Reassessing Opportunities and Resources: Serbia's Response to Energy Production and Climate Change at the Local Level

Milica Bajić-Brković, University of Belgrade, Faculty of Architecture, Serbia

1. Introduction

Dealing with the climate change challenges ranks among the priority tasks spatial planners and all those who are responsible for development of cities and towns, are faced with. The issue is becoming more and more important globally, which calls for immediate and thorough actions in almost every area of our everyday life. Measured by the scope and intensification of human activities that are recognized as affecting climate, as well as the rate and speed of the change, the question is nowadays viewed as one of the key concerns of the fast growing urban world.

The climate change phenomenon is among those which are usually documented, described and explained on a larger scale, on the global or regional level. This is consistent with the very nature of the phenomenon and the way we monitor and measure its attributes. In contrast, most of what is causing the change takes place at the local level, and relates to how we live, our energy sources, transport, what we produce and what technology we use. It is within the complex issues in the later one where swift changes are persistently taking place, making our cities, towns and regions hyper-dynamic places in a constant need for accurate and prompt planning responses. Coping with that is a multifaceted task, and countries develop their strategies and actions in accordance with the capacities, needs and opportunities they have.

Energy production is a major contributing factor to climate change in Serbia. Accordingly, it is the energy sector which is in focus of every discussion on how the problem should be approached, and what is it that the country has to do in order to deal with this issue. The question is becoming even more critical as the pressure for making Serbia clean and environmentally sound place is increasing. The strategies recently developed and actions currently carried on in the country illustrate how the energy wheel could be steered to fulfill the diverse and opposed tasks of providing more energy, while keeping the environment unchanged and safe. As the generating factors of climate change are locally bound, it is the local level that has been taken as priority area in addressing the issue and considering solutions, actions and measures to be taken.

2. Trends, Threats and the Raising Awareness

In Serbia, like in many other countries, GHG emissions generated by energy production and energy use are the main contributing factor to climate change. Accordingly, the focus has been placed on energy sector and the areas of the highest energy consumption. Over the last ten years, the matter has been mainly tackled at the national level, which resulted in different political decisions, policies, normative solutions and national action plans. Serbia is among those who signed and ratified the Kyoto protocol. The Ministry of Environment and Spatial Planning is a focal point for the UN Convention on Climate Change (UNFCCC). In 2008, the Climate Change Unit was established within the Ministry, whose main

responsibility is to initiate and coordinate activities related to climate change. An independent Serbian Energy Efficiency Agency was (SEEA) was founded in 2002, which was followed by a number of daughter offices throughout the country. Their work is aimed at improving conditions for energy and energy products conservation, as well as promoting and encouraging rational use of energy, and the use of renewable energy sources.

Being a developing country, Serbia is not committed to the quantitative reduction of collective GHG as defined by Kyoto protocol. Nevertheless, by signing the protocol, it gained the opportunity to reduce these emissions through the Clean Development Mechanism, through which developed countries can invest in Serbian projects with an aim of reducing the emission of GHG on their territory. In 2002, Serbia signed the Athens Memorandum on the establishment of the regional (ESSEE) energy market of the Southeast European countries and accession to it. The country has also committed itself to the 20+20+20 by 2020 Strategy, which stands for: decreasing GHG emission by 20%, decreasing the use of non-renewable energy sources by 20%, and increasing the usage of renewable energy by 20% by 2020. These have been followed by the National Spatial Development Plan of Serbia 2024, Strategy on Energy Development of Serbia by 2015, and Strategy on Implementation Program and Energy Survey. In addition, many studies, programs, exploratory projects, etc. were carried out regarding particular projects, or initiatives.

