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TRIPLE HELIX IN ENERGY EFFICIENCY PROJECTS

TRIPLE HELIX U PROJEKTIMA ENERGETSKE EFIKASNOSTI

ABSTRACT

Triple Helix model was developed by prof. Henry Etzkowitz of Stanford University, who proposed an innovative approach to knowledge-based society. Balanced Triple Helix model provides a comprehensive collaboration of university, industry and local government.

This paperwork represents the application of model to a program of systematic energy management in Croatia, particularly in public buildings, owned by local governments. So far, the team of UNDP Croatia in assistence with scientists has developed the project and training models, engaged in the project and educated local government in all five counties of eastern Croatian. Within the EU project Chee curriculum for interdisciplinary postgraduate studies at the University of J.J. Strossmayer, Osijek has been prepared.

Energy efficiency measures by ECSO model (insurance funds from energy savings through energy efficiency measures), are planned to be implemented in selected public buildings. In the practice, it will be implemented by local companies. Thereby, a circle from the initial training of local government to energy savings and reduced CO2 emissions in actual objects. An additional benefit is the starting flywheel of manufacturing equipment and service development , as well as better living conditions in the reconstructed buildings, all with the return on investment through energy savings in several years. The basic assumption for such activities is narrow and well-managed group of specialists with a new and specific knowledge from research institutions, industry, and local government as the owner of the facilities, on interdisciplinary activities in implementing energy efficiency measures.

Key words: *energy efficiency, science, saving, renewable sources, Triple Helix*

SAŽETAK

Triple Helix je model koji je razvio prof. Henry Etzkowitz sa Stanford Univerziteta, a koji predlaže inovativan pristup ka društvu baziranom na znanju. Balansirani Triple Helix model predviđa sveobuhvatnu suradnju univerziteta, gospodarstva i lokalne samouprave.

U ovom slučaju radi se o primjeni modela na program sustavnog gospodarenja energijom u Hrvatskoj, konkretno u javnim zgradama u vlasništvu lokalne samouprave. Do sada je tim stručnjaka UNDP-a Hrvatska uz pomoć znanstvenika projekt i modele edukacije, uključio u projekt i educirao sve lokalne samouprave u svih pet županija istočne Hrvatske. U sklopu EU projekta CHEE pripremljen je kurikulum za interdisciplinarni poslijediplomski studij na Sveučilištu J. J. Strossmayer.

Planira se provedba mjera energetske efikasnosti na odabranim javnim objektima koje će se provoditi po ECSO modelu (osiguranje sredstava iz uštođene energije putem mjera energetske efikasnosti), a u praksi će ih provoditi tvrtke sa područja regije. Time se zatvara krug od početne edukacije lokalnih samouprava do uštede energije i smanjena emisije CO2 na konkretnim objektima. Dodatna korist je pokretanje zamašnjaka proizvodnje opreme i razvoj usluga, te bolji uvjeti boravka u rekonstruiranim objektima, a sve to uz povrat investicije za nekoliko godina kroz uštedu energije. Osnovna pretpostavka za takve aktivnosti je uska i dobro vođena suradnja stručnjaka sa novim i specifičnim znanjima iz znanstvenih institucija, gospodarstva i lokalne samouprave kao vlasnika objekata na interdisciplinarnim aktivnostima u provedbi mjera energetske efikasnosti.

Key words: *energetska efikasnost, znanost, ušteda, obnovljivi izvori, Triple Helix*

1. Introduction: Triple Helix - cooperation of science, industry and local government

1.1 Triple Helix - Theoretical Framework

The Triple Helix Concept defines how educational sector, business sector and government should cooperate at national and regional levels, in order to align the educational system and labor market needs, and encourage innovation. Originator of the Concept is Dr. Henry Etzkowitz, research professor at Stanford University.

The Triple Helix concept comprises three basic elements: (1) a more prominent role for the university in innovation, on a par with industry and government in a knowledge–based society; (2) a movement toward collaborative relationships among the three major institutional spheres, in which innovation policy is increasingly an outcome of interaction rather than a prescription from government; (3) in addition to fulfilling their traditional functions, each institutional sphere also "takes the role of the other" performing new roles as well as their traditional function. Institutions taking non-traditional roles are viewed as a major potential source of innovation in innovation.

