

BUILD2LC Project
**Boosting Low Carbon Innovative Building
Rehabilitation in European Regions**

State of Art, SWOT analysis and
identification of needs

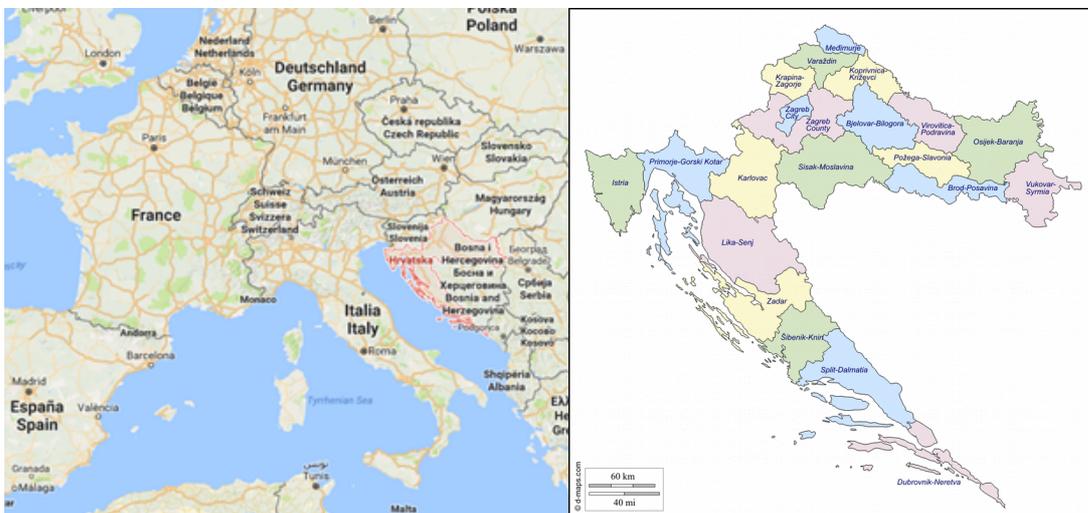
Zagreb, 19 September 2016

Region: Croatia

1 STATE OF ART OF ENERGY REHABILITATION IN BUILDINGS

1.1 Brief Picture of the Region

The geographical coverage of the Croatian Operational Programme Competitiveness and Cohesion 2014-2020, the policy instrument addressed within the framework of BUILD2LC project, is national and therefore this analysis examines the entire Croatian territory.



Maps, Source: Google

Croatia in the moment of political uncertainty

Europe’s youngest member, Croatia, is strategically located at the crossroads of Central Europe, Southeast Europe and the Mediterranean basin. Its capital city is Zagreb, which forms one of the country's primary subdivisions, along with its twenty counties. Croatia covers 56,594 square km and has diverse, mostly continental and Mediterranean climates. Croatia's Adriatic Sea coast contains more than a thousand islands which makes the country an attractive tourist destination. According to the 2011 population census, the country's population is 4.28 million.

Croatia is a parliamentary democracy. In the past year and a half the country has experienced a changing political situation. The coalition formed after the general elections in the end of 2015 set-up a government that lasted only for about six months before it collapsed in June 2016. New general elections were held on 11 September 2016 and the new government is in formation.

Positive economic trends, but risks remain

Gross domestic product (GDP) is a measure for the economic activity. It is defined as the value of all goods and services produced less the value of any goods or services used in their creation. To evaluate standards of living, it is more appropriate to use GDP per capita in purchasing power standards (PPS), in other words, adjusted for the size of an economy in terms of population and also for differences in price levels across countries. The volume index of GDP per capita in (PPS) is expressed in relation to the European Union (EU28) average set to equal 100. In 2015 the index for Croatia was 58, almost half the EU average (Figure 1).

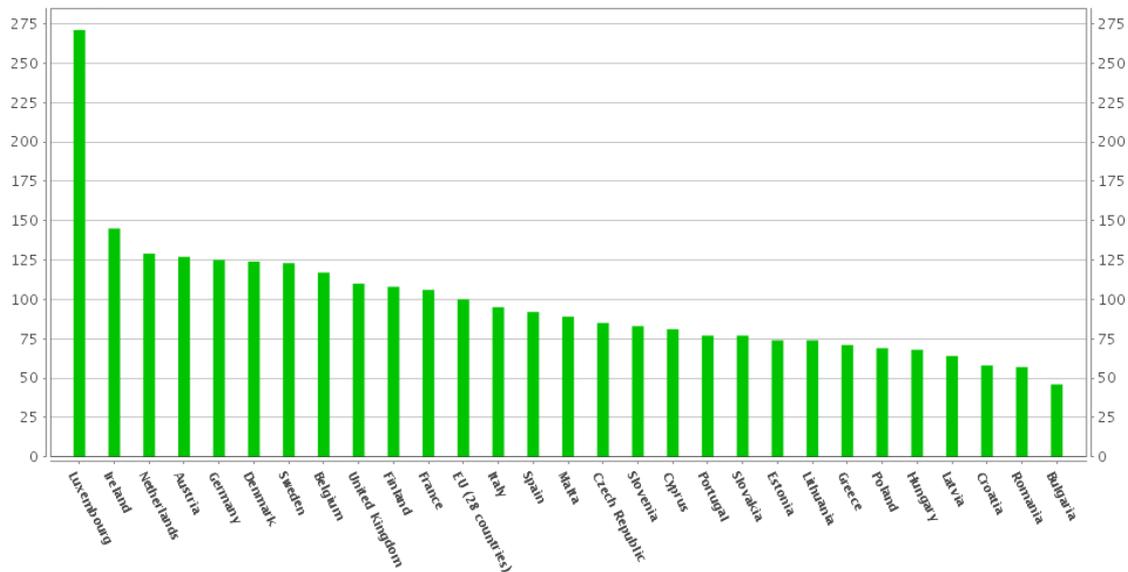


Figure 1: GDP per capita in PPS (index EU 28 =100) in 2015, Source: Eurostat

After six consecutive years of declining activity caused by the economic crisis, the domestic GDP rebounded in 2015 and is expected to increase in the following two years. The Croatian Economic Institute has issued a positive forecast for real GDP growth rates for 2016 and 2017 of 1.5 and 1.8 percent respectively. Unlike in recession years, domestic demand is expected to have a positive contribution to GDP growth, as was the case in 2015 (Figure 2). According to most recent estimates released by the Croatian Bureau of Statistics the national GDP for the first quarter of 2016 increased in real terms by 2,7% as compared to the same quarter of 2015. Croatia is experiencing an increase in personal consumption, a steady recovery of trade activities and a gradual increase of investments on the back of an increased absorption of EU structural and investment funds.

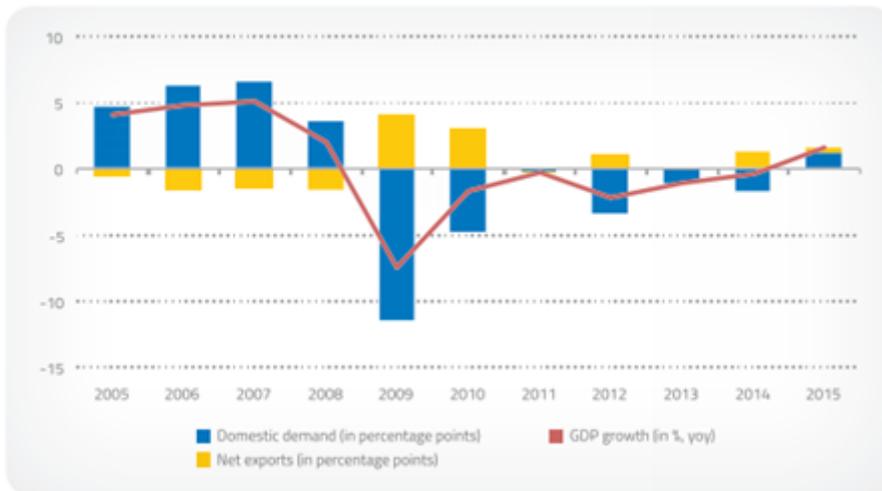


Figure 2: Demand contribution to GDP growth Source: Croatian Economic Outlook Quarterly, March 2016

Nevertheless, GDP remains well below its pre-cris level, unemployment is still high at 17% and the economy is highly vulnerable due to elevated levels of debt in both public and private sector. Croatia came out of the 2008-2014 recession with high general government debt, which is a heavy burden for the economy and a source of vulnerability. Additionally, a credit-driven consumption and investment boom in the pre-crisis years resulted in rapid accumulation of corporate and household debt. The recession, non-performing loans (NPLs) and the conversion of Swiss franc into euro loans have weakened the profitability of the financial sector, but the sector still remains well capitalised. Only now not confident in investing the remaining capital in riskier projects. The biggest contributor to NPLs is still the corporate sector, with construction, manufacturing and wholesale and retail trade holding more than two-thirds of NPLs.

