Could government legalize illegal settlement by improving their energy efficiency?

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Abstract

In recent months we are faced with serious budget problems in Montenegro, the solution of which, among other things is seen in reducing the number of employees in state administration. On the other hand, the costs of living are significantly above the disposable budget of households. Particular problem is the high cost of electricity, which recently

resulted in the street protests of discontented citizens. On one hand we have a government that alerts the lack of electricity, and on the other hand we have citizens that may hardly cover these costs. In addition, Montenegro is dealing with a double-challenge of inefficient space use (country features over 100,000 illegal homes, if distributed evenly implying that every other family lives in an illegal home) and inefficient energy use (Montenegro needs on average 8.5 times more energy per unit produced than an average EU country).

1.How to solve a problem and please both sides? Is that feasible at all?

UNDP office in Montenegro came up with the idea to link solving the big problems in Montenegro, such as the problem of illegal construction, with increasing the level of energy efficiency in households, businesses and other facilities. Namely, UNDP proposes an integrated policy solution to the double-challenge in providing energy efficiency measures to incentivize households to legalize their homes. The idea and research that was recently conducted show how the legalization of illegal buildings by the introduction of mandatory energy efficiency measures in them, may at the same time result in the increase of revenue to the central and local budgets, reduction of negative impact on the environment, increase of employment, engagement of the economy, reduction of electricity consumption and thereby to reduce the need to import electricity, and ultimately to contribute to the welfare of the population.

Our research (energy audits) conducted on 30 illegal houses in three pilot municipalities showed that significant savings in energy consumption could be realized (up to 60%). Based on these results, we propose an approach to formalizing informal settlements in Montenegro through implementing an energy efficiency incentive system for the households. The scheme is broken down into 2 steps: (1) a household receives a loan to improve energy efficiency. On average for a 100m2 household, €3,800 loan (with 4.5% interest rate) results in 59% of energy savings or €630 per year at the current energy prices; (2) a household enters into a contractual agreement with the Government/municipality to use the savings from energy efficiency to pay off the low-interest loan it received for the retrofit and the formalization cost.

The benefit for the household is dual- a title to the house and improved energy efficiency/resulting financial savings. The benefit for the municipality/Government is the steady supply of funding for the property tax. The benefit for the private sector is the increase in demand for retrofits and upgrading of the infrastructure that services informal settlements.

Keywords: energy efficiency, sustainable development, illegal construction, energy audits, retrofitting

2.INTRODUCTION

The world is experiencing three inter-related crises at the moment. One regards the rising trend of resource prices. The resource price index in the 20th century fell by 50% even though the population quadrupled, economic output rose 4 times, and demand for fossil fuels and water increased by 16 and 9 percent respectively. The first decade of 21st century reversed this trend, and relative to the beginning of 20th century in 2010 the index rose by 147%1. This is a result of a combination of factors: rising demand and population, decreasing sources of supply, volatility of supply (most fossil fuel deposits are located in conflict prone locations such as Iran, Saudi Arabia, Venezuela). If we continue on this path, by 2050 we would need three times more resources and this is simply no longer an option, which brings us to the second crises.

This crisis regards the rising inequality globally within countries. During the last several decades, millions of people around the world have been lifted out of poverty. In Central and Eastern Europe, some 90 million people or 18% of its population moved out of poverty since 1999. Despite this, 30% of the region's population is still considered poor or vulnerable, with the number rising by 5 million for each 1% of decline in GDP2. The recent ILO report echoes this in noting that the 'society is becoming increasingly anxious about the lack of decent jobs. The findings show that Social Unrest Index in 2011 rose in 57 out of 106 countries, as more people were pushed out of labor market, predominantly impacting youth and women. So what does this mean for societies across the world? The recent research shows that more unequal societies feature far more social problems including high rates of suicide, obesity, teenage pregnancy, imprisonment, and low levels of literacy, trust, life expectancy3. In short, the economic growth does not yield human development returns in those high developed countries that features high levels of inequality and that subsequently invest the bulk of their public resources into prisons, policy, and defence and health services to deal with the growing amount of social problems.

