energy consuming equipment.</p> <p>The Energy House is active on the territory of the Brussels-Capital Region since 2013. Since November 2015, the different antennas have come together to form a single Energy House. They are now twenty advisers gathered in the heart of the city that can meet personalized support requests.</p>
DE	Financial	Additional funding for energy-related building renovation is secured from 2013 onwards with extra KfW grants of €300 million.
DK	Information-Education	BedreBolig (Better Homes) scheme was introduced on 1 January 2014 to make it easier and clearer for home owners to renovate their homes by offering comprehensive, expert advice as well as by strengthening cooperation between home owners and financial institutions advisers, banks and mortgages institutions to facilitate the interaction between home owners throughout the energy renovation process.
EL	Financial	The Energy Efficiency at Household Buildings Programme will enter its second phase by the end of 2015. Greece also plans to carry out Energy performance improvements of services buildings through ESCOs in the period 2015-2020 where 3000 buildings should be renovated through ESCOs.
ES	Financial	The Aid Programme for the Energy Renovation of Existing Buildings (PAREER) approved in September 2013, aimed at buildings used for housing and in the hotel industry. With a budget of €125 million, it promotes integrated energy efficiency improvement and renewable energy measure in the stock of existing buildings by awarding grants and repayable loans to projects.
FR	Financial	The social housing eco-loan has also been extended to the end of 2020.

MS	Measure Type	Description
	Information-Education	A renovation Information Services based on the concept of one-stop approach is set up in France with the aim of helping owners to make decisions through the implementation for the energy renovation of private dwellings. This is a new local public service with 450 Renovation Information Service Points (PRIS), present on the whole territory and has a mission of guiding property owners based on their profile and their location and suggest local information centres, local counselling centres and provide basic information. A new awareness campaign for the existence of these PRIS was launched in September 2013.
IE	Financial	A National Energy Efficiency Funds (NEEF) has been established in March 2014 (€35 million committed by government) with the objective of directly assisting energy efficiency upgrades in the commercial and public sectors.
IT	Financial	An incentive scheme for the promotion of renewable thermal energy and energy efficient heating (also known as "Conto Termico") started in 2012. This measure partly overlaps with the existing tax credits scheme, meaning that a large series of measures implemented by private actors can be eligible both for tax credits and incentives available under the "Conto Termico".
LV	Financial	An existing public building renovation scheme will be refinanced for a new period (2014-2020). Specifically, a grant scheme, financed through EU structural funds will target renovations of central government buildings and improvements in the energy performance of municipal buildings.
RO	Financial	Ongoing program on energy renovation of apartment blocks, started in 2009
NL	Financial	The government has created a new revolving fund for energy-saving measures in existing buildings, where € 555 million of central government funds are in total made available. Co-financing from banks amounting to € 225 million is also secured for projects specifically targeting owner-occupiers. At the same time, the Dutch central government is providing landlords in the social rental sector with a new subsidy of € 400 million for investments in energy-efficiency in 2014-2017 with the aim of contributing to the objectives of the Energy Saving Agreement for the Rental Sector. Under this agreement, the aim of an average label B (corporations) and a minimum label C (private landlords) for 80% of homes for 2020 is set.

Cyprus should to further strengthen and evaluate the adopted measures in order to successfully stimulate cost-effective deep and NZEB renovations. The advantages deriving from NZEBs should be better identified, also in relation to thermal comfort, health and productivity. Dissemination activity and training on NZEBs should be enlarged among professional competences. At EU level, only a few countries have implemented unambiguous targets up to 2050, which is a barrier for target-oriented and effective policy making.

To create specific instruments to increase the NZEBs number, policies should be target-oriented. The targets have to be properly defined using indicators like CO₂-emissions, primary and final energy demand or RES deployment. Moreover, the targets for the building stock should be embedded in a coherent target scenario and vision of the overall energy system's development.

Long-term and ambitious targets are needed with intermediate steps up to 2050. Member States have mostly addressed new buildings, but more emphasis should be put on policies addressing efficiency and RES-measures in existing buildings. A focus on deep renovation of the existing stock is necessary to avoid lock-in effects to reach the long-term target for CO₂ emission-reduction. Even in ambitious modelled scenarios a considerable share (about 50%) of renovation activities up to 2030 does not represent a renovation level which could be called "NZEB renovation". These buildings are locked for further efficiency improvement for the next decades. The current policy instruments do not provide sufficient incentive for deep renovation. Deep renovation should also include long-term compatible staged renovations. Building-specific renovation roadmaps are an effective means for ensuring a target-oriented execution of staged renovation over a longer period.

Policy and regulatory framework should be stable and predictable not only to ensure investment security, but also for developing know-how and trained staff.

2.4 Barriers towards NZEB in Cyprus

The Energy Efficiency Directive (Directive 2012/27/EU) includes a provision (Article 19(1)(a)) that calls Member States to evaluate and, if necessary, take appropriate measures to remove regulatory and non-regulatory barriers to energy efficiency. This section presents an overview of barriers and challenges in relation to NZEBs. Many of these in relation to realizing residential NZEB renovations are similar among the countries. The main common barriers and challenges currently found in the literature are reported in Table 6 and Table 7 in relation to the decision making process.

Table 6: Barriers in relation to the decision making process towards NZEBs at EU level.

Barriers towards NZEBs	
Technical	Existing building structure and technical system limit the choice of technical solutions that can be used but where technical solutions can be found, they are often costly and not financially viable.
Financial	Investment cost too high.
Social	Lack of knowledge and/or interest for energy efficiency among residents and building owners, often due to lack of awareness combined with challenges with architectural and cultural values.
Environmental/health	Criteria for materials and waste, mix between comfort and efficiency.
Organisational/legal	The ownership structure and need for consensus among several homeowners can hinder NZEB renovations.

Table 7: Challenges towards NZEBs retrofit at EU level.