Croatia is currently expected to grow above its potential over the next two years. Eventually, however, the economy is set to return to its long-term potential growth, currently estimated at below 1%. Country specific recommendations from Bruxelles in the light of the EC Annual Growth Survey published on 26 November 2015 is **lifting low potential growth with sustained investments and deep structural reforms in labour and especially product markets in view of fostering full utilisation of the labour force, while ensuring robust productivity growth.**

Energy structure and energy efficiency in buildings

The total primary energy supply in Croatia in 2014 amounted to 402,22 PJ with more than 80% of energy supply originating from fossil fuels (coal, oil, gas). During the period from 2009 until 2014, the total primary energy supply decreased at an average annual rate of 2 percent and in 2014 the total energy supply decreased by 3,1%.

In 2014 the final energy consumption amounted to 260,54 PJ. From 2009 to 2014 the final energy consumption decreased at an average annual rate of 2.7 percent and in 2014 the total final energy consumption decreased by 5% compared to the previous year. In the same timeframe consumption of renewables (other than biomass) increased at average annual rates

of 20.7 % and in 2014 it increased by 32.5% compared to the previous year. The consumption of all other energy forms decreased (Table 1).

	2009.	2010.	2011.	2012.	2013.	2014.	2014./13.	2009.-14.
	PJ						%	
Ugljen i koks Coal and coke	9,18	9,54	8,42	7,84	8,92	8,66	-2,9	-1,2
Ogrjevno drvo i biomasa Biomass	47,49	50,80	49,42	51,27	50,56	44,74	-11,5	-1,2
Ostali obnovljivi izvori Other renewables	0,32	0,50	0,54	0,59	0,63	0,83	32,5	20,7
Tekuća goriva Liquid Fuels	122,59	116,86	113,88	107,56	107,28	104,35	-2,7	-3,2
Plinovita goriva Gaseous Fuels	42,98	44,80	40,90	35,91	34,24	31,80	-7,1	-5,9
Električna energija Electricity	55,76	57,04	56,58	55,19	54,18	53,34	-1,6	-0,9
Toplinska energija Heat	20,72	21,35	20,61	19,30	18,57	16,84	-9,3	-4,1
UKUPNO TOTAL	299,04	300,90	290,34	277,66	274,36	260,54	-5,0	-2,7

Table 1: Final energy consumption by fuels, Source: Energy in Croatia 2014

Almost half of the final energy consumption, precisely 46,64%, in 2014 was energy consumed in buildings (Figure 3) out of which around ¼ is attached to public and commercial buildings and the rest to residential housing .

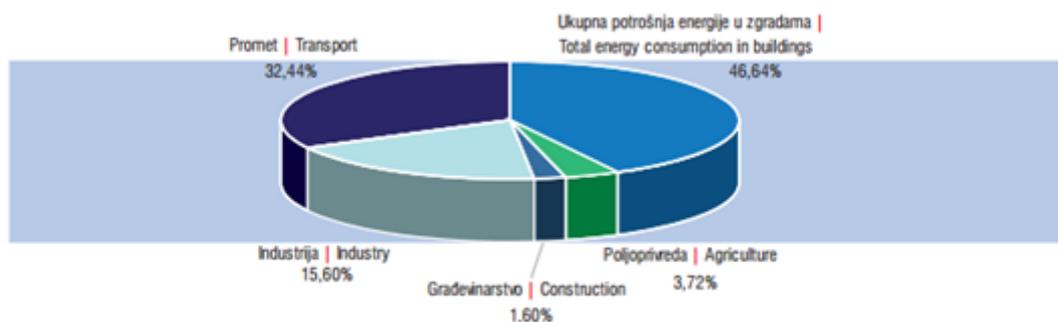


Figure 3: The share of total energy consumption in buildings in 2014 in the final energy consumption, Source: Energy in Croatia 2014

The final energy consumption in the “other” sector - consisting of households, services , agriculture and construction subsectors - amounted to 135,38 PJ with a decreasing trend over the period 2009-2014 most evident in the subsectors households and construction (Table 2).

	2009.	2010.	2011.	2012.	2013.	2014.	2014./13.	2009.-14.
	PJ						%	
Kućanstva Households	110,80	115,97	110,67	107,24	104,35	93,45	-10,5	-3,4
Uslužni sektor Services	30,63	32,18	31,66	30,44	29,52	28,07	-4,8	-1,7
Poljoprivreda Agriculture	10,47	10,27	10,49	9,61	9,47	9,70	2,4	-1,5
Građevinarstvo Construction	6,15	5,39	5,16	4,79	4,60	4,16	-9,6	-7,5
UKUPNO OPĆA POTROŠNJA TOTAL OTHER SECTORS	158,05	163,81	157,99	152,08	147,95	135,38	-8,5	-3,0

Table 2: Final energy consumption in "other" sectors by subsectors, Source: Energy in Croatia 2014

The negative trend in final energy consumption can be attributed to a number of factors, such as energy efficiency improvements and increased use of renewables, but the main reason behind the drop in final energy consumption over the past 7 years is due to the economic crisis and its impact on living standards. Now that the economy is recovering and energy prices for electricity and natural gas in Croatia continue to be below market value future trends in energy efficiency may well change for the worse.

Data from the ODYSSEE-MURE project available for the period from 2000-2013 shows that the highest market share in the final consumption of households in 2013 was for wood and other renewables (46,73%), followed by electricity (21,62%) and natural gas (19,75%) (Figure 4). A high share of 67,97% of this energy was used for space heating (Figure 5).

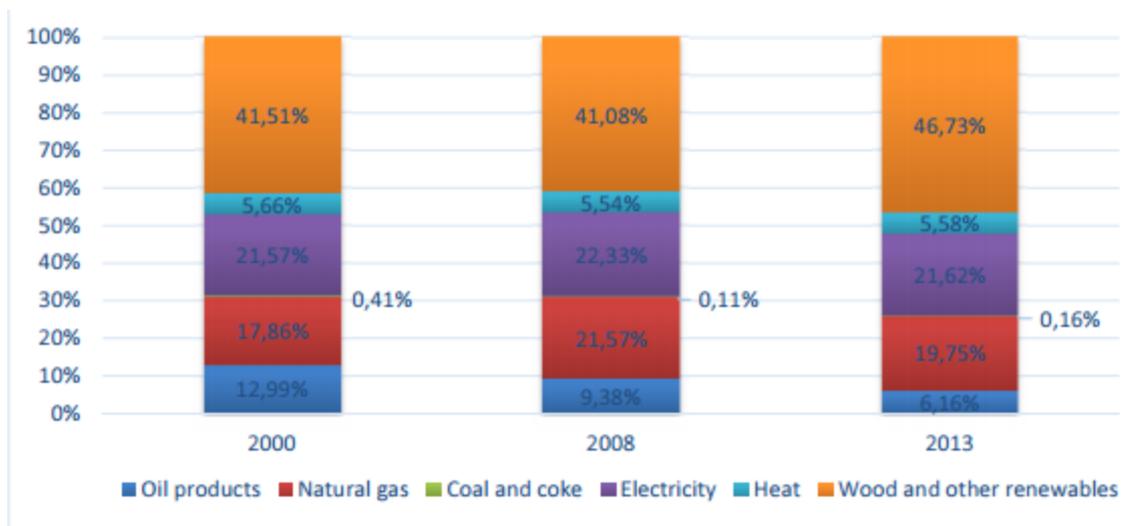


Figure 4: Shares of energy forms in household final energy consumption, Source: Energy efficiency trends and policies in Croatia, Project Odysee-Mure