Finally and linked with the other two crises, the world is at a tipping point in regard to the loss of vital ecosystem services and extreme events- both connected to the changing climate. Some 60% of ecosystem services that underpin our economies and life on earth have been degraded, some beyond the point of return. Recently published research in the Journal of Nature that for the first time compared effects of biodiversity loss to other human-caused environmental changes analyzed 12 peer-reviewed articles and concluded that reduced biodiversity affects ecosystems at levels comparable to those of pollution and global

1 McKinsey's 'Resource Revolution' The report last accessed on May 4th 2012. http://www.mckinsey.com/Features/Resource_revolution

2 This World Bank study quoted in 'The Economic and Financial Crisis in CEE and CIS: Gender Perspectives and Policy Choices' last accessed on May 4th 2012 at: http://www.levyinstitute.org/pubs/wp_598a.pdf

3 Richard Wilkinson, Kate Pickett 'The Spirit Level: Why More Equal Society Almost Always Do Better' Allen Lane, 2009

warming4. In layman terms, this means that environment's ability to provide clean water, food and stable climate is seriously undermining the quality of life and human development globally. In terms of disasters, in November last year IPCC published first scientific proof that the changing climate results in an increase in frequency and intensity of extreme weather events5. Our region experienced some $70 billion disaster-related losses during the last two decades6.

The three crises are related, mutually reinforcing one another and creating a vicious cycle that impacts all segments of sustainable human development- economic competitiveness, social inclusion and environment. Any viable solution must match the complexity of the crises, addressing them in an integrated manner that will unleash economic growth and job creation, while at the same time conserving the biodiversity and maintaining the balanced environment.

This paper will present one such integrated solution that aims to resolve the multi-dimensional development challenge of informal housing (low economic empowerment, rising pressure on environment, high exposure to extreme events, inefficient resource use, low quality of life). It will demonstrate how UNDP plans to utilize main principles of green economy to provide economic empowerment to the citizens in Montenegro.

3.What is a Green Economy?

UNEP defines a green economy as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive. In a green economy, growth in income and employment should be driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services. These investments need to be catalyzed and supported by targeted public expenditure, policy reforms and regulation changes.7

The development path should maintain, enhance and, where necessary, rebuild natural capital as a critical economic asset and as a source of public benefits, especially for poor people whose livelihoods and security depend on nature.

4 http://www.clickgreen.org.uk/research/trends/123462-biodiversity-loss-is-as-damaging-as-climate-change-and-pollution.html

5 The IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, PDF presentation last accessed on May 4th 2012 http://www.ipcc.ch/news_and_events/docs/srex/SREX_slide_deck.pdf

6 From Transition to Transformation: Sustainable and Inclusive Development in Europe and Central Asia, report last accessed on May 4th 2012 at http://www.unece.org/fileadmin/DAM/publications/oes/RIO_20_Web_Interactif.pdf

7 UNEP, Towards a Green Economy, Pathways to Sustainable Development and Poverty Eradication, 2011

It is very important to understand that the concept of a "green economy" does not replace sustainable development. However, there is a growing recognition that achieving sustainability rests almost entirely on getting the economy right.

Perhaps the most widespread myth is that there is an inescapable trade-off between environmental sustainability and economic progress. There is now substantial evidence that the "greening" of economies neither inhibits wealth creation nor employment opportunities, and that there are many green sectors which show significant opportunities for investment and related growth in wealth and jobs.

Also, many theorists and practitioners believe that green economy is a luxury only wealthy countries can afford, or worse, a developed-world imposition to restrain development and perpetuate poverty in developing countries. Contrary to this perception, there are numbered examples of greening transitions taking place in various sectors in the developing world, which deserve to be emulated and replicated elsewhere.

The last two years have seen the idea of a "green economy" float out of its specialist moorings in environmental economics and into the mainstream of policy discourse. It is found increasingly in the words of heads of state and finance ministers, in the text of G20 communiqués, and discussed in the context of sustainable development and poverty eradication.

Over the last quarter of a century, the world economy has quadrupled, benefiting hundreds of millions of people. In contrast, however, 60% of the world's major ecosystem goods and services that underpin livelihoods have been degraded or used unsustainably. Indeed, this is because the economic growth of recent decades has been accomplished mainly through drawing down natural resources, without allowing stocks to generate, and through allowing widespread ecosystem degradation and loss.