Opportunities towards NZEBs retrofit	
Technical	Existing building structure and technical systems limit the choice of technical solutions possible for NZEB renovations.
Financial	Building owners are unlikely to make a return on investment.
Social	The need for communication and information early in the renovation process to increase acceptance among residents.
Environmental/health	The risk of moisture must be taken into consideration when making a building more airtight.
Organisational/legal	The need for an extensive communication between involved organisations and actors early in the process.

A disconnection can be identified between developing innovative technologies from the building industry and the lack of take up due to budget constraints. Awareness of how users consume energy in residential buildings should be increased. Furthermore, it is widely recognised that energy targets are challenging for cultural and historic buildings.

In relation to NZEBs renovation, the existing building structure sets limits to what extent the existing technical solutions can be implemented. This limitation is more relevant where the architectural value of the building needs to be conserved, making the retrofit processes more challenging. Furthermore, existing technical solutions for NZEB are perceived as expensive adding to the main financial challenge of having high investment in NZEB renovation projects. A return of the investment appears often as difficult apart from considering savings through the life - cycle of the building; in this case the initial investment costs are lower than those of the overall operational costs. The payback period for NZEB renovation may take between 15 - 30 years, and often residents do not benefit from this payback period. Moreover, a landlord cannot, or do not want to, raise rents and becoming uncompetitive in the market as the difference between non - NZEB and NZEB is not considered by the tenants.

It is also common that a lack of knowledge regarding NZEBs renovation is spread among professionals and residents. Communication of best practices in NZEBs renovation is important to increase the knowledge among professionals and general public on energy efficient renovation and technical solutions. A follow - up is important to ensure that residents use buildings. Communicating with residents and end - users has been identified as necessary. End - user behaviour after a completed renovation is also a challenge in the retrofitting process.

In relation to financial barriers, public authorities have a leading role in setting up financing schemes for the national or local contexts. The level of ambition of financial programs rises in order to have greater impact and unlock further private investment for NZEB renovation. Legislation and financial incentives have a strong influence in developing NZEBs projects.

Communication and information between involved actors and organizations of the renovation project, as well as with the residents, are among the factors that can provide a successful NZEB renovation.

3. Training of professionals for energy efficiency in buildings in Cyprus

The construction sector, with a contribution to around 8% of national GDP and 12% of total employment³ represents an important part of Cyprus economy, in line with the situation of most of EU Member States. The new focus on building energy efficiency plays a key role in the future development of the construction sector and its contribution to the national economy both in terms of value added and employment.

Focussing on the qualitative characteristics of the labour force is essential, in order to ensure that workers in the building sector have the necessary knowledge and skills to effectively contribute to the achievement of the national targets for 2020 and 2030.

In more general terms, investments in the training of experts, with a specific focus on energy efficiency, is crucial in both developing new knowledge and skills and in ensuring the translation of this knowledge to practice in a number of issues related to the Energy Performance of Buildings Directive (EPBD) and Energy Efficiency Directive (EED). These investments are vital also to the achievement of the "multiple benefits of energy efficiency"⁴.

There are only a few specific requirements for training and qualifications in the main EU energy efficiency legislations. Combining the obligations of EPBD Article 17⁵, and EED Article 16, but also considering EPBD Article 20 and EED Articles 8, 16 and 17, MSs are required to ensure that certification and/or accreditation schemes for the qualification and training of experts are available for energy services providers, energy audits, energy managers and installers of energy-related building elements.

In addition, the Renewable Energy Directive (RED) establishes an overall policy for the production and promotion of energy from renewable sources in the EU, including schemes for accreditation of training and certification of installers of small scale RES systems in buildings such as: biomass boilers and stoves installers, solar photovoltaic installers, solar thermal systems installers and geothermal systems installers.

Beside this specific requirements, training of professionals is recognised as an essential part of any national plan to reach energy efficiency targets, which are not limited to the EPC inspectors and auditors, but involves all the workers in the construction process and business.

³ See "BUILD UP Skills – Cyprus Analysis of the National Status Quo": <http://www.buildupskills.org.cy>. For a discussion of the contribution of the building sector to economic growth and employment in Europe, see: Saheb et al. (2015): "Energy Renovation: The Trump Card for the New Start for Europe", JRC Technical Report, EUR 26888.

⁴ See IEA (2014) Report: "Capturing the multiple benefits of energy efficiency": http://www.iea.org/publications/freepublications/publication/Captur_the_MultiplBenef_ofEnergyEfficiency.pdf

⁵ The EPBD requires regular inspection of heating and air-conditioning systems (Articles 14 and 15); within the framework of Article 17 Member States (MSs) must ensure that the energy performance certification of buildings and the inspection of heating and air-conditioning systems are carried out in an independent manner by qualified and/or accredited experts.

This Chapter addresses mainly the issue of training and qualification of experts to meet the challenges of the energy efficiency renovation of the Cyprus building stock.

Information on the current situations of Cyprus in terms of training for professionals in building energy efficiency and NZEBs were collected through a series of meetings⁶ and from secondary sources (EU Funded programs websites, NEEAPS, ART 4 EED National renovation strategies; Cyprus Ministry of Education and Culture website; Ministry of Labour and Social Insurance website). On the basis of these information a qualitative evaluation and assessment of the main gaps and challenges was made.

A review of best-practices examples from other EU Member States experiences and recommendations to develop further the training offer (both in terms of content and process) in Cyprus are also provided.

3.1 Assessment of the current status: training for professionals in building energy efficiency in Cyprus

3.1.1 Needs identified and the national roadmap – BUILD UP Skills Cyprus – Pillar I

The discussion on the implementation of professional trainings in energy efficiency in building starts by considering the overall national context. Indeed, despite recent years' improvements, overall professional training is not widespread and Cyprus has one of the lowest participation rates in upper secondary vocational education and training (VET) in the EU. Eurostat data⁷ show that it came to 13.6 % in 2013, compared to the EU average of 48.9 %, with general education clearly predominating as a result⁸.