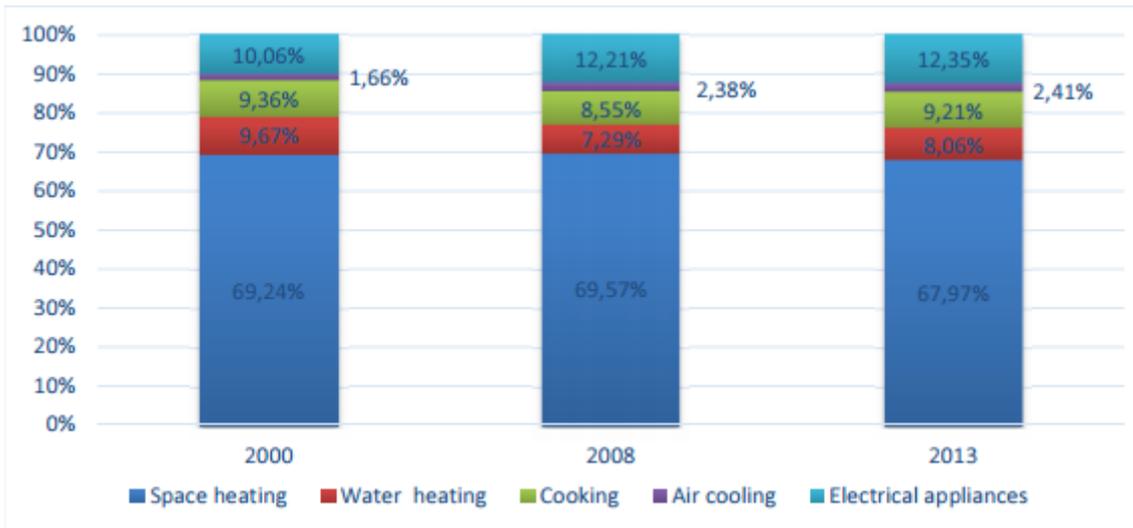


Figure 5: Shares in households final energy consumption by end-uses, Source: Energy efficiency trends and policies in Croatia, Project Odysee-Mure

In the service sector, electricity has the highest share in energy consumption (65,11% in 2013) and the remaining majority are fossil fuels – oil and gas (Figure 6). Because data on total energy consumption by sub-sector for the service sector in Croatia are not available, shares of electricity consumption by sub-sector for the service sector in Croatia are shown (Figure 8) where public buildings are represented in public offices, health sector and education sector.

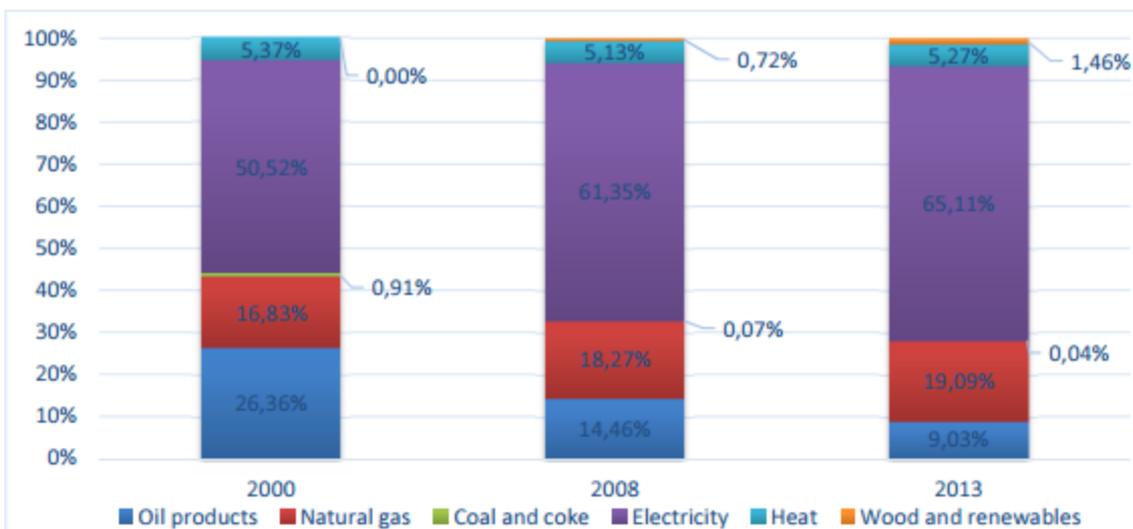


Figure 6: Shares of energy forms in final energy consumption in service sector, Source: Energy efficiency trends and policies in Croatia, Project Odysee-Mure

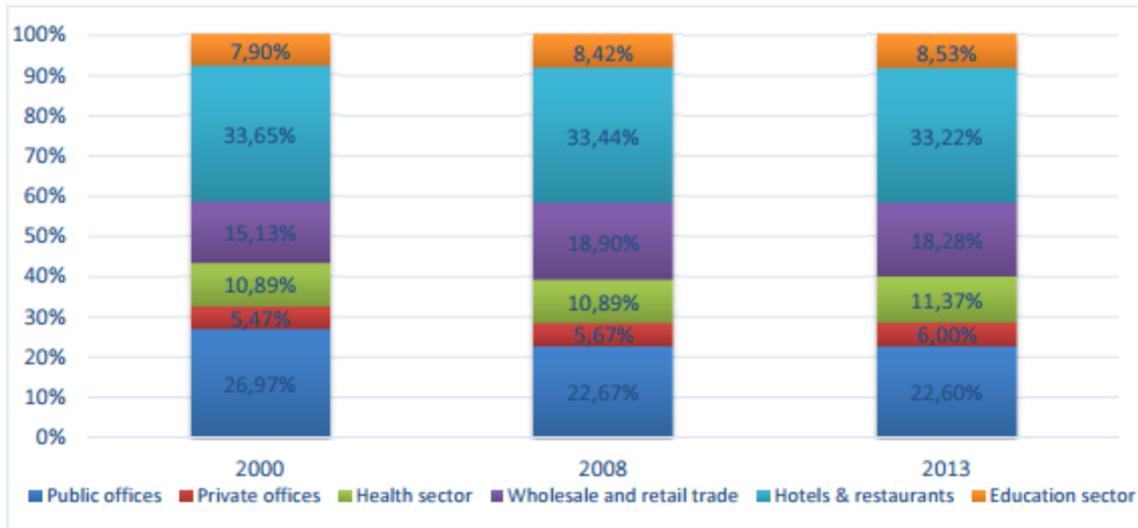


Figure 7: Electricity consumption of services by sub-sectors, Source: Energy efficiency policies in Croatia, Energy Institute Hrvoje Požar, Project Odysee-Mure

1.2 State of Play

Current Croatian national building stock (data from July 2014) consists of 887,321 buildings, with total area of 192,519,039 m². Review of the Croatian national building stock includes data on the number, area, construction and energy performance of the national building stock divided by purpose into multiapartment buildings, family houses, public buildings and commercial buildings. According to the analysis, buildings built before 1987 have a maximum value of the required annual heating energy and annual final energy for heating, cooling, domestic hot water and lighting.

Achieving the goals of energy renewal to nZEB standard requires the mobilisation of significant resources for investment and operational costs. With proposed schedule for the reconstruction, overall reduction in CO₂ emissions of 87.22% will be achieved (by 2050).

Increased construction activity has a positive effect on GDP, employment and income budget. If the proposed programme of integral renewal of 92% of the national building stock will be realized by the end of 2049, the expected impact on employment could be between 62,000 new jobs in the scenario with conservatively estimated multiplier effects, and 102,000 in the scenario with strong multiplication.

1.3 Link to the RIS3

The Smart Specialisation Strategy (S3) 2016-2020 and Action Plan for the implementation of the strategy for the period 2016 -2017 has been adopted by the Croatian government in April 2016. The drafting process was coordinated by the Ministry of Economy and the strategy is a prerequisite for the absorption of ESI funding allocated in TO. The adoption of the document has unlocked the funds for the development of a number of technology parks.

The S3 Croatia focuses on the efficient cooperation between business and scientific sector in areas where Croatia has strongest prospects for smart, inclusive and sustainable growth, building on its strengths, comparative advantages and potential for excellence. Energy and sustainable environment is among five identified priority areas. This priority is further divided into 2 subpriority areas (Figure 9) which relate well to the identified horizontal topics, key enabling technologies (KET) and information communication technologies (ICT).