Meanwhile, for the first time in history, more than half of the world population lives in urban areas. Cities now account for 75% of energy consumption and 75% of carbon emissions. Rising and related problems of congestion, pollution, and poorly provisioned services affect the productivity and health of all, but fall particularly hard on the urban poor. With approximately 50% of the global population now living in emerging economies that are rapidly urbanizing and will experience rising income and purchasing power over the next years – and a tremendous expansion in urban infrastructure – the need for smart city planning is paramount.

4.Energy efficiency

People have always used energy to do work for them. Thousands of years ago, early humans burned wood to provide light, heat their living spaces, and cook their food. Later, people used

the wind to move their boats from place to place. A hundred years ago, people began using falling water to make electricity.

Today, people use more energy than ever from a variety of sources for a multitude of tasks and our lives are undoubtedly better for it. Our homes are comfortable and full of useful and entertaining electrical devices. We communicate instantaneously in many ways. We live longer, healthier lives. We travel the world, or at least see it on television and the internet.

In 1973, when Americans faced their first oil price shock, people didn't know how the country would react. How would Americans adjust to skyrocketing energy prices? How would manufacturers and industries respond? We didn't know the answers.

Now we know that Americans tend to use less energy when energy when energy prices are high. We have the statistics to prove it. When energy prices increased sharply in the early 1970s, energy use dropped, creating a gap between actual energy use and how much the experts had thought Americans would be using. The same thing happened when energy prices shot up again in 1979, 1980, and 2008—people used less energy. When prices started to drop, energy use began to increase.

In 2009, the United States used 27 percent more energy than it did in the 1970s. That might sound like a lot, but the population increased by over 43 percent and the nation's gross domestic product (the total value of all the goods and services produced by a nation in one year) was 2.6 times that of the 1970s.

If every person in the United States today consumed energy at the rate we did in the 1970s, we would be using much more energy than we are - perhaps as much as double the amount. Energy efficiency technologies have made a huge impact on overall consumption since the energy crisis of 1973.

Mankind is facing one of the greatest challenges in its history: developing in order to "meet the needs of present generations without compromising the ability of future generations to meet their needs"8. Increasing demands for natural resources, weakening of ecosystems, global warming and soaring population growth are just a few of the global issues confronting us. Since the end of the 1960s there have been more and more global initiatives to reduce social and ecological imbalances. The movement is now speeding up: those involved are becoming aware of the role they can play within their sphere of influence and of the interdependence between the various aspects of sustainable development.

Improving energy efficiency is mostly connected with buildings, both residential and business, changes and the main challenge now is to design, build and renovate buildings to

8 Our Common Future, Brundtland Report, 1987

reduce their environmental impact and create areas that are healthy and comfortable for the occupants.

Throughout their life cycle, buildings consume natural resources, generate waste and emit large amounts of CO2, contributing significantly to global warming. A large proportion of the world's population, particularly in the developed countries, spends 90% of its time indoors (source: OECD). In this context, questions of hygiene standards inside buildings and the comfort of occupants are also central issues in the debate.

At building level, energy efficiency covers all the methods used to reduce the energy used for a given service (heating, lighting, operating machines, etc.). Two types of energy efficiency are generally taken into consideration:

Energy efficiency associated with the framework This corresponds to the structural properties of the building that will reduce energy requirements (and in particular heating and lighting). This category includes: optimized insulation, double glazing, treatment of heat bridges, management of openings (doors and windows) and coverings (blinds and shutters).

Energy efficiency from high-performance equipment and as a result of the management of this equipment. High-performance equipment is that providing the best efficiency.

Equipment management is used to adapt the level and duration of the provision of energy to requirements. It corresponds to the installation of products and systems that will regulate and automate energy consumption in the building in order to avoid unnecessary consumption.

Energy efficiency retrofits provide an opportunity to reduce greenhouse gas emissions, generate economic activity, save billions in energy costs, and ensure the long-term viability of affordable housing. However, there is insufficient data on how much energy these upgrades actually save, and therefore little data on what the return on investment would be for lenders. Without this data, it is very difficult to secure upfront capital investments in retrofits, inhibiting this sector’s capacity to scale.