The situation of Cyprus was the subject of an extensive in-depth study under the EU BUILD UP Skills⁹, an initiative implemented under the framework of the Intelligent Energy Europe programme (IEE Calls for proposals 2011, 2012 and 2013) to increase the number of qualified workers in the building workforce in Europe. The project focuses on the continuing education and training of craftsmen and other on-site workers in the field of energy efficiency and renewable energy in buildings.

Research related to Cyprus under Pillar I¹⁰ was published in the BUILD UP Skills Cyprus report. The report identified in 2012 a lack of a sufficient number of skilled workforce for

⁶ Cyprus – Energy Efficiency in buildings stakeholders' meeting 28 May 2015 – MECIT, Nicosia; Energy Efficiency in Cyprus: Meetings, at MECIT and at the Cyprus Institute, 17-18 December 2015, Nicosia

⁷ Eurostat, 2013

⁸ For an comprehensive description of the Cyprus education, and vocational education and training systems, see also: CEDEFOP (2012). "Vocational education and training in Cyprus - Short description", Luxembourg, Publications Office of the European Union, and European Commission (2016) "Education and Training Monitor 2016 – Cyprus", at: https://ec.europa.eu/education/sites/education/files/monitor2016-cy_en.pdf
⁹ <http://www.buildupskills.org.cy>.

¹⁰ The BUILD UP Skills Initiative is made up by two "Pillars". The first one refers to the first call for proposals (2011-2012): projects across 30 EU countries (EU-28, the Former Yugoslav Republic of Macedonia and Norway) were funded and they developed national qualification platforms and roadmaps that would serve to successfully train the building workforce in order to meet the targets for 2020 and beyond. The follow-up phase, known as Pillar II, consists of 22 projects, funded in different countries to design new qualification and training schemes and/or upgrade existing ones, based on the roadmaps developed in Pillar I. Regular exchange activities have been organised at EU level to foster learning between the countries. Project coordinators are brought together twice a year at the so-called EU Exchange Meetings.

the implementation of measures relating to the construction of energy efficient buildings. At the same time, insufficient appropriate training programs for the training of the workforce were highlighted.

The Build-up skills-Cyprus Report examined and estimated the employment needs for selected technical occupations in the field of energy efficiency in buildings in Cyprus. The qualitative characteristics of the labour force was also considered and analysed.

Concerning the skills relating to key technologies for the achievement of the energy efficiency targets for 2020, the analysis identified the following ones:

- Installation and maintenance of biomass systems
- Installation and maintenance of heat pumps and shallow geothermal systems
- Installation and maintenance of photovoltaic systems
- Installation and maintenance of solar systems for domestic hot water
- Installation and maintenance of solar systems for heating and air-conditioning
- Installation of conventional thermal insulation / thermo-insulation plaster
- Installation of external thermalinsulation
- Installation of doors and windows
- Installation of solar protection systems
- Installation and maintenance of central heating or other types of heating
- Installation and maintenance of cooling and air-conditioning appliances
- Installation and maintenance of mechanical ventilation systems
- Installation and maintenance of automation systems and electronic monitoring and control systems for central heating and cooling and air-conditioning appliances, including BMS33.

In quantitative terms, based on a series of assumptions, the Build-up skills-Cyprus project estimated both the minimum annual number of persons experienced in the above mentioned specific skills by 2020 and the minimum annual number of professionals in different occupation categories, that require training¹¹. The results are presented in Table 1 and 2 respectively.

¹¹ The matching of the skills to occupations was made according to the International Standard Classification of Occupations, ISCO 88 (COM): see Build-up skills-Cyprus Report, for more details and the full methodology.

Table 8: Estimates on the minimum annual number of persons acquiring the identified critical skills

Skill	2013	2014	2015	2016	2017	2018	2019	2020
Installation and maintenance of biomass systems	46	50	54	59	63	67	71	75
Installation and maintenance of heat pumps and shallow geothermal systems	59	65	72	78	85	92	98	105
Installation and maintenance of photovoltaic systems	15	53	23	103	68	211	127	225
Installation and maintenance of solar systems for DHW	320	327	333	339	345	352	358	364
Installation and maintenance of solar systems for heating and air-conditioning	15	18	22	27	33	40	45	50
Installation of conventional thermal insulation / thermo-insulation plaster	523	628	733	837	942	1.047	1.151	1.151
Installation of external thermal insulation	52	70	92	105	135	174	230	288
Installation of doors and windows	105	115	126	136	147	157	167	178
Installation of solar protection systems	52	63	73	84	89	94	99	105
Installation and maintenance of central heating or other type of heating	353	416	481	549	620	693	769	848
Installation and maintenance of cooling and air-conditioning appliances	294	351	409	471	535	602	671	743
Installation and maintenance of mechanical ventilation systems	59	70	82	94	107	120	134	149
Installation and maintenance of automation and electronic systems	115	133	152	172	192	213	234	257

Source: *BUILD UP Skills – Cyprus Analysis of the National Status Quo, 2012*

Table 9: Estimates on the minimum annual number of professionals in different occupation categories that require training

ISCO	Occupation	2013	2014	2015	2016	2017	2018	2019	2020
7122	Builders	557	673	792	903	1.028	1.162	1.309	1.366
7134	Insulation workers	58	70	83	94	108	122	138	144
7136	Plumbers	1.039	1.178	1.301	1.464	1.597	1.790	1.915	2.103
7137	Building electricians	51	84	70	133	116	224	173	250
7213	Sheet-metal workers	118	134	149	165	177	188	200	212
7233	Air-conditioning and refrigeration mechanics	152	181	211	244	277	313	349	387
7241	Electrical mechanics and fitters	35	40	46	52	58	64	70	77
	Total	2.008	2.359	2.652	3.054	3.361	3.862	4.154	4.538

Source: *BUILD UP Skills – Cyprus Analysis of the National Status Quo, 2012*

The examination of the curricula and contents of the selected specialisations of the relevant Technical Schools showed that they provide the required knowledge and skills to students, enabling them to work in these specialised fields after their graduation or to

pursue further studies in post-secondary and tertiary education institutions. However, the project highlighted the need for reviewing the curricula in order to enrich it, as well as to add new specialisations in the Secondary Technical and Vocational Education, in order to meet skills needs, especially regarding energy efficiency. The same applied to the content of the vocational training programmes offered by the Human Resource Development Authority of Cyprus (HRDA), addressed mainly to the unemployed as well as to the schemes implemented within the framework of the Continuing Vocational Education and Training System (CVET).