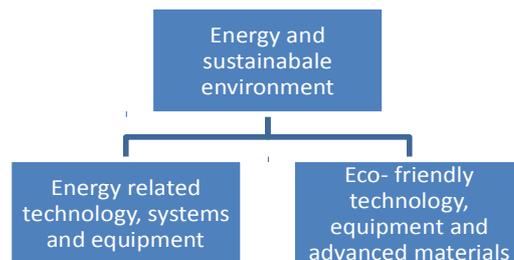


Figure 8: Subpriority areas within priority area Energy and Sustainable Environment, Source: Croatia Smart Specialization Strategy 2016-2020

The first subpriority area is focused on introduction of new optimized technical solutions and new advanced materials as well as application of ICT solutions for the improvement of energy efficiency and energy management. The second subpriority is focusing on the solutions for the fight against climate change and the development of a low carbon economy, including the use of renewable energy sources, application of advanced materials for a “green” construction.

The “Intelligent Energy” cluster, a business network of SMEs investing in R&D and innovations is listed as a key stakeholder for both subpriority areas.

Besides Calls for Proposals under TO1 two strategic projects are planned in support of 1) the set-up of an Innovation network in industry and development of thematic innovation platforms and 2) initiative cluster for competitiveness.

1.4 Policy Instruments. Regional and National Plans and Policies on Energy Rehabilitation of Buildings

Strategies:

Energy development Strategy of the Republic of Croatia until 2020 – This main strategic document was adopted in 2009 and hence projections and targets set within this document do not properly reflect reality and do not take into account current trends in the energy sector.

Long term Strategy for mobilizing investment in the renovation of the national building stock in the Republic of Croatia - The main objective of the Strategy is to identify effective measures, pursuant to a predefined economical and energy-optimal model of building renovation, for a long-term mobilisation of costefficient integral renovation of the national building stock of the

Republic of Croatia by 2050, including all residential and commercial buildings. This strategy is included in the NEEAP.

Plans:

Third National Energy Efficiency Action Plan (NEEAP) 2014-2016 - Under the Energy Efficiency Directive, EU countries must draw up these plans every three years. NEEAP set out estimated energy consumption, planned energy efficiency measures and the improvements individual EU countries expect to achieve. The fourth NEEAP is in development.

National Plan for the increase of number of nZEB buildings - EU countries make energy efficient renovations to at least 3% of buildings owned and occupied by central government. The methodology is described in the Long-term strategy for mobilising investment in the renovation of the national building stock in the Republic of Croatia.

Three year Action Plan and Annual Plan (regional level) – based on the Energy Efficiency Act counties and cities with a population above 35.0000 are obliged to develop and adopt Three year action plans and Annual plans. Plans cover the period 2017-2019.

Sustainable Energy Action Plans (local level) – many cities have voluntarily joined the Covenant of Mayors initiative which encourages European cities to combat climate change by developing SEAPs which are a basis for future implementation of specific projects on energy efficiency and use of renewable energy sources.

1.5 Legislation, Regulation

Significant change in the field of energy efficiency in the buildings in 2014 was adoption of the **Energy efficiency Act OG 127/14** regulating efficient energy use, adoption of local, regional and national plans of energy efficiency, energy efficiency obligations, obligations of regulatory body for energy, transmission system operator, distribution system operator and energy market operator regarding transmission, transport and distribution of energy, obligations of energy distributors, suppliers of energy and/or water, and particularly energy services, determination of energy savings and consumer rights in application of energy efficiency measures.

Technical regulation on energy economy and heat retention in buildings OG 97/14 is the main and most important regulation laying down the technical requirements for the rational use of energy and thermal protection of the construction of the building, technical systems of heating, ventilation, cooling, air conditioning, domestic hot water and lighting to be met during the design and construction of new buildings, as well as reconstruction of existing buildings and during use of buildings that are heated to an internal temperature higher than 12°C.

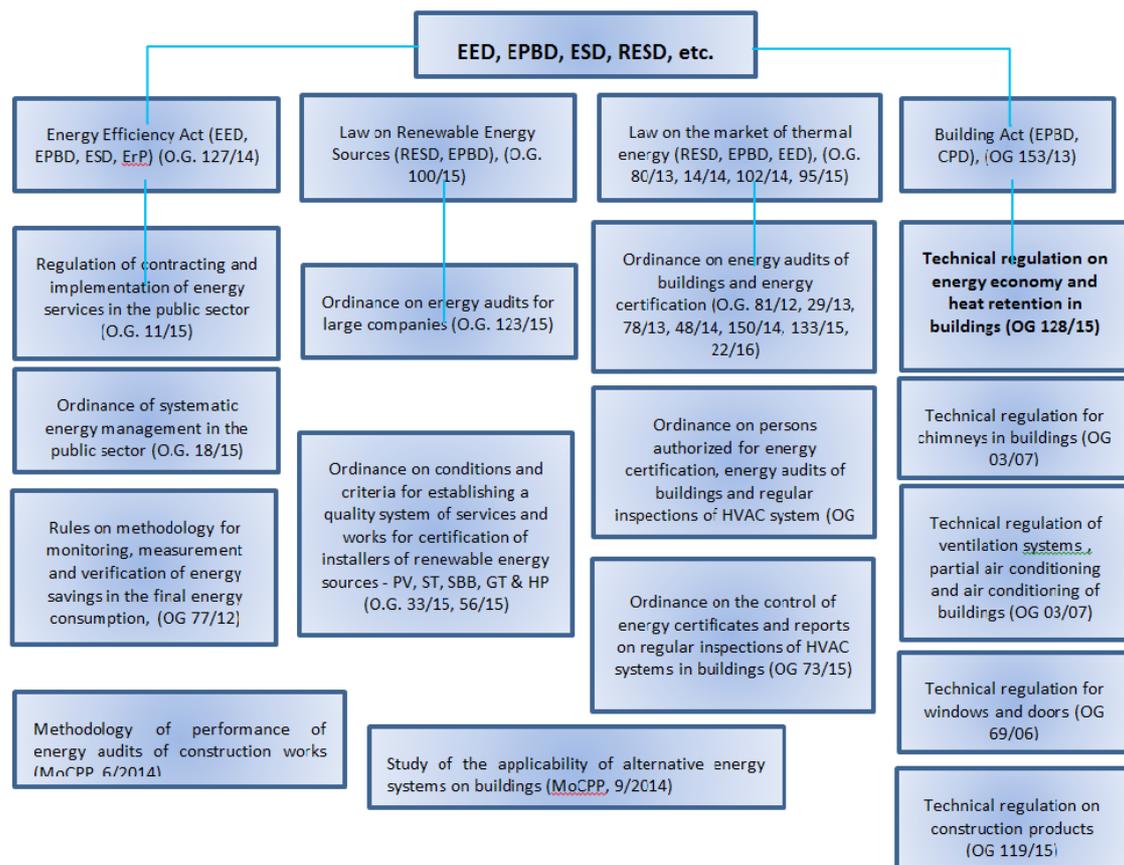


Figure 9: EE legislative framework in Croatia, Source: Ministry of construction and physical planning

1.6 Financial Support and Instruments

The financing programmes and instruments presented are aimed at public and residential sector supporting energy efficiency in public buildings and family/multifamily houses.

National and EU programmes:

- **Environmental Protection and Energy Efficiency Fund (EPEEF)** – providing funding for small-scale household programmes for EE and RES. Types of projects financed by the fund are: co-financing of energy audits, house insulation (including windows replacement), RES application (PV, solar water heating panels, biomass, etc.) and, from the beginning of 2015, also the purchase of new energy-efficient home appliances.
- **Operational Programme Competitiveness and Cohesion (OPCC)** - allocated ESIF funding for energy renovation of public buildings, multifamily buildings and family homes through TO04. Grants are allocated through dedicated national programmes and financial instruments are in development most probably for public buildings only.
- **ETC programmes** – selected cross-border and transnational programmes feature low carbon priorities and allow for EE investments, such as INTERREG IPA CBC Croatia-Bosnia and Herzegovina-Monte Negro or INTERREG MED. Usually CBC programmes are

more implementation and investment oriented than transnational programmes and in rare cases also interregional programmes will fund EE investments and soft measures.