5.Montenegro and legalization problem

In the past decade, Montenegro has witnessed rapid urbanization fuelled by foreign direct investment on the Adriatic coast and in mountain resorts. This growth, which has significantly increased the GDP of the country for several years has, in parallel, caused negative effects such as urban sprawl in previously natural landscapes along the coast and around the capital Podgorica, resulting in large numbers of informally built constructions (that is without a construction permit), both commercial and residential, that have very low energy efficiency characteristics, resulting in an overall increase in CO2 emissions due to rising energy demand in buildings. According to one estimate, there are approximately 100,000 such informal constructions, though there are no clear statistics. Approximately 62% of the population of Montenegro lives in urban areas and the quality of their life is under pressure from urban development problems. Uncontrolled urbanization, especially in the central area (around

Podgorica and other cities) and the coastal areas (seaside tourist development), is having negative impacts, such as overcrowded settlements and inaccessibility to infrastructure.

Informal constructions in Montenegro generally fall under three broad categories:

A building constructed on a parcel of land that legally belongs to the owner. The owner obtained the necessary 'construction permit' but did not secure the 'use permit' from the municipal authorities, which is required by law to ensure that the housing unit was built according to specifications approved in the 'construction permit'. Owners are required to pay specified municipal fees to obtain the 'use permit'.

A building constructed on own land by the owner of the land, but without both the 'construction permit' and the 'use permit'.

A building constructed on state or municipal land without the express consent of the owner and without the necessary 'construction or 'use permit'.

Nearly all Montenegrin households (>99%) are connected to the electricity grid and metered. Based on the latest available data, average monthly electricity consumption in Montenegro in 2001 was 367 kWh per household. This makes that average monthly bill for electricity per household amounts cca 100 euro. According to the estimation of Ministry of Economy of Montenegro 80% of the electricity in the household is used for the heating. Most homes are heated through an electric radiator system, an electric thermal accumulator or an individual heating system. Wood is one of the most popular heating sources in individual houses in Montenegro, especially in the North, but almost absent in the South and in apartment buildings.

Assuming that the 100,000 informal constructions have the same average energy consumption profile as regular houses (a highly conservative assumption given their generally sub-standard workmanship and hence low EE), the informal housing sector is estimated to account for over one-quarter of Montenegro's residential energy consumption and 7% of the country's energy-based GHG emissions. The irregular sector is also characterised by relatively high energy poverty: systematic data are scarce but some observations suggest that up to 40% of people living in the irregular housing sector do not have access to sufficient energy services to ensure a healthy lifestyle for themselves and their families.

Buildings constructed without building permits in most cases have not been subject to the process of verification of application of standards, neither in the course of design development nor during performance of works, particularly from the aspect of seismic risk.

Existence of a large number of informal buildings, primarily residential facilities, highlights the urgent need for organized approach to resolving the problem of regularization of such buildings and verifying achieved level of their static and seismic protection.

The Government of Montenegro has adopted a National Formalisation Program (NFP) and Action Plan to regularize the vast stock of informal individual housing. The new Regularization Law will mandate all owners of illegal houses to undergo mandatory building registration process; it will impose penalties (up to building demolition) for those property owners who fail to comply with the requirements. The Law and bylaws will also stipulate the administrative procedures and financial costs associated with legalization.

6.UNDP approach to the legalization problem

National Formalization Program, will result in new policies, regulation and significant investment to transform illegal housing stock into regularized and law-compliant buildings. However, if implemented as designed, NFP will not bring in energy efficiency improvements in individual houses, which are now characterized by poor thermal performance, high energy use and offer major opportunities for cost-effective GHG emission reduction. In order to address this problem, UNDP design the National Formalization Program in such manner that it would incorporate mandatory requirements and financial support package for energy efficiency improvements as outlined in the following section.

The formalisation of Montenegro's large informal buildings sector represents a unique opportunity to not only insert EE considerations into regulation of this building stock (for the first time ever), but also to integrate informal neighbourhoods and settlements into municipal governments' spatial planning in order to address urban-system GHG mitigation opportunities in a 'joined up' manner.