The report underlined that, along with the review and upgrade of the programmes, the Secondary Technical and Vocational Education and CVET schemes could and should be improved by training programmes for trainers and teachers to refresh and enrich their knowledge and enabling them to cope with the requirements of the new specialisations.

Also an upgrade and modernization of the existing centres and their equipment, along with the creation of new training centres to satisfy the training needs for the new skills, was identified as one of the needs. This modern infrastructure would serve especially for the training of the labour force in new specialisations, like the installation and maintenance of heat pumps and shallow geothermal systems, mechanical ventilation systems, automation and electronic monitoring systems. The current situation shows that this seems a pending issue.

In recent years some of the points highlighted in the EU BUILD UP skills report have been addressed with clear improvements. Indeed, has been taken as a "roadmap" for the implementation of actions and follow-up initiatives.

3.1.2 Implementing the national roadmap

BUILD UP Skills - Pillar II

The second pillar of the Build-up Skills programme, named WE-Qualify - 'Improve Skills and Qualifications in the Building Workforce in Cyprus', consisted in a three-year project concluded in 2016 for the organisation and delivery of educational training programmes, which led to a specific "WE-Qualify" certification for the development of the following skills:

Installation of thermal insulation.

Three training courses were completed in 2015 and 2016 regarding the installation of thermal insulation systems for 24 hours of classroom training and 9 hours of hands-on practical training. These activities had more than 70 attendees and led to specific certification for 69 of them.

Installation of thermopanes and exterior sunshades.

One training course was organised, which included 24 hours of classroom training and 9 hours of hands-on practical training. Seven participants obtained a certification after the course.

Installation and maintenance of biomass boilers and stoves.

One training course, approved by MECIT was organised, which included 31 hours of classroom training and 9 hours of hands-on practical training (in cooperation with the Agricultural Research Institute). The course counted on 14 attendees.

The training programmes were organized by the WE- Qualify consortium¹² and took place at the facilities of the Cyprus Productivity Centre. The names of the certified installers were published on the project's website¹³.

Among the many positive features:

- The project counted on a National Consulting Committee (NCC)¹⁴ to consult and support the implementation of the training programmes to link the relevant stakeholders, the trainees and the decision makers. The Committee has also supported networking and dissemination activities.
- A specific evaluation of training programmes was implemented, with a dedicated questionnaire to the trainees.
- Training material and practical tools for trainees and trainers was developed (including guides for trainers and training methodology for each skill) and made available through the project web-site¹⁵.
- The project included a number of dissemination activities. These included, among others: meeting with the Director of Secondary Technical and Professional Education of the Ministry of Education and Culture; Energy savings fair "SAVENERGY" in 2015 and 2016; and one day events ("GREENET- Euro network supporting innovation for green jobs"; 10 years of Energy Performance of Buildings Certificates; "Passive house basics").

3.1.3 Nearly Zero Energy Buildings

According to the Energy Performance of Building Directive (EPBD) obligations, Member States shall ensure that new buildings occupied and owned by public authorities are NZEBs after December 31, 2018 and that all new buildings are NZEBs by December 31, 2020. The Directive also establishes the assessment of cost-optimal levels related to the establishment of minimum energy performance requirements in buildings. As part of National Plans for increasing the number of NZEBs, intermediate targets for improving the energy performance of buildings have to be provided. Member States also have to develop policies and take measures to stimulate the transformation of refurbished buildings into NZEBs, and inform the Commission thereof¹⁶.

The challenge of the nZEBs obligations require the development of new skills not only on the blue collar workers, but also for architects and engineers

These skills cross a number of disciplines (for instance economics and cost calculations, energy simulation) and require to integrate traditional energy efficiency measures with competencies in RES technologies.

¹² Cyprus Energy Agency (Coordinator), Cyprus Institute of Energy, Human Resource Development Authority of Cyprus, Cyprus Organisation for Standardisation, Cyprus Productivity Centre, Technical Chamber of Cyprus

¹³ http://www.cea.org.cy/we_qualify/

¹⁴ The members of the National Consulting Committee were: Cyprus University of Technology, University of Cyprus, University of Nicosia, Ministry of Education and Culture, Energy Service, Ministry of Energy, Commerce, Industry and Tourism, Cyprus Employers and Industrial Federation

¹⁵ http://www.cea.org.cy/we_qualify/

¹⁶ See D'Agostino et al. (2016), "Synthesis Report on the National Plans for Nearly Zero Energy Buildings (NZEBs), JRC Technical Report, EUR 27804 for a review of the literature and progresses made by Member States towards nZEBs targets.

Technological development is leading to a paradigm shift: from energy-consumer fabrics, buildings are becoming energy systems interacting with other systems which both consume, produce, store and exchange energy.

In Cyprus, some important actions have been taken to inform and train building professionals about constructing NZEBs and renovating existing buildings to NZEB standards.

The MECIT, which is working in close cooperation with the Ministry of Education and Culture, workers' unions and employers' organisations in order to identify and fill any skills gaps, has organised informative sessions about NZEBs that were directed to architects and engineers, which included both the legislative framework and best-practice examples. In addition, the MECIT prepared and made available a technical guide to be used as a reference, facilitating the design of NZEBs. The use of the technical guide is thought to be on a voluntary basis and it is planned to be upgraded accordingly so as to remain in use even after the mandatory construction of NZEBs enters into force.

The Chamber of professional engineers and the Chamber of Industry and Trade also organize training programs that deal with efficient buildings. Nevertheless, the nZEB concept has not been yet dealt with appropriately.

Some specialized courses are also organized by Cyprus Energy Agency, CYS (Cyprus Organization for Standardization). These are 2 specific courses about insulation (40 hours) and windows (25 hours). However, electrical, thermal systems, air conditioning, etc. are not specifically covered.