The main priorities have been defined and identified as (*Energy Sector Development*, 2005):

- "Harmonizing development of energy production sectors with energy needs, while minimizing social costs for the supply of energy products;
- Rational use of energy resources and enhancement of energy efficiency;
- Diversification of energy sources;
- Gradual introduction of technologically reliable, energy efficient, economically sound and environmentally acceptable technology, including an increased use of renewable resources and - 53 - natural gas technologies, for the combined generation of power and thermal energy;
- Careful usage of new and renewable energy resources, including the remaining hydropower potential;
- Giving more space and increase the share of renewable energy sources;
- Harmonizing tariffs and prices, taxes, customs and antimonopoly regulations;
- Supporting innovation of technical regulations, rules and standards for energy technologies/activities; stimulate efficient energy use, including the formation of the body for the monitoring and management of reforms in the energy system and implementation of the Serbian Energy Sector Development Strategy;
- Providing incentives for investments in new energy sources/technologies and energy efficient devices/equipment for energy use. Providing financial incentive measures for programs/projects of energy efficiency and selective use of new and renewable energy sources";
- Reduction of the GHG emissions;
- Placing the Green Energy option among the priorities for the next twenty years.

All these are to be supported by adopting the specific programs referring to energy efficiency, renewable energy sources, environmental protection, research and technology development, specialized education and training, as well as introduction of the revised energy statistical system and adoption of the specific energy related regulation regarding the performance of energy activities (*Energy Sector Development*, 2005). The renewable energy sources, like biomass, wind and solar power plants, as well as construction of additional hydroelectric dams are expected to take substantial share in energy production in the future.

Two recently developed and adopted documents, "Efficient ways for GHG emissions reductions within the post-Kyoto framework in Serbia"(Ministry of Environment, Mining and Spatial Planning of Serbia, 2011.) and „Nationally Appropriate Mitigation Actions – NAMAs" "(Ministry of Environment, Mining and Spatial Planning of Serbia, 2010.), focusing on the reduction of GHG emissions, have addressed the issue on a more pragmatic level by focusing on measures to be employed in the 2012-2020 timeframe. The measures have been quantified in terms of emission reduction possibilities, as they relate to energy production, industry, transportation, buildings, agriculture, waste and forestry. It is estimated that the likely reduction, as the result of implementation of these measures by 2020, may take from 7% in the building sector, 8% in transportation, and up to 57% in the energy production sector. The expected possibilities in GHG emission reduction, as well as the selection of targeted sectors, clearly indicate which path the country has to take and where the focus for future actions should be placed.

At the time, the Ministry of Energy is preparing a new Energy Development Strategy of Serbia up to 2025, which will be completed during the time period 2012-2013. One of the major targets in this document is to double the share previously allocated to renewable energy sources, up to 19% by 2025.

In meeting these challenges, Serbia is also confronted with different threats, the most significant being:

- "*Economic constrains,* caused by the slow recovery of production and service activities in the majority of Serbian economic sectors, including the production stagnation in the majority of industrial branches, except for the energy-intensive groups.
- *Economic/energy constrains*, caused by inadequate prices of power and thermal energy, whereby the energy industry subjects are prevented from timely investment in higher quality maintenance and modernization of energy sources, whose age is about 25 years on average. In addition to that, in the previous period of almost 15 years there were no significant investments in the construction of the facilities.
- *Technological/developmental constrains*, which are the consequences of a permanent setback in science and technology"(*Energy Sector Development*, 2005).

3. Hard and Soft Strategies

In order to cope with the problem, Serbia has adopted a joint strategy as a combination of both the hard and soft approaches. It was estimated that soft strategies are much closer to the local level, which would nicely blend with political decision on fostering decentralization, and providing more opportunity to the small scale projects. For each component, or strategy itself, the effects were evaluated vis-à-vis the impacts the strategy may impose on the immediate surroundings and environment in general, as well as the effects it has on the quality of life, particularly on the socio-economic well-being on the local level.

Hard strategies:
1. National strategies, policies and regulations
2. Price strategies
3. Directives to be implemented at the local level
4. Enforcement of the adopted measures, development of new regulation
5. Introduction of the effective monitoring by the state

Soft strategies:
1. Encouraging local communities to give priority to developments that comply with objectives of the National Strategy

2. Prioritizing energy production on a small scale, as environmentally responsible energy production
3. Prioritizing Green Energy options in local planning and development
4. Development of educational programs for citizens
5. Supporting citizens' initiatives and participation

At the outset the focus was on hard strategies, whereas the soft part was given lesser attention. Gradually, the pattern has changed matching the shifting trend, as well as the raising awareness among the stakeholders and general public. Today, the soft strategies are in focus, they are planned and are being implemented on a much larger scale, and are likely to substantially alter the Serbian energy sector. Although most of them are still at the early stage of implementation, they illustrate the commitment to keeping the climate change in focus, and determination to cope with the challenge.