7.UNDP research in energy efficiency of the illegal houses

In the beginning of 2011 Ministry of Sustainable Development and Tourism of Montenegro and UNDP agreed on join implementation of three new pilot projects which deal with problem of transformation of informal settlements to formal. This is related to three municipalities: Zabljak, Bijelo Polje and Bar.

Projects activities resulted in:

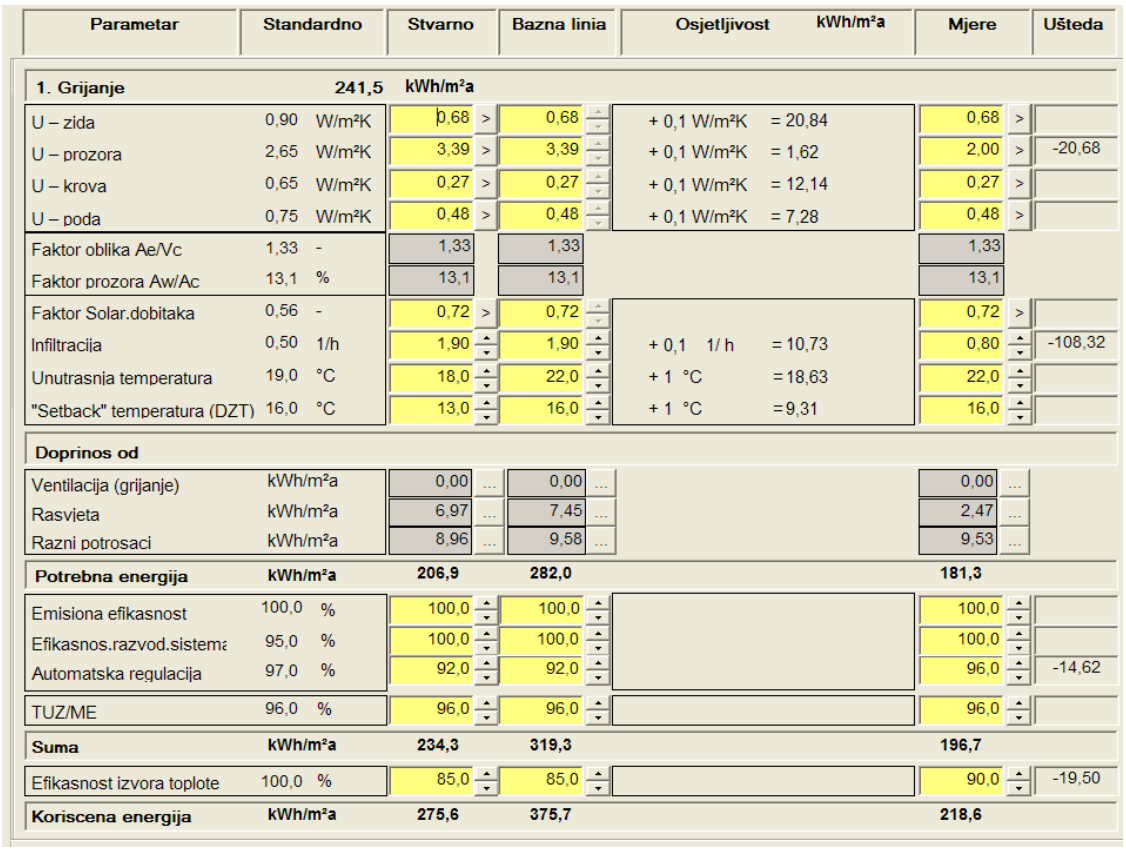
identifying alternative solutions for formalization of informal settlements

giving initial study on the energy efficiency characteristics of the informal building sector in Montenegro and an assessment of the economic mitigation potential of the sector, with particular focus on the Government's Formalization Programme and how the Programme can be harnessed to maximize mitigation outcomes – in terms of the buildings themselves and also how they can be best integrated into broader urban planning.

proposing different economical scenarios for formalization process

encouraging housing opportunity for people of low and moderate income by creative, flexible, and innovative approach to resolving this issue

Purpose of the energy audits was to determine a baseline for consumption and potential savings giving the most basic renovation/retrofit measures. Every energy audit consisted of basic information about the existing object, its current use, dimensions, number of inhabitants, heating periods during the day and the whole year, local climate characteristics etc. Data on average yearly consumption of electricity and consumption of water was collected from Public Utility Companies. This was provided with assistance of municipal officials9.