NZEBs are also the subject of interesting training course organised under the framework of EU-funded projects and described hereafter.

3.1.4 EU funded projects

Cypriot universities also participated in a number of EU funded projects related to the training of professionals for the building sector.

SouthZeb project

Among them, the SouthZeb project¹⁷ is considered of particular interest. The project aimed at supporting the building sector professionals in the Southern European countries, based on the experience of front-runner countries in central and northern Europe¹⁸, to keep up to date with the market developments as well as to design and implement training and assessment programs, especially focussed on the transfer of successful practices and knowledge for nZEBs. As a result, ten training modules and the corresponding assessment exams were developed, together with 40 "train the trainer" workshops, (with the participation of at least 150 trainers)¹⁹ and 4 large pilot training sessions, one in each target country, where at least 1500 professionals have been trained and certified. In addition, a portal and e-learning platform, used for the supply of

¹⁷ Cyprus Institute of Technology was a partner of the project. See <http://www.southzeb.eu/>

¹⁸ Greece, Cyprus, Portugal and Southern Italy were the target countries, while United Kingdom, Austria and Northern Italy were the front-runner countries.

¹⁹ A "nZEB Trainer" certificate was awarded to trainers who participated in "train the trainer workshops" and who successfully completed a set of 4 nZEB specific training modules. Candidates had to have at least five years post-graduation experience in a suitable environment. As a feedback mechanism, the "nZEB trainers" only achieved the certificate if positively evaluated by "trainees" during the "Training the trainers" sessions.

the training programs was developed and at least 400 professionals followed the training programs remotely through the e-learning platform.

The project highlighted the importance of a “modular” training approach in order to provide the many and different technical skills (installation of insulation, RES installation, cost calculation, etc.) required by professionals involved in the nZEB building process.

However, the sustainability of SouthZEB after the completion of the EU-funded project has emerged as a major issue, as well as the lack of harmonization of the methods, the standards and even the simulation tools used in calculating the energy efficiency and consumption of the buildings, which differ from country to country.

MENS project

Also focussed on nZEBs, the ongoing MENS Project²⁰, which included the University of Cyprus as one of the partners, aims at providing and enhancing nZEB skills of engineers and architect through a series of accredited training activities developed by 9 universities. The goal is to create and implement a new education and training program for professionals in the construction industry in 10 countries, under the European Qualifications Framework provisions.

Some of the positive features of the project are:

- An integrated approach, based on modules and interdisciplinary education and focussed on real case studies
- Formal accreditation procedure in each country assignment of ECTS credits.
- A network of over 250,000 stakeholders.
- The possibility to continue the education and training courses for at least 5 years after the end of the project, based on concrete sustainability plans agreed by University partners.

MENS is developed through 3 sets of training activities: (a) national accreditation professional courses; (b) e- learning and webinars, and (c) case studies experiences around Europe.

Although the actions and projects undertaken go in the right direction and all represent success stories which correctly address key issues related to training of professionals to meet energy efficiency goals for buildings, still efforts are needed to convert these actions into a stable, systematic, coherent and long-term policy for training.

Indeed the actions addressed only part of the skill gaps identified in the both in quantitative and in qualitative terms (only some of the skills have been targeted so far) and continuity and sustainability of these projects after the initial pilot phase remains uncertain.

3.1.5 EPC Certifiers, auditors and installers

Another area of interest for training and development of new skills and qualifications for energy efficiency in buildings relates to EPCs certifiers, auditors and installers.

²⁰ <http://www.mens-nzeb.eu/en/>

With respect to EPCs certifiers, according to current legislation in Cyprus EPCs can be issued only by qualified technical experts registered in the catalogue of technical experts for the issue of Energy Performance Certificates. An accredited bachelor's degree is required²¹, as well as a number of years of experience and registration at the Scientific and Technical Chamber of Cyprus. In addition, EPCs certifiers can attend the training seminars organized by the Cyprus Energy Service²². Furthermore, the regulations for the inspection of HVAC systems require the inspection of HVAC systems at specified time intervals by qualified inspectors²³.

In Cyprus, as in most of EU countries, regular inspections, EPC certification, and energy audits are managed by different legislation and actors. The scope of the audit procedure is wider (as it includes building structures, technical building systems and occupants' behaviour) and this reflects on the levels of education and length of experience required for the experts carrying out each activity. However, qualifications of experts carrying out inspections and audits overlap to some extent and opportunities for cooperation in programme operation and accreditation exist. Also in this case a modular training approach could be an efficient option so the schemes could share the same basis but offering different details. It should be possible that the same person (after adequate training) is accredited for both EPCs and energy auditing. Coordinating the three procedures could offer significant opportunities for reducing costs and achieving more reliable results. This is also mentioned in the Commission guidance note on Article 8 of the Energy Efficiency Directive²⁴. However, at date, any synergy between EPC certifiers (assessment based on calculation) and auditors (assessment based on real data) remains to be explored in Cyprus.

As already noted in the Build-Up Skill Report, the existing monitoring systems and mechanisms for the labour market and the training system, essential for the early identification of skills needs and of the possible supply and demand mismatch for technical occupations²⁵ are adjusted to the short-term and medium-term identification of skills needs and the mismatch of supply and demand in the labour market. There is still room for further improvement of the cooperation between the education system and the labour market on the basis of long-term targets, as well as room for improvement for the estimation of the quantitative and qualitative needs emanating from the broader policy targets.

3.2 Specific challenges identified

²¹ In one of the following fields: civil engineering, mechanical engineering, electrical engineering, chemical engineering environmental engineering and architectural engineering.

²² Requirements differs for: (a) qualified experts for the issue of EPCs for residential buildings (requirement of at least one year of experience in the building's sector or energy or technical building systems; and (b) qualified experts for the issue of EPCs for non-residential buildings (minimum requirement of at least three years of experience in the building's sector or energy or technical building systems;).