- **Programme for energy renovation of public buildings** - The program is adopted by the government and promotes a comprehensive renovation of buildings through combination of grant funding from EPEEF, preferential loans from Croatian Bank for Reconstruction and Development (HBOR) and engagement of private Energy Service Providers (ESCOs).
- **Programme for energy reconstruction of family houses 2014-2020** – adopted by the government and implemented through EPEEF or regional/local governments the programme implemented by EPEEF provides grants energy audits and certificates, development of technical documentation and energy renovation as well as installation of individual metering system. OPCC funding or in combination with national funds.
- **Programme for energy reconstruction of multifamily buildings 2014-2020** – adopted by the government and implemented by EPEEF provides grants energy audits and certificates, development of technical documentation and energy renovation as well as installation of individual metering system. Funding is from OPCC or in combination with national funds.

Regional and local programmes/incentives:

- **Counties, cities or municipalities** may publish grant schemes to promote energy efficiency (*example*: Zagreb County - energy efficiency measures in public buildings – open to local governments), energy management (*example*: City of Karlovac - installation of smart meters and heat cost allocators- open to residential sector) or renewable energy sources (*example*: City of Zagreb installation of RES – open to private persons and companies).
- **Incentive models** based on reduction of communal fee for the construction of buildings requiring less energy for heating than prescribed by the law. Such models are established in 6 cities/municipalities with a reduction ranging from 20%-100%. There is no specific incentive model developed for nZEB.

Dedicated and preferential loan programmes:

- **Croatian Bank for Reconstruction and Development (HBOR)** - National development bank provides preferential loans under several dedicated programmes (national or EIBs) to increase energy efficiency in the buildings sector. Open to public and private sector.
- **Western Balkans Sustainable Energy Financing Facility II (WeBSEFF II)** - Investment facility established by the European Bank for Reconstruction and Development provides debt financing accompanied by technical assistance. Open to public and private sector.
- **Green for growth fund** – international initiative meant to complement existing financing programmes. It functions as PPP providing subordinated funding to financial institutions or direct funding to ESCOs, municipalities, public entities or projects in the area of EE and RES, suppliers of EE equipment.
- **REENOVA+** - Financing program developed by the European Bank for reconstruction and development (EBRD) within the framework of Sustainable Energy Finance Fund (SEEF) provides debt financing accompanied by technical assistance. Open to residential/private sector (owners of family houses and apartments, contractors and suppliers of EE products).

- **Commercial banks** offer loans and dedicated programmes for energy renovation of residential buildings either through direct credit lines or subordinated credit lines (EBRD, EIB, WeBSEFF). Open to private and public sector.

Technical assistance programmes:

- **Horizon 2020 - Project Development Assistance (H2020 PDA)** - This facility aims to bridge the gap between sustainable energy plans and real investment through supporting all activities necessary to prepare and mobilise investment into small scale (€ 7.5-50 M) sustainable energy projects.
- **European Local Energy Assistance (ELENA)** - Project development assistance governed by European development banks (EIB, KfW, CEB and EBRD) assists public authorities with development of innovative and bankable large scale investments (over € 50 M).

Other:

- **Energy Performance Contracting (EPC)** - EPC represents one of key financing schemes for implementation of energy renovation of public buildings. However, with fewer than 10 ESCOs on the market and less than € 150 M of investments per year Croatia is still lagging behind established EU ESCO markets.
- **Public-private partnership model (PPP)** - PPP model has been sparsely used for energy renovation of public buildings in Croatia despite a very solid legal and institutional framework. High costs of preparation and financing combined with time consuming procedures make PPP model adequate only for large scale renovation projects.
- **Crowdfunding** - As an innovative and emerging financing method crowdfunding provides community based financing for small scale renovation projects. With only one operational crowdfunding platform for energy efficiency projects (Croenergy.eu) and very restrictive legal framework, Croatia's crowdfunding market has yet to reach full potential.

Financing programmes in development:

- **EBANKA** - Ethical development bank functions as a cooperative providing community based debt financing for members accompanied by technical assistance and possibly aggregation of projects

1.7 Construction and Buildings Market Brief Description

Discontinuation of negative trends in the construction sector

The recent economic crisis has harmed Croatia's construction sector most of all manifesting itself in a decrease of construction activities and employment. Yet despite the unfavorable developments, the construction sector still plays a significant role in Croatia's overall economy. According to 2015 data the construction sector represented a 4,3 % share in the GDP and a 6,7 % share in the overall employment. In the latest data released by the Croatian Bureau of Statistics, the volume of construction works in May 2016 has increased 4,3 % in comparison to May 2015 (Figure 3) with construction works on buildings recording an increase in 11,4 % and a

decrease of 1,6 % on civil engineering works. This is the first indication that the negative trend may have finally come to an end.



Figure 10: Volume indices of construction Works, May 2011-May 2016, Source: Croatian Bureau of Statistics

While the Croatian construction sector has only now started to recover, the situation EU wide is much better. Statistics for EU-28 show that the negative trends ceased already in 2010 and after a three-year period of stagnation the sector started to recover in 2013. Overall, the developments in EU construction sector were far more stable than in Croatia where an investment boom in construction from 2000-2008 was followed by an equally strong fall. From December 2008 until December 2015 the volume of construction works was cut in half and 49.348 jobs were cut (54,5%), whereby 89% of that figure were jobs cut in crafts (smallest companies). Unlike in some EU countries, in Croatia there were no specific measures in place to support the recovery (investments, tax incentives, preferential loans) and the construction sector was additionally challenged with the opening of the market to foreign competition in 2013 when Croatia joined the EU. During the crisis many of the largest companies were bought by foreign investors.

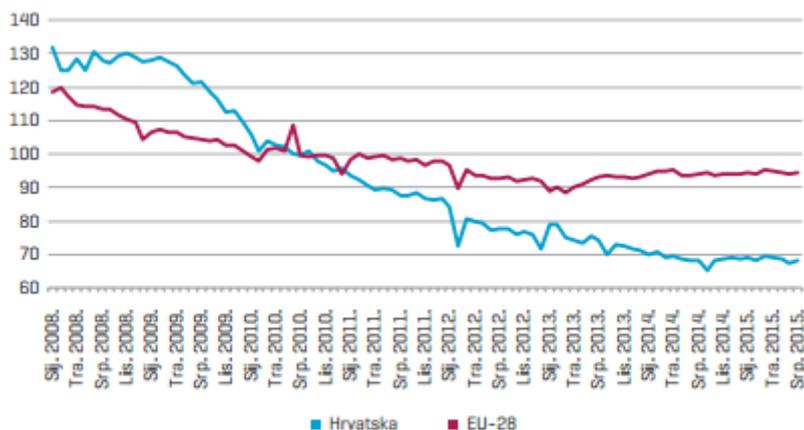


Figure 11: Volume of construction works, 2010=100, *Source:* Sectoral analysis for construction October 2015, Zagreb Economic Institute

The salaries in the construction sector are not competitive. In the first six months of 2015 the average net salary was 15,4% lower than the average salary in Croatia.

The negative trend and lower demand for construction activities has also driven the prices of construction material down in 2008 whilst at the same time the production prices kept rising.

In the overall picture of construction works in Croatia, the leading area is transport infrastructure followed by non residential buildings, pipelines and then residential buildings, measuring more than half the size of volume of construction works than in non residential buildings.

The financial crisis in the construction sector has caused a decrease in the volume of completed works in every county since 2008, but in 2013 the situation has started to improve in some counties. A closer look into construction trends specifically in the buildings sector shows different levels of activity in different parts of the county. Figure 4 shows that the highest share of completed construction works on buildings was in the City of Zagreb. Combined activities in City of Zagreb, Primorje-Gorski Kotar and Split-Dalmatia – counties where the main urban centres are located (City of Zagreb, City of Rijeka and City of Split) - represent 41% of all activities.