The increased importance of knowledge and the role of the university in incubation of technology-based firms have given it a more prominent place in the institutional firmament. Universities, heretofore primarily seen as a source of human resources and knowledge, are now looked to for technology as well. Many universities have developed the internal organizational capabilities to formally transfer technologies rather than relying solely on informal ties. Universities are also extending their teaching capabilities from educating

individuals to shaping organizations in entrepreneurial education and incubation programs. Rather than only serving as a source of new ideas for existing firms, universities are combining their research and teaching capabilities in new formats to become a source of new firm formation, especially in advanced areas of science and technology. Universities increasingly become the source of regional economic development and academic institutions are re-oriented or founded for this purpose. New organizational mechanisms, such as incubators, science parks, and networks among them become a source of economic activity, community formation, and international exchange. New modes of interdisciplinary knowledge production, involving Triple Helix partners, inspire research collaboration and firm-formation projects.

2. Triple Helix in the projects of energy - efficient building reconstruction

2.1. The current situation and conditions in Croatia

More than 40% of energy in Croatia is consumed in the buildings. Approximately 80% of energy is consumed for heating, cooling, and hot water, and even 85% does not meet current building regulations on thermal protection. With the reconstruction of buildings 70 to 90 percent of energy savings could be acheaved. Those result have already been achieved in some realized reconstruction - examples of good practice. Additional to reducing energy consumption and CO2 emission, significant financial savings are realised, and comfort of living in the buildings and the value of the property are increased. EU Directives provides for the annual implementation of energy efficient reconstruction of at least 3% of facilities, which is also accepted in Croatian plans for energy efficiency projects.

UNDP's project entitled "EE in buildings in Croatia," found out that in about 9,000 public buildings in the Republic of Croatia energy costs amount to around EUR 200 million. According to estimates, 80% of the total number of flats and houses in Croatia is located in the two lowest categories of energetic (energy consumption for heating larger than 200-250 kWh/m2). Application of energy efficiency measures, by conservative estimates, could save more than 30% of energy. It could be achieved through the energy services market, thus the companies would finance EE measures through energy savings in buildings.

2.2. Potentials and Challenges

The introduction of EE in 20% of the total number of housing units in the RC (280.000) over the next 10 years, can create 7000 direct "green jobs" per year, and at least as many more indirect jobs. Investment would amount to over 2 billion euros. Previous experiences show that the reconstruction plans of EE facilities will not be acheaved without significant changes in all fields related to the construction sector, financing activities and education. As the main challenges and obstacles in achieving of EE object reconstruction plans - lack of awareness on energy saving, underdeveloped financial instruments for EE activities, and the lack of specific knowledge and innovation among all stakeholders, owners of buildings, architects, and contractors could be sorted out.

What has been done in Croatia so far? The legal framework for energy efficiency - a national program (2008 - 2016) and the National Action Plan (2011-2013) has been set out. Measures for energy efficiency to retail, transport, public and commercial services, and industry are

planned. Part of the measures are implemented in the practice – less in industry and trade, and more in the service sector and households. Most has been achieved in public sector facilities, though they represent a small part of the activities to be undertaken. UNDP Croatia`s projects SGE and HIO, which are partialy financed from EPEEF funds. With those projects part of the preconditions for the implementation of energy efficiency in buildings is made. In the national registry for energy has been enrolled and treated 1350 public facilities and over 100 000 energy bills, just for the Region of Slavonia. The amended ZUKE`s law (Law on energy efficient management) will soon be adopted, which has overaken the obligations of the EU Directive 2010/31/EU of 19 May 2010 "on the energy performance of buildings." Besides a series of guidelines that define the current tasks, the most important guideline for the future is the adoption of national plans for increasing of the number of buildings that are "nearly zero energy house" - buildings with very high energy efficiency, and energy consumption for heating less than 15 kWh/m2, which provides that up to 31.12. 2020th all new buildings should be "nearly zero energy".

2.3. How to implement the Triple Helix model in practice?

Initial experiences of the project of reconstruction of public facilities in organization of the Ministry of Construction which started in April, 2012. has confirmed the correctness of the model - without cooperation of the scientific community and professional chambers, state and local governments, state and commercial banks, trained and qualified construction companies and superior quality control of all activities, realisation of such a complicated project can not suceed. In this particular case, the State set a task in front of the actors in the project, without sufficient preparation. Other actors were included in the project afterwards, in consultation process, decision making and implementation activities.