²³ Qualification requirements are: degree in mechanical engineering, Scientific and Technical Chamber of Cyprus membership, and succeed to exam.

²⁴ <http://eurlex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:52013SC0447&from=EN>

²⁵ The monitoring systems and mechanisms in place are operated by four national authorities: the HRDA, the Ministry of Finance, the Ministry of Labour and Social Insurance and the Ministry of Education and Culture. The HRDA conducts on a regular basis relevant research studies which include 10-year employment forecasts, annual estimates for the number of persons required for specific occupations, by district, as well as thematic priorities for multi-company programmes subsidised by the HRDA. Furthermore, based on the guidelines of the Board of Governors of the HRDA, which consists of government, employer and trade unions representatives, the HRDA carries out specialised studies on sectors and issues that are expected to affect the human resources and its required skills and qualifications, such as the green economy.

In addition to the challenges already introduced in the previous sub-chapters (e.g. NZEBs and interdisciplinary skills) other issues emerged from the review of the current situation in Cyprus:

Retraining for authorised experts

The need of specific retraining for the experts already authorised to issue Energy Performance Certificates (EPC), to tackle the new challenges that will come with the introduction of Nearly Zero- Energy Buildings (nZEB). This is a specific issue within a more general challenge, discussed earlier, on developing and offering training modules and programmes specifically focussed on nZEBs.

Retraining for qualified experts

The need to retrain qualified experts, recognised on the basis of Directive 2002/91/EC, in order to make them sufficiently trained to interact with owners, to deal with real energy consumption and to make reliable recommendations for energy efficiency investments.

This is an important aspect to consider since it is part, together with information and dissemination activities, of a broader and more ambitious goal of knowledge and capacity building, which aims at linking the training of experts with the general public (e.g. building owners), public authorities and other relevant stakeholders not directly involved in the construction process.

Employers' engagement

A lack of employers' engagement in the education of students (for vocational education and training - VET) and professional training course (on the job training) has been identified as a point of weakness. The economic crisis and the slowdown in the construction sector negatively contributed to this aspect, however, also structural barriers exist: one of them is that the Cyprus economy, and the building sector in particular, consists predominantly of small and medium-sized and micro-enterprises, for which providing work-based learning and apprenticeships to students of VET programmes is a challenge. The same applies to a large number of self-employed in the construction sector, which have very limited, if none, subsidies for the cost of their training and specialization. In a time when also public finances are constrained, the most important training programmes developed and implemented are those financed through European funds.

3.3 EU experiences and best practices

3.3.1 National training programs and initiatives

Various training measures have been mentioned and highlighted for the building sector in the latest National energy efficiency action plans (NEEAPs)²⁶.

²⁶ See Economidou et al. (2016), "Assessment of the first National Energy Efficiency Action Plans under the Energy Efficiency Directive. Synthesis Report", JRC Technical Report, EUR 28055 EN; and Rivas et al. (2016), "Effective information measures to promote energy use reduction in EU Member States - Analysis of information, empowerment and training measures in Member States National energy Efficiency Action Plans", JRC Technical Report, EU27997

One interesting and successful case in the **Austrian "Klimaaktive"** programme²⁷ : an umbrella measure by the Austrian Climate Initiative, consisting of a large number of programmes with the aim to promote the topics of climate protection, energy efficiency and renewable energy sources, in the personal, commercial and public spheres, by means of information, advice, education, training, quality standards and networking. It is estimated that since 2014 the program contributed to the training of around 13.500 professionals (plumbers, planners, energy consultants, etc.) and more than 1.000 professional building specialists are in active exchange on the e-learning platform. The platform, together with a smartphone app (ECOGATOR) offers information about the most energy efficient products on the market and includes an adviser for personal buying decision. The training activities are linked with dissemination and information campaigns with an extensive use of collaborative tools and social media. The project created a network of interacting stakeholders.

Moreover, since 2011, the Upper Austria Energy Academy has been offering training in energy efficiency and renewable energy. The courses are targeted to managers responsible for energy in enterprises, local authorities and institutions, but also to energy consultants, building services engineers, building contractors, construction site managers, planners and architects. The training programme includes seminars, field trips and courses, including training to become an energy consultant²⁸ .

France, introduced in 2010²⁹ the possibility of issuing energy saving certificates together with the development of information, training and innovation programmes. One of the first actions in this framework is the "**FEEBAT**" (Formation aux Economies d'Energie des entreprises et artisans du BATiment -training in energy saving for building companies and artisans) training program which provided specialized training to more than 66 000 attendants by the end of 2013. The program called "**2012 Grenelle Environment Roundtable Rule of the art**" contributed to the elaboration of technical documents to guide companies and craftsmen in the renovation, maintenance and construction of buildings compliant with energy efficiency objectives.

The **Housing Improvement Club** (Club de l'Amélioration de l'Habitat)³⁰ has implemented an on-line apprenticeship platform directed to building professionals for training on building renovation. Around 17 000 trainees have benefited from this. It was funded mainly by the ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie – French Energy Agency), between 2008 and 2010.

Finally, with the **PRAXIBAT programme**, the ADEME helps regional councils to invest in equipment for training centres to implement thermal solar energy, photovoltaic energy, wood heaters, heat pumps as well as lighting, ventilation and the energy performance of opaque walls.

With regard to the necessary qualifications for energy-related building renovation and energy efficient building, in **Germany** the EU project 'BUILD UP Skills' has found that the necessary sets of qualifications are well-established in the training and masters' examination schemes for the relevant occupations and that the relevant technologies and processes are widely covered³¹ . Germany also has a very extensive education and training system for building workers³² . For the areas of energy efficiency and renewable

²⁷ <https://www.klimaaktiv.at/>

²⁸ [http:// www.energyacademy.at](http://www.energyacademy.at)

²⁹ Decree No.2010-788 of 12 July 2010

³⁰ <http://www.cah.fr/>

³¹ The full country report (divided in three parts), can be found here: <https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-de>

³² The core of the Germany sophisticated and well-established training system is a three or three-and-a-half year dual vocational course in which the practical training alternates with theoretical teaching in vocational centres. Standardised national testing schemes and curriculum plans ensure that people complete the training with

energies alone, a survey of training providers in craft and industry identified around 315 courses (excluding advanced and masters' courses and ignoring product training from industry and the wholesale sector). These include the advanced training to become a building energy consultant, which has been available for almost 20 years.