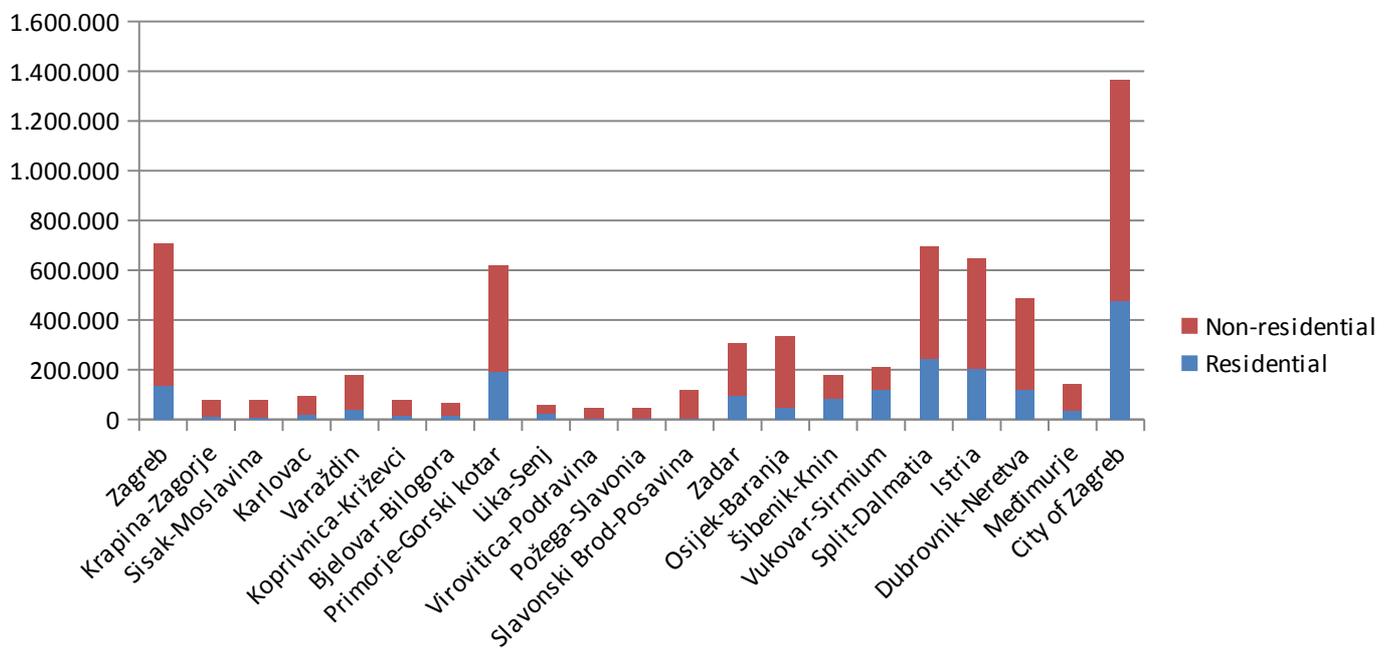


Figure 12: Value (in Croatian kuna) of construction works completed for residential and non-residential buildings, by counties in 2014, *Source:* Croatian Bureau of Statistics

In 2015 the rehabilitation of residential buildings has been more strongly than before promoted by the **Environmental Protection and Energy Efficiency Fund (EPEEF)**. The programme for the reconstruction of family homes has been implemented at regional (county) level until 2015 and that year for the first time the EPEEF has assumed the role of the implementing body on national level supported by an improved media campaign. This has resulted in a stronger interest from citizens and a more equal distribution of funds from all regions than in the previous years. The EPEEF also implements and funds the rehabilitation of multifamily buildings, non residential and public buildings based on programmes adopted by the government.

The **National Energy Efficiency online portal** has been launched in 2016 as the central place for streamlining information, advice and news in the field of EE in Croatia. The structure is well divided into “citizens”, “commercial sector” and “public sector” .

Promotion of energy efficiency in buildings is also carried out on national level by **Centre for monitoring business activities in the energy sector and investments (CEI)**, **Agency for transactions and mediation in immovable properties (APN)**, **Agency for investments and competitiveness (AIK)** and **Croatian Bank for reconstruction and development (HBOR)** as well as line ministries Ministry of economy, Ministry of Construction and physical planning and Ministry of environment and nature protection and Ministry of Regional development and EU funds .

There are plenty of other promotional channels: five Croatian regional energy agencies, Energy Institute Hrvoje Požar, Croatia green building council, commercial banks, ESCO companies, private online info portals, such as www.energetika-net.com and www.gradimo.hr, and others.

1.8 Professional Characterization (Labour)

The lack of a qualified labour force in the construction sector is certainly one of the main barriers to be overcome in Croatia. Life-long education of workers and professionals in the construction sector are targeted through two ongoing projects:

The CROSKILLS project, part of the Build Up Skills initiative, is aimed at life-long education of Croatian workers in the field of energy efficiency in building.

The first project phase (2012-2013) gathered the relevant Croatian institutions and professional associations in the construction, energy and education sectors through the National Qualification Platform, resulting in the formulation of needs and priorities within the National Roadmap and action plan, formally endorsed by 23 sectoral stakeholders.

Based on the National Roadmap, the second project phase (2014 - 2017) is developing lifelong training plans for six key building professions - brick layer, carpenter, plasterer, housepainter, roofer, drywall installer - defining and verifying training programs and conducting test trainings for workers in the first accredited training centres country-wide.

Subsequent funding for the developed and accredited training programs will be accessible through the European Social Fund, while the next phases of this initiative envisages extension

of the program to the institutional vocational education system, systematic training of installers of technical systems in buildings etc. The institutional requirements for this need to be set by this project i.e. through active involvement of sectoral ministries and other institutions in the work of the National Qualification Platform.

The main challenges of the professionals involved in nZEB design and construction as identified by the **project PROF / TRAC** project are:

- Many professionals in the buildings sector have limited knowledge and skills in energy efficient building design and nZEB principles.
- Lack of collaboration between the different disciplines and professionals. Most of the available trainings focus on one specific target group and on one technique or concept.
- Lack of harmonised certification and qualification schemes with mainstreamed training materials for building professionals on nZEB. Lack of skills-mapping and qualifications for the specific subject and target groups.
- Training materials for education and post-initial education are created on an ad-hoc basis without consensus on an underlying qualification framework. Training materials for education and post-initial education should be coordinated and updated for a life-long- learning process.

Project PROF-TRAC, with an impressive partnership, offers a solution to overcome these barriers by developing an Open Training Platform and Qualification scheme for Continuing Professional Development for professionals in the building sector. This platform targets technical experts, architects and managers involved in nZEB design and construction. The developed European qualification scheme will be part of a life- long-life learning process for continuous development and up-skilling of professionals.

1.9 Preliminary Best Practices

New financial instruments:

Reconstructed public buildings in City of Zagreb under the ZagEE project - [ZagEE](#) project is funded under the Mobilising Local Energy Investment Project Development Assistance (MLEI PDA) supported by Intelligent Energy Europe which assists local and regional authorities to develop sustainable energy projects. It aims to bridge the gap between sustainable energy plans and real investment by funding activities necessary to prepare, and mobilise finance for public investment programmes. Different finance models were used for funding buildings.

CROENERGY.EU - Croenergy is a specialized crowdfunding platform for financing projects in the field of energy efficiency, renewable energy sources and environmental protection developed and launched by REGEA in 2015. Currently, the platform offers the financial model based on donations and awards but in next phases it is planned to open the possibility of financing campaigns through loans and equity. One campaign, energy rehabilitation of kindergarden Pregrada, has been successfully completed with 121% of expected funds secured. Another project, purchase of an energy efficient oven for healthier meals in a public school, is currently ongoing.

Innovation:

Bračak Energy Centre - REGEA is implementing the reconstruction and revitalisation of Bračak Manor leading to the set-up of a regional hub of excellence and knowledge of energy efficiency and renewable energy sources. The reconstruction of the building will result in an upgrade from EPC rating F to rating B. Bračak Manor is a unique showcase model for demonstrating applied energy efficiency measures and the successful inclusion of renewable energy sources in a building under cultural heritage protection.

System for monitoring, measuring and verification of energy savings (SMIV) – this web based application is a single registry enabling a systematic monitoring of energy savings, reduction of CO2 emissions and investments resulting from implemented EE measures in four sectors: service, industry, transport, households. The intended users of the application are public sector, providers of energy services and providers of financial support and it uses a bottom-up methodology. It is possible to enter exact data measured before and after the intervention.

Energy poverty:

Rural electrification project - This is a joint project of the Ministry of Environmental and Nature Protection, the Environmental Protection and Energy Efficiency Fund, and the United Nations Development Programme (UNDP) in Croatia. The project has provided electricity to poor households in rural areas that are far from the power grid and their connection to the system is not profitable. In the pilot project 5 solar systems were installed in Karlovac County in 2015.