Parametar	Standardno	Stvarno	Bazna linia	Osjetljivost kWh/m²a	Mjere	Ušteda
1. Grijanje	**241,5 kWh/m²a**					
U – zida	0,90 W/m²K	0,68 >	0,68	+ 0,1 W/m²K = 20,84	0,68 >	
U – prozora	2,65 W/m²K	3,39 >	3,39	+ 0,1 W/m²K = 1,62	2,00 >	-20,68
U – krova	0,65 W/m²K	0,27 >	0,27	+ 0,1 W/m²K = 12,14	0,27 >	
U – poda	0,75 W/m²K	0,48 >	0,48	+ 0,1 W/m²K = 7,28	0,48 >	
Faktor oblika Ae/Vc	1,33 -	1,33	1,33		1,33	
Faktor prozora Aw/Ac	13,1 %	13,1	13,1		13,1	
Faktor Solar.dobitaka	0,56 -	0,72 >	0,72		0,72 >	
Infiltracija	0,50 1/h	1,90	1,90	+ 0,1 1/ h = 10,73	0,80	-108,32
Unutrasnja temperatura	19,0 °C	18,0	22,0	+ 1 °C = 18,63	22,0	
"Setback" temperatura (DZT)	16,0 °C	13,0	16,0	+ 1 °C = 9,31	16,0	
Doprinos od						
Ventilacija (grijanje)	kWh/m²a	0,00 ...	0,00 ...		0,00 ...	
Rasvjeta	kWh/m²a	6,97 ...	7,45 ...		2,47 ...	
Razni potrosaci	kWh/m²a	8,96 ...	9,58 ...		9,53 ...	
Potrebna energija	**kWh/m²a**	**206,9**	**282,0**		**181,3**	
Emisiona efikasnost	100,0 %	100,0	100,0		100,0	
Efikasnos.razvod.sistema	95,0 %	100,0	100,0		100,0	
Automatska regulacija	97,0 %	92,0	92,0		96,0	-14,62
TUZ/ME	96,0 %	96,0	96,0		96,0	
Suma	**kWh/m²a**	**234,3**	**319,3**		**196,7**	
Efikasnost izvora toplote	100,0 %	85,0	85,0		90,0	-19,50
Koriscena energija	**kWh/m²a**	**275,6**	**375,7**		**218,6**	

Figure 1: The appearance of used software

Energy audit team used the following measuring equipment during the inspection of the buildings :Thermal Imager-3 Testo880 PROSet; Data loggers for measuring temperature and humidity Testo 175 and Testo 635-2 Luksmetar.

9 Calculation of building energy performance was performed using: ENSI (Energy Savings International AS) "ENSI EAB CG 8.1". The algorithm for calculation in the current version of the Key Number software relies mainly on the EN ISO 13790:2004 standard. Economic calculation is done in the "ENSI Profitability Software - Version 7.0".

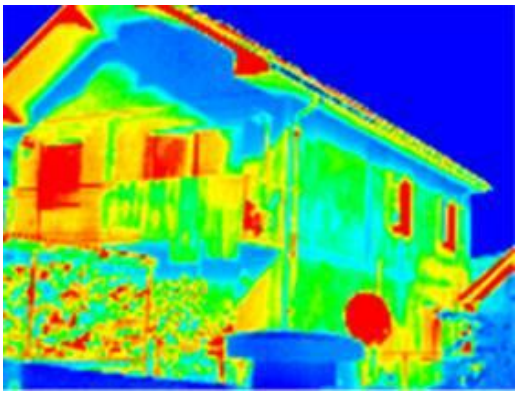


Figure 2: Results of thermal camera imaging (one of the audited buildings in Bijelo Polje)

After revision of all provided audits, a general conclusion regarding possibilities for EE retrofitting in informal settlements is that, on average, with €3,800 investment in retrofits the annual savings are €700 (payoff in less than 6 years), and this is in accordance with current energy prices (€ 0.7/kWh as opposed to € 0.17 kWh which is average within liberalized energy market in Europe).