These qualification and training systems have been well-established for several decades; they are reliable and transparent to consumers.

Alongside them, Germany also offers special accreditation systems for providers of energy services and certification systems for measures to improve energy efficiency. Deutsche Akkreditierungsstelle GmbH (DAkkS), the national accreditation agency, provides accreditation to certification bodies for management systems, products/services and people and to verification bodies for emissions trading. Under the Peak Equalisation Efficiency Systems Regulation (Spitzenausgleichs-Effizienzsystemverordnung – SpaEfV), DAkkS is also responsible for monitoring the 44 currently accredited certification bodies for energy management systems, which counted on 280 technical auditors/experts in 2014 but which is growing rapidly.

The German Government has created the list of energy efficiency experts, together with the Federal Office for Economic Affairs and Export Control (Das Bundesamt für Wirtschaft und Ausfuhrkontrolle – BAFA)³³ and the KfW development bank³⁴ to provide quality assurance for funded on-site energy consultations and high-efficiency renovations and new builds funded by the KfW. This is achieved with standardised specifications for the required qualifications, regular training courses and evidence of practical work done, with spot-checks on this evidence. Overall, the national level of technical competence, objectivity and reliability among energy service providers in Germany may be considered adequate to meet the challenges of energy renovation in buildings.

Other highlighted examples include the centre for the advanced vocational training of energy sector technicians and operators (Scuola delle Energie)³⁵ hosted by ENEA's Centre in Rome (**Italy**). The School, set up in October 2012, offers a wide range of professional courses, including an annual summer school on Energy Efficiency and represents a training hub of excellence providing a permanent and comprehensive package of advanced courses to train specialized technicians, with a particular focus on energy efficiency in buildings and renewable energy sources.

Specific training programs for SMEs and builders have been developed and offered by an advisory centre in the framework of the "Energy Efficiency housing pilot project"³⁶ in **Lithuania**.

Finally, cases of coordination of training and accreditation for energy auditing, energy certification and inspection are those of Slovenia and Croatia.

comparable skills all over the country. The vocational training thus builds up comprehensive professional competence, enabling graduates to plan and handle technical tasks in a complex and changing field of work, stimulating the ability to adapt and change to handle new skills and competences. Many apprentices also continue on courses with up to 1 700 teaching hours to become "masters".

³³ http://www.bafa.de/EN/Home/home_node.html

³⁴ <https://www.kfw-entwicklungsbank.de/International-financing/KfW-Entwicklungsbank/>

³⁵ <http://www.efficientaenergetica.enea.it/formazione/scuola-delle-energie>

³⁶ Project funded by the World Bank; for more details see: <http://projects.worldbank.org/P035163/energy-efficiencyhousing-pilot-project?lang=en>

Slovenia, introduced a common training/certification article in its legislation for all three relevant Directives (EED, EPBD and RES) which translates into implementing a co-ordinated modular training approach.

Croatia has a set of training programmes on energy efficiency for professionals (in the fields of architecture, construction and building services) which provides a wide range of different competences and, as a result, trained engineers are authorised to carry out energy audits, energy certification of buildings and regular inspections of heating and cooling or AC systems. This Croatian model is in place since 2009, and it has been adopted by other countries in the Balkan region.

3.3.2 EU initiatives and projects in Member States

A number of national projects were developed in Europe in the context of BUILD UP Skills phase II.

The **Construye2020** project (Spain) is working, in collaboration with national authorities, on the development of a new qualification for ground source heat pumps installers. The project also developed an app for mobile devices which can be used as a training tool, providing good practices for the renovation of buildings.

The **BEEP** project (Finland) developed a training concept for trainers and workers based on best-practice of energy-efficient construction and on a comprehensive toolbox including: slides and didactic videos in 5 languages, training material for workers self-learning, a pilot training for "agents of change" (mentors who can help to set an example and explain how to improve the quality of the work) and an on-site training ambassador who plays a critical role in attracting workers' to the pilot trainings.

The **Qualishell** project (Romania) fostered the implementation of national qualification schemes for installers of high efficiency windows systems and thermal insulating systems to support the transition towards the implementation of nZEBs. The project also implemented effective mechanisms to ensure a large-scale and long lasting implementation of the two schemes, by use of existing networks, evaluation of competences acquired, and promotion of effective partnerships between education system and the construction sector. The results of the project have been mentioned in the QUALICHECK's project³⁷ as good practices for improving quality of the construction works.

Under the project '**Demonstration of Energy Efficiency and Utilisation of Renewable Energy Sources Through Public Buildings**'³⁸ two-day awareness-raising residential campaigns (road shows) were organised in seven Hungarian regional centres, demonstrating the promotion of use of the so-called Building Energy Rating Tool, the

³⁷ <http://qualicheck-platform.eu/about/quality-of-the-works/>

³⁸ This is part of a larger project called "CEC5 PROJECT" (implemented through the CENTRAL EUROPE co-financed by the European Regional and Development Fund), within th CENTRAL EUROPE Programme. The project aims at developing collective bottom-up initiative towards a harmonization of the sustainable assessment of the built environment in Europe and promoting energy efficiency and renewable energy sources use through their application in public buildings. It involves 12 project partners from 8 Central European Countries. For more details, see: <http://www.projectcec5.eu/>

planning and steps of possible and practical energy efficiency improvements of residential buildings, the possible practical uses of renewable energy sources and the targets and achievements of the project. At the campaign sites, an interactive exhibition demonstrated practical uses of renewable energy sources in buildings. In parallel, a training programme is planned: 125 experts will have the opportunity to acquire skills to use of the Building Energy Rating Tool. Further to the application of rating tools, these experts will also be trained to provide customised individual advice on energy efficiency.