4. Hidden Assets and Opportunities Rediscovered

All three documents, Strategy on Energy Development of Serbia by 2015, Strategy Implementation Program and Energy Survey, and "Efficient ways for GHG emissions reductions within the post-Kyoto framework in Serbia" have envisaged projects, actions and measures, many of which are, or could be implemented on the local level.

Thus, Strategy on Energy Development of Serbia by 2015 and Strategy Implementation Program and Energy Survey, rank as third special priority programs where the renewable sources of energy are to be used - biomass, geothermal, solar, wind, and hydro-potential, particularly of small rivers, as well as special programs of new technologies that are more efficient in terms of energy use and are environmentally more acceptable, like waste incineration technologies, thermal energy on the basis of natural gas, and technologies of small and mini hydropower plants. The energy potential of the renewable energy sources in Serbia is significant and amounts to over 3 Mtoe per year.

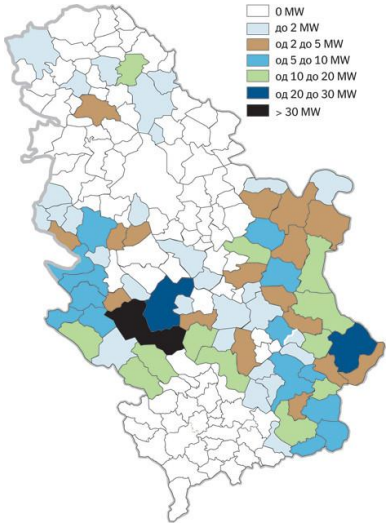

Image 1: Municipalities with potential for construction of mini hydro plans

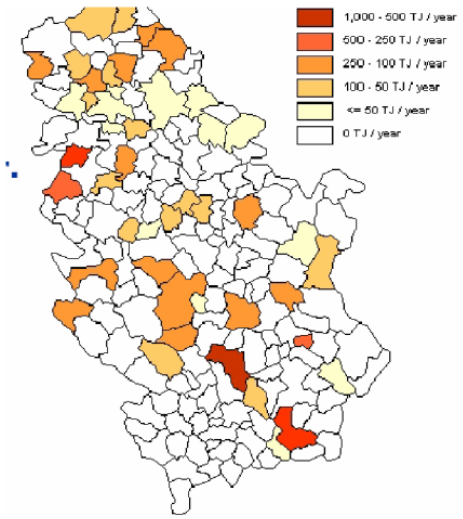

Image 2: Distribution of geothermal resources

Source: *Energy Sector Development: Strategy of the Republic of Serbia*, *Ministry of Mining and Energy, Republic of Serbia, 2005.*

Special attention is given to the hydro potential as it has been assessed as having the highest potential. The explorations recently carried on have indicated that over 25% of the remaining technically usable hydropower potential relates to the small hydropower plants (*Energy Sector Development,* 2005). In weighing up large versus small hydro systems, the decision has been made to give priority to the small system option, based on a multi-factorial assessment, including factors of heritage preservation, environmental impacts, urban development, etc. At about 900 potential locations on the Serbian 11 rivers, the possibilities have been identified for the construction of small hydropower plants (up to 10MW), with a possible production of about 1800 GWh/year. The dispersion of small energy plants appropriately match the spatial distribution of settlements in the country, with virtually thousands of small towns, villages and hamlets ubiquitously dispersed over its territory, especially in the Eastern and South-Eastern regions.

Serbia is very rich in geothermal energy sources. While it has been used mostly as balneology resource, in horticulture, agriculture and heating, nowadays the shift is moving toward its more intensive use for conventional urban needs. For instance, the location in Macva, whose construction was planned to start in the mid 90s but was postponed due to the economic and political situation in Serbia at the time, and which can provide district heating supply to a population of some 150 000 inhabitants, is back on the agenda. The geothermal potential is mostly located in the Pannonia basin in the Vojvodina region, the Sava Basin and the Danube Basin, and in the Southern part of Serbia. About 160 geothermal springs have already been examined and data on them collected, and some additional 70 at different distances from surface are still under investigation. "The total potential is estimated at 0.2 - 0.4 Mtoe, equivalent to some 2.2-4.4 TWh from both heat and electricity supply. Out of the 160 springs some 50 have a potential of over 1 MW each. It is further estimated that the exploitation of resources might substitute more than 500,000 tons of imported fuel equivalent to some 10% of current energy use for heating".