More detailed average results are, as follows:

Average building (heated) area	116.80
Average electricity bill [€/god] (for 2009/2010/2011)	1240.32
Baseline (kWh/m2 year)	468.81
Baseline (kWh/year)	52771.05
After EE retrofit measures (kWh/m2year)	169.74
After EE retrofit measures (kWh/year)	20122.85
Calculated savings (kWh/m2year)	303.49
Lowering of CO2 emission (tons/year)	0.82

Assessment of the investment in EE retrofit measures [€]	4458.20
Net savings [€/year]	736.15
Return on investment [year]	5.60
Savings in delivered energy / wooden logs (kWh/ year)	32945.80
Savings in delivered energy / electrical energy (kWh/ year)	574.65

The most cost effective and most often basic EE measures that have been suggested are:

appropriate isolation of external walls

replacement of windows/doors

isolation of roofs

EE audits also suggested implementation of additional measures, such as installation of central heating, which will not significantly improve EE performance, but will in general raise a living comfort for the inhabitants. These measures are relatively expensive, and with longer return on investment, but they are also included in narrative part of audits, in order to be considered by the owners as possibility for additional improvement of living conditions.

General conclusion is that energy efficiency measures can be used as a tool for encouraging owners of the informal object to apply for legalization. Calculation showed that that each household that apply for formalization will have almost the same cost as it pay regularly for electricity today, but now this cost covers electricity bill, but also retrofitting and formalization. This means that with the same amount of financial resources, they will have legal object, energy efficient and safer house.

Energy efficiency measures can be used as a tool for encouraging owners of the informal object to apply for legalization. The main idea is to increase number of applicants, and on the other side to provide solution that would be in line with principles of sustainable development and status of Montenegro as ecological state.

Below is explained one of possible the scenarios for formalization using energy efficiency measures as incentive, for average residential building of 100m2.

EE measure as incentives – calculation:

(Example – residential house of 100m2, with average monthly energy bill – 100 euros.)

Size of Houshold	Cost for energy per month (euro)	Saving	Formalization cost (50e per m2)	Retrofitting cost(interest rate 4.5% on investment 3800eur)
100	90	59%	5000 €	5760
Scenario after retrofitting (costs)				
	Electricity bill (euro)	Monthly formalization cost, 20 yr period	Monthly retrofit cost, 15 yr period	Total
Monthly	36.9	20.9	32	89.9

The idea is to use possibility of getting soft loan with no or very low interest rate, with 20 years period for repayment that will be used for retrofitting the object. The main condition for loan is IF household apply for formalization process.

This calculation shows that each household that apply for formalization will have almost the same cost as it pays regularly for electricity today, but now this cost covers electricity bill, but also retrofitting and formalization. This means that with same amount of financial resources, they will have legal object, energy efficient and safer house.

Revenue from formalization to government

Monthly	Yearly	After 20 years
2,083,333.33€	25,000,000€	500,000,000€

Through identifying alternative solutions for formalization of informal settlements and integration of sustainable development principles into planning process, this project will contribute to establishment of the link between economic growth, poverty reduction and environmental sustainability.

8. CONCLUSION

The paper demonstrates potentials for using energy efficiency as an incentive for formalization of illegal households. Building on the wealth of research on decision making and behavioral economics, the solution features a revenue-neutral option that addresses dual challenges from the consumers' perspectives (households: inefficient use of energy and illegal house) and dual challenge from the providers' perspective (Government: low real estate tax collection and low investment in infrastructure).

This solution has never been tested before. It will require a multidimensional approach to systemic level change (new regulation and policy development), institutional level change (establishing novel links between the municipal and national level, designing novel processes for financial management) and individual level (capacity building, behavioral change). On the positive note, regardless of its success, this proposal is likely to yield important lessons on the potential for manipulating incentives for green economy.

Implications for future research include consideration of incentives related to clean energy production (e.g. solar and wind power) and sustainable urban development (e.g. municipality's capacity to manage incoming funding for a greener and sustainable urbanization).

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