Additionally, an EU project that is worth mentioning is **PROF-TRAC**³⁹, which is considered the equivalent of BUILD UP Skills Pillar I for professionals (architects, engineers, building managers) instead of for blue collar workers. Within the Horizon 2020 framework, the project has developed an open training and qualification platform focus on multi-disciplinary skills cutting across traditional professional disciplines. A preliminary skills mapping exercise was undertaken and a free online repository of training materials, has been established with constant updates, thus enabling potential trainers to design their own course.

The **REE-TROFIT** (Training on Renewable Energy solutions and energy Efficiency in reTROFITting) Project⁴⁰, although completed in 2013, is also worth mentioning because of its achievements:

It contributed to the diffusion of best practices and practical tools in the participating countries to facilitate the institutionalization and implementation of vocational courses on RES and energy efficiency in retrofitting. It also carried out vocational courses based on the defined training model and resources in each country with at least 450 trained and certified professionals.

The project was also successful in extending the REE-TROFIT training model and resources beyond the project consortium and in raising awareness of regional, national and European policy makers. It provided suggestions to implement a strategy for assuring the sustainability and large-scale replication of training after the project period.

3.4 Training of professionals: Conclusions and recommendations

The assessment of the status of the training programmes of professionals needed for the energy renovation of the national building stock highlighted a mixed picture. On one side, several efforts have been made in recent years to fill the skill gaps already identified. They all go in the right direction and included very positive experiences which were discussed above.

While some of the skill gaps identified have been addressed, many of these, mainly longer term sustainable schemes still need to be further developed. Many of these schemes still aim at meeting short-term skills needs and are organised in the context of pilot projects.

The main recommendation based on the analysis of the provided information is to develop and implement a national broad and long-term framework strategy, broader and more articulated than the one outlined by the BUILD UP Skills Pillar I Report. This should include white collars workers (engineers, architects, managers) and new emerging

³⁹ <http://profrac.eu/open-training-platform-for-nzeb-professionals.html>

⁴⁰ <http://www.reetrofit.eu/content.php>

professional profiles linked to the development of new strategic technologies as well as the update and creation of new qualification standards, starting from the most positive aspects and lessons learned within these first pilot projects, such as e.g. WE-Qualify, SouthZEB, MENS (see 2.2) as well as from other relevant best practice examples (see Chapter 4).

Relevant pillars for a long-term framework strategy would include:

Modular training

It is advisable to develop training modules which are flexible enough to allow both efficient retrain of experts, frequent update and the acquisition of interdisciplinary skills, such as the ones required for nZEBs. In addition, also in the case of EPC certifiers, installers and auditors, it would possibly allow for an efficient coordination of the training routes, which avoid duplications and unnecessary costs. Successful examples of implemented training in energy efficient buildings, shares this aspect.

Use of ICT and modern training tools

An increase use of on-line training, webinars, remote access and open access to training materials to integrate traditional class work and practice would make a difference in the diffusion of new skills to a large number of professionals. Distance learning would allow acquiring experiences already established in other contexts and make the transfer of knowledge easier.

Interdisciplinary content

Modules on cost-benefit analysis; energy simulations and optimization are required, in particular to meet the challenges posed by mandatory nZEBs requirements in the next years.

Specific nZEBs training schemes should be developed and promoted⁴¹. Furthermore, with the advent of Smart Grids (SG) a building would be better described as a system communicating and exchanging energy with other systems. In the future, technologies such as smart home systems, building-integrated PV and energy storage technologies are likely to be more and more diffused in energy-efficient buildings. Specific courses to deal with these strategic and emerging energy technologies could be envisaged, as well as

Training of trainers

In order to assure continuity to the training process Cyprus needs qualified local trainers. New qualifications and constant update of the trainers is a key part of the overall framework and it is still an open challenge. In this respect, learning from other countries' experiences and trainers (as in the SouthZeb EU project) could be the initial step.

Certification and accreditation schemes

The development of reliable and recognized certification schemes for professionals in the building sector, beyond the already established accreditation schemes for installers and EPCs

⁴¹ For example, the SouthZeb project developed and delivered, among others, the following modules: "nZEB simulation and design software", "Low carbon technology and automation for nZEB", "Retrofitting towards nZEB", "Construction management and field supervision of nZEB", and "Preparation of funding schemes and other incentives for nZEB".

Monitoring and evaluation

Early identification or even anticipation of skill needs and of the possible supply and demand mismatch for technical occupations is extremely important to develop, implement and adjust the system of training and vocational education. In addition, a comprehensive and systematic evaluation of the training programmes offered should be included since the beginning as well as feedback mechanisms to assure that the training are adjusted to professionals' and market needs, especially in new and unexplored fields and in rapidly changing environments.

Focus on practical activities

Demonstration projects and on-site practical training is especially important in the building sector, it is important both to assure that the right balance of class work and practical activities and the availability of adequate facilities and sites for training purposes.

Engagement of employers

The employers' engagement is central to foster on the job training and requalification. Specific measures for self-employed should be also developed.

Dissemination activities and capacity building

Trainings should be addressed or linked not only to the supply side (buildings professionals) but also to the demand side of the building chain (e.g. associations of property owners and public authorities as owners). For instance, specific training would be important for property owners associations and local authorities to communicate the value and benefits of energy retrofit to individual owners thus originating a scale effect in the renovation process of the building stock. It is important, beyond the development of new qualifications and skills, to create a diffused culture of energy efficiency in building and construction.

Involvement and coordination of many different actors and stakeholders

In order to efficiently build this overall training framework for the building sector, the involvement and coordination of many different actors and stakeholders is essential. Given the structural barriers of the building sector and the Cyprus market, without coordinated efforts from the many actors involved (several Ministries, Universities, private companies, building owners etc.) the project is likely to fail or to result in a fragmented (and inefficient) constellation of programmes and training courses which cannot assure the support of an ambitious, long term plan for the energy efficiency renovation of the building stock.

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