2.3.1. Preparation of program concept, using the foreign experience –

In the phase of program preparation advantage of the positive and negative experiences of EU countries in implementing various energy efficiency measures in public, residential and commercial buildings, should be taken. They show all the challenges and problems in implementation, therefore it is easy to point out mistakes that are already committed elsewhere. In this segment of the program close cooperation between government bodies is required, in order to set up a basic "Wish List" and selection of scientific institutions in the field of public administration, EU funds and finance, construction and engineering. Respecting their suggestions, and reaction of local and regional government, terms of reference for the implementation of the project could be set up. The step should not be skipped, because later changes and corrections of the program are expensive and difficult to implement. The role of the scientific community - multidisciplinary teams of experts is of the most importance in the preparation phase, but The State and the local government must clearly express their intents and set a framework, which the activities should take place within.

2.3.2. Determination of project framework:

Models of funding - through the ECSO companies; by means of the owners of buildings, local government and The State; through the EU programs and funds; through public-private partnership; through a combination of financing
The legal framework - enabling the realization of projects by changing the rules on borrowing og LGUs through the ECSO operations and EU programs and funds

Comprehensive training of - owners of the facilities, government agencies, local governments, planners and contractors (funding from EU programs,methodologies, methods of reconstruction)
Technical requirements for the reconstruction of objects - depending on climate zone and facility types
Logistics implementation of the program - set a time frame, timetable of activities, responsibility for the selection of objects, responsibility for each project step

2.3.3. The implementation of project activities

The choice of funding depending on the resources and capacities of LGUs
Selection of facilities, preparation of project documentation, Tender
Works under the supervision of the designer and the evaluation results

3. Examples of good practice - Triple Helix methods in EE projects

3.1. EU IPA project CHEE – energy efficient reconstruction of public facilities

Chee IPA Cross-border project is a classic example of successful implementation of activities through the Triple Helix model, written and performed two years ago in a cross-border program Croatia - Hungary. The project has been prepared by professional experts in energy efficiency projects in the EU and the UNDP Croatia, i consulting with experts on passive and low-energy building of the Faculty of Architecture in Zagreb. Cost benefit analysis was prepared at the Faculty of Economics in Osijek. The partner in the project was The city of Osijek, because the author of the project has already successfully implemented two EU projects eith them, so the City has operational experience in the implementation of EU projects.

Through the project, Eastcroatian cities were trained to carry out energy efficiency activities. A series of activities to increase visibility in Croatia and Hungary were geld. The Faculty of Economics Osijek and The faculty of Economics Pecs participated in the project as well. One of the valuable results of the project is the development of Curriculum for Interdisciplinary Postgraduate Studies of energy efficiency.

The most important result is the reconstruction of primary school “Ljudevit Gaj” by energy efficiency principles upon which this school became the best isolated school in Croatia, and a great example of good practice. More contractors from Slavonia was taught to do complex reconstructions to the level of low-energy standards.
Good results were outcome of pervasive collaboration of few faculties, development institutions, local governments, manufacturers and contractors by Triple Helix model. Overall

reconstruction will be completed by replacing the heating system and installation of ventilation and heat recovery, after which the expected energy savings of 80 percent.

3.2 Reconstruction of children's nurseries “Ivančica” in Osijek

Pilot project of children's nurseries "IVANČICA" in Osijek is an example of reconstruction of the existing building in order to permanently reduce energy needs with sustainable costs.
It is also an example of a sustainable project, because the entire investment returned exclusively through the recovery of energy savings.
The reduction of heat consumption by 74% was achieved.

BEFORE RECONSTRUCTION: ► 238.531 kWh, or 278 kWh/m2
AFTER RECONSTRUCTION: ► 61.790 kWh, or 72 kWh/m2

Pilot project realized in cooperation of the Energy Institute Hrvoje Pozar, The City of Osijek, and several construction companies which were educated, while the works were performed under the supervision of experts.

The results of the measurement represent well the success of reconstruction and indicate the extent to which the object is an example of good practice.

Likewise, the whole activity is a good example of cooperation between scientific institutions, universities, local government and the economic sector.

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