With knowledge to a Warm home – this is a project implemented by DOOR in collaboration with the City of Petrinja under which a detailed research on energy poverty in the Sisak-Moslavina County was conducted and 79 households at risk of energy poverty were equipped with energy efficient appliances for small measures for energy savings. The real success of this project is that it resulted in a change of regional policy through the inclusion of a priority in the county's social services plan for the period 2015-2020 by which a system of energy advice will be developed and set-up targeting individuals at risk of energy poverty.

Professionalization of the construction sector:

Croskills project – part of Build Up Skills initiative, this project is aimed at life-long education of workers in the field of energy efficiency in building thus strengthening qualifications of craftsmen, employed and unemployed construction workers. The 1st project phase (2012-2013) gathered relevant institutions and professional associations in the construction, energy and education sectors through the National Qualification Platform, resulting in the formulation of needs and priorities within the National Roadmap and action plan, formally endorsed by 23 sectoral stakeholders. The 2nd project phase (2014-2017) will develop lifelong training plans for 6 key building professions, define and verify the training programs and conduct test trainings for workers in the 1st accredited training centres country-wide.

Cluster Intelligent Energy – this is a business network counting 32 involving mostly SMEs, but also scientific institutions, experts and NGOs building on the triple helix concept. The cluster is export oriented (in 2014 62% of activities were export related) and invests in R&D and innovation (11 patents). It focuses on energy technologies in the area of energy efficiency,

energy management, energy and HVAC systems, smart grids, hydropower (small hydro), solar energy (PV) and heating systems (biomass).

1.10 References

BUILD2LC Application Form, April 2016

Energy in Croatia 2014, Annual Energy Report, Ministry of Economy, December 2015

Croatian Economic Outlook Quarterly, The Institute of Economics Zagreb, March 2016

Sectoral analysis for Construction sector, The Institute of Economics Zagreb, December 2015

Croatian bureau of Statistics, www.dzs.hr

Report on energy efficiency trends and policies in Croatia, Project Odysee-Mure, October 2015

Croskills project, www.croskills.hr

Prof TRAC project, <http://proftrac.eu/>

Ministry of Construction and Physical Planning www.mgipu.hr

Croatia Smart Specialisation Strategy for the period 2016-2020 and Action Plan for the implementation of the Strategy 2016-2017, April 2016

EC Country Report Croatia 2016 Including an In-Depth Review on the prevention and correction of macroeconomic imbalances, March 2016

Eurostat, <http://ec.europa.eu/eurostat>

Croatian Chamber of Commerce, Construction sector in EU and Croatia- from the recession to the recovery, January 2016

2 SWOT Analysis

TOPIC 1: New financial instruments

Definition within BUILD2LC context

This topic focuses on the development of a new, flexible and innovative financial instrument, elaboration of cost effective measures reflecting the needs and expectations of the FI future beneficiaries, increasing the effectiveness of public funds with the use of PPP, promotion of business models for the contracting of energy services (ESCO, EPC), increasing the amount of available public funds (eg. combining EFSI i ESI).

Summary of the situation in Croatia

In 2016 the Ministry of Regional Development and EU funds has successfully launched the first 6 financial instruments intended for SMEs within the framework of OPCC, TO3. MRDEUF is coordinating the elaboration of the study assessing the potential future use of financial instruments in the area of energy efficiency conducted by EIB and the set-up of the system for the implementation of financial instruments within TO4 for energy efficiency in buildings (focus on public buildings), companies, tourism and public. The process of the preparation for the set-up of FI for EE is running in parallel to BUILD2LC activities and a consolidation of efforts would be beneficial. Previous experience in financial instruments includes the implementation of the national Programme for energy renovation of public buildings using the ESCO model implemented through a combination of funds. Lessons learned have shown that mostly large investments have been realized while a business model for small scale investments has not emerged. However, an innovative and emerging financing method providing community based financing for small scale renovation projects has been launched in 2015, the crowdfunding platform [CROENERGY](#) . Two realized investments so far show that the platform has a future, although there are still many predominantly legal barriers preventing an up-scale of the model. It is worth mentioning that there have been efforts from local/regional governments to set up a revolving fund for energy rehabilitation of buildings using ESI funds but without any results.

TOPIC 2: Professionalization of the construction sector

Definition within BUILD2LC context

In order to achieve EU and national energy efficiency and climate change targets it is necessary to create a qualified labour force in the construction sector. Professionals and workers along the value chain, ie in all processes of energy rehabilitation of buildings, must have the skills needed to meet the challenges associated with nZEB (npr. new materials, products, new systems and processes). This topic focuses on the development of training schemes, certification, accreditation and integration of stakeholders along the construction supply chain.

Summary of the situation in Croatia

The main challenge in Croatia is the lack of a qualified labour force in the construction sector when it comes to energy efficiency and the burden of non competitive salaries. Since 2012 the project [Croskills](#), part of the Build Up Skills initiative, has been implemented as a systematic solution for labour market needs in the construction sector. Under the project lifelong training programmes for six key building professions have been developed and test trainings for workers in the first accredited training centres conducted country-wide. Subsequent funding for the developed and accredited training programs will be accessible through ESF and in prospect is the extension of the programme to institutional vocational education system, systematic training of installers of technical systems in buildings etc. The initiative enjoys the support and involvement of sectoral ministries and other institutions in the work of the National Qualification Platform. Croatia is one of the first EU that has defined nZEB on national level through the adoption of the technical regulation in 2015. Development of skills in reference to nZEB are existing through previous EU projects such as [SustainCo](#) and a new EU project [PROF/TRAC](#) that targets technical experts, architects and managers involved in nZEB design and construction. It will develop an Open Training Platform and Qualification scheme for Continuing Professional Development for professionals in the building sector.

TOPIC 3: Activation of demand and combating energy poverty

Definition within BUILD2LC context

This topic focuses on activating the demand for investments in energy rehabilitation of buildings with emphasis on vulnerable groups. But, the focus is also on non-investment measures for the achievement of energy savings, such as providing of quality advice and information. There is not a single definition of energy poverty at EU level, but most simply put those are consumers that spend a proportionally large share of their income on energy bills. Here, the emphasis is on specific measures for vulnerable groups (eg. children, elderly, municipalities with low financial capacity) and the set-up of advice centres.

Summary of the situation in Croatia

As outlined in the Social Action Plan on Understanding of Social Aspects of the Energy Community, adopted in 2013, the Ministry of Economy was supposed to define criteria and propose mechanisms for fighting and monitoring energy poverty, but so far this has not been done. As a result of changes in social care regulations in 2015 only very basic eligibility criteria for receiving the status of a consumer at risk of energy poverty have been established¹ – registered social welfare beneficiaries and the disabled. Consequently, up to 125.000 eligible consumers representing roughly 3% of the Croatian population are entitled to receive a monthly voucher for electricity bills. This measure is financially compensated through the introduction of a solidarity fee to all other energy household consumers as a top up on the

¹ Directive on criteria for receiving the status of a consumer at risk of energy poverty in the network systems and Directive on monthly fee for the energy consumer at risk

price of electricity. According to 2014 poverty indicators released by the National Bureau of Statistics 9,7% of the population could not keep their homes adequately warm, 29,1% could not pay their utility bills on time and for 66,3% housing costs presented a heavy financial burden. The obvious discrepancy between data indicating percentage of the population having energy related problems and percentage of the population addressed with current anti energy poverty measures shows that the system in place is far from an adequate solution. There are no support measures dealing with expenses for natural gas, but there is a support measure implemented in some counties (regional level) for the purchase of log wood used for heating. This topic is also relevant in war affected areas where the reconstruction of infrastructure is still an issue. This topic is still awaiting a systematic solution, but on the bright side domestic NGO [DOOR](#), specialized in energy poverty, is very experienced and very active in promoting the right solutions through domestic and EU projects as well as an maintaining an ongoing dialogue with key stakeholders.

TOPIC 4: Innovation

Definition within BUILD2LC context

This topic focuses on the creation of new technical and systematic solutions with the intention to enhance energy efficiency in buildings. This can be achieved by promoting the use of new materials, processes and systems. This topic is particularly suited for the design and implementation of a strategic project or pilot project with demonstrational character with the emphasis on public sector. here, the focus is on new ICT solutions, deep renovation of buildings (energy rehabilitaion of buildings with a minimum of 60% savings), smart buildings, and the cooperation with the private and scientific sector.

Summary of the situation in Croatia

The Croatia Smart Specialization strategy has been adopted very recently in April 2016. The document includes also an Action plan 2016-2017 and its adoption has unlocked the use of ESI funds allocated in TO1 (described in more detail in section 1.3.). Among EU members, Croatia is performing relatively low when it comes to innovations, but there are in fact quite a few best practice examples across different sectors and niches: Croatia has developed an excellent software application for monitoring energy savings (SMIV), EU funded project [ECO SANDWICH](#) has developed and marketed a new highly efficient construction material, REGEA has collected considerable experience in energy refurbishment of public buildings under cultural heritage protection with application of advanced materials and technologies where possible (revitalization of Bračak Manor, revitalization of downtown centre in the City of Zagreb, revitalization of County palace in Krapina) and the [Intelligent Energy Cluster](#) has is functioning as a successful business network based on the triple helix concept representing SMEs that invest in R&D and innovation. There are also noteworthy companies developing and offering cloud based services in the energy sector, such as GISDATA, but also many start-ups for which there will be more available support in future (many technology parks are opening, more funding is available through TO1). When it comes to energy rehabilitation of buildings, innovations are not a priority since there is still a large need for regular rehabilitation activities

and this is mainly due to the fact that Croatia did not have access to structural funds in the period 2007-2013 like other EU members.

2.1 Strengths

- under the Croskills project training programs will be developed and accredited and planned is also an extension of the program to the institutional vocational education system (PCS)
- existing experience through EU projects (SustainCo - developing tools and delivering capacity building for professionals in the area of nZEB; ECO SANDWICH – development and marketing of innovative construction material; BUILD UPON – supporting countries to deliver strategies for renovating their existing buildings, Bračak Energy Centre...) (PCS, I)
- NGO DOOR is active in the field of combatting energy poverty and has collected experiences through various EU projects and initiatives (EP)
- labour force in the construction sector has technical knowledge (PCS)
- Croatia has good ICT solutions for energy management: Croatia has a very well developed software programme for monitoring of consumption (ISGE) and savings (SMIV) that stand out as best practice examples on EU level (I)
- Croatia has experience in implementing financial instruments through the implementation of Programme for the reconstruction of public buildings (FI)
- there is a large potential for energy rehabilitation in Croatia (high number of buildings in bad conditions) (ALL TOPICS)
- effective nation-wide campaigns by EPEEF contributing to positive attitude on energy savings and public awareness in favour of energy efficiency (ALL TOPICS)

2.2 Weaknesses

- Croatia has no experience in tackling energy poverty with systematic solutions (EP)
- some studies show that around 30% of the Croatian population can be considered at risk of energy poverty (EP)
- Supervision in construction works and companies executing works often knowingly do not work responsibly (work on more than one construction site and contract works without enough capacity to perform the work in qualitative manner) (PCS)
- project designers and other private business owners in the construction sector often do not have the time and financial sources to attend trainings (PCS)

- it is not easy to identify a good implementation model: it is not cost effective to invest in small buildings – it is obligatory to produce technical documentation for each building separately which increases the price of the investment per property and extends the period for the return of investment. Lessons learned during the implementation of the Programme for the reconstruction of public buildings (implemented by APN) show that only large investments were realized through the ESCO model (FI)
- Croatian market is not ready for the use of financial instruments: in the programming period 2007-2013 Croatia did not use grants for energy rehabilitation of buildings and for an integral energy rehabilitation large investments are needed and there is not enough financial strength/capital to top up grants (FI)
- debt on all levels, personal and national, is very high in Croatia (FI)
- the study in support of the ex-ante assessment for the deployment of EU resources during the 2014-2020 programming period in the area of energy efficiency (Final report on assessing the potential future use of financial instruments in Croatia in the area of energy efficiency) is not well elaborated (FI)
- final beneficiaries, especially the residential sector, are used to traditional financing models (grants) and do not have experience in using financing instruments (FI)
- architects/project designers, construction engineers, contractors are not familiar with the new nZEB standards (new materials, integration of RES, new systems and processes) and there is also a need for coordination between all professions (mechanical, construction, electro technical) (PCS)
- there are no certification schemes at present – *but planned through Croskills and Prof/TRAC* (PCS)
- public awareness on energy poverty is very low and there is no social housing in Croatia (EP)
- project designers (all professions) lack the knowledge and experience with innovative materials and technologies (I)

2.3 Opportunities

- energy poverty as a topic is gaining importance: Ministry of Economy has initiated this topic and planned activities are the introduction of higher co-financing rates (EP)
- Croatia S3 Strategy 2016-2020 has been adopted this year along with the Action plan for the period 2016-2017 which unlocks ERDF funds allocated to TO1(I)
- ongoing is the standardization of the Energy performance contract (EPC) and the Republic of Croatia will request a clarification from Eurostat hopefully confirming the interpretation that EPC is not public debt because risk is on the side of the ESCO (FI)
- there is a possibility to combine EFSU and ESIF (FI)
- using financial instruments to deliver ESIF means larger volume of investments could be realized in comparison to traditional financing (FI)

- cooperation with domestic producers of materials and technologies could benefit the economy and open new opportunities (PCS)
- education of contractors such as plumbers, electro-technicians and other professions who by nature of their work are in direct contact with citizens could activate the demand for energy rehabilitation – *this is in plan through Croskills* (PCS, EP)
- EC/EU supports the set-up and implementation of financial instruments as opposed to traditional financing (FI)
- the revision of OPCC is planned in 2017 (all topics)
- synergies with ongoing similar initiatives/programmes/processes/projects/networks in Croatia or EU could bring added value and reinforce BUILD2LC objectives (all topics)
- available financing through various EU and community programmes (Horizon, Croatian Operational programme delivering ESF funds, ETC programmes etc) (all topics)

2.4 Threats

- there is no definition for energy poverty: it is generally accepted that households which spend 1/10 of their income on energy bills are at risk of energy poverty, but a more elaborate and clear definition is needed (if you own a property can you be considered poor?) (EP)
- labour force in the construction sector with technical knowledge is emigrating because salaries in Croatia are low (PCS)
- securing public funds and private capital for energy rehabilitation: commercial banks have a very low confidence towards energy efficiency projects – they use the same set of questions and terms for all projects regardless of the topic (FI)
- unfavourable interpretation of the public debt rules on EU level: according to Eurostat energy efficiency projects count as public debt. In order to apply PPP model (which does not count as public debt) the investment has to be higher than the estimated value of the property (FI)
- there are no clear rules for financial instruments delivering ESI funds: rules for the programming period 2014-2020 have changed in comparison to 2007-2013 and still there are not guidelines for all areas. there is also no experience in combining different funds (FI)
- the system for financial instruments delivering ESI funds is inflexible: conditions are very strict and prescribe 50% savings which is difficult to achieve, partially because a large share of buildings do not serve the intended function, aggregating buildings in tendering is risky because if one applicant/owner is ineligible, all applicants are ineligible by default (FI)
- many entities take part in the process for the set-up of financial instruments delivering ESI funds and the coordination could be improved. The prolongation of the process can jeopardize the effective absorption of structural funds (FI)

- lack of information from future beneficiaries during the phase of preparations for the set-up of financial instruments delivering ESI funds may lead to measures that do not reflect the needs and capacities in the field (FI)
- applying innovative materials and technologies in energy rehabilitation of buildings under cultural heritage protection is challenging due to conservative attitudes and strict rules from curators (I)
- innovations are more costly and the construction sector is economically not well (I)
- badly executed energy rehabilitation (PCS)
- poverty in general is a more pressing issue than energy poverty (EP)

3 Needs

Following is a list of needs in energy rehabilitation in buildings in Croatia is based on the state of art and SWOT analysis:

- coordination/conciliation between entities involved in the set-up of financial instruments delivering ESI funds (several Ministries, different departments and sectors within those Ministries, TA, EIB, EC etc) (FI)
- identify business models for small scale energy refurbishment of buildings (FI)
- support the set-up of financial instruments on regional/local level (FI)
- attract private capital to leverage ERDF and other public funds (FI)
- on EU level: a more flexible system for FI, more favorable rules on interpretation of public debt (FI)
- raise public awareness on energy poverty (EP)
- define energy poverty & develop a systematic solution for fighting energy poverty (EP)
- exchange of know-how and practice in the field of energy poverty and nZEB (EP & PCS)