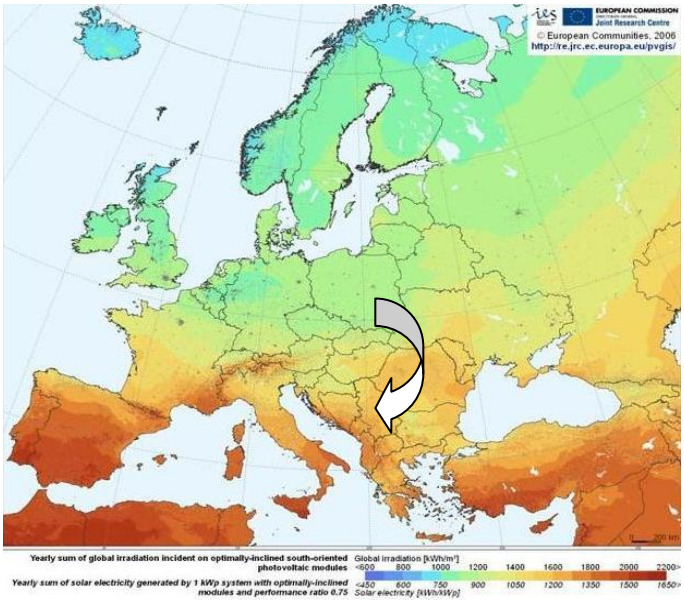

Image 3: Solar potential in Serbia as compared to other European countries

Source: http://re.jrc.ec.europe.eu/pvgis

Although Serbia is a country with a very high solar energy potential, this resource has been underused so far. In meeting the challenge of climate change, Serbia is determinant to secure a larger share of this option as well. There are several projects that are being

undertaken, and their completion and actual use are expected to start in the near future. Also worth mentioning is a growing number of individual households going for the solar or wind small scale production for their own needs, which is about to create an entirely different townscape in many towns and villages in Serbia. This is taking place independently of the state actions. The development of the small scale solar and wind plants has been supported by financial sector, and many banks are readily responding to this newly born interest among citizens and small scale enterprises. It is estimated that the solar based energy production will take a substantial share in the overall RE energy supply by 2020.

Recent studies have indicated that biomass is most likely to be the Serbian best ranked second renewable energy source. In 2010 Action Plan for Biomass was adopted by which a long term strategy has been defined along with the short term objectives and implementation program. The Action Plan for Biomass was made in accordance with the EU Directive 2009/28C and EU COM2005/628, and is the most important national document which defines policies and measures for development of small scale local plants for biomass energy production in the country.

As far as the emissions reduction is concerned, the most important document is a recently adopted report: "Efficient ways for GHG emissions reductions within the post-Kyoto framework in Serbia". The report has identified as relevant the following sectors: (1) energy (2) industry (3) buildings (4) transport (5) forestry (6) agriculture/manure, and (7) waste management. For each one the BAU projection of emissions for 2020 was estimated (Table 1), and the projected emissions reductions to be obtained by implementing the reduction measures by 2020 were estimated and quantified (Table 2).

Table 1: Breakdown of the main GHG emissions by sub-sectors and BAU projections for 2020

No	Project classification	National GHG Inventory Classification	2020 BAU GHG emissions (1,000 tCO2e)	2020 BAU GHG emission projections (% total without removals)
1	Energy	Public electricity and heat production	45,083	44%
2		Pulp, paper and print	2,2121	2%
3		Other industries	2,848	3%
4	Transport	Road transport	10,379	10%
5	Buildings	Commercial/institutional	9,713	9%
		Residential		
6	Industry	Mineral products	2,373	2%
		Metal production	4,178	4%
7	Agriculture	Enteric fermentation	1,747	2%
		Agricultural soils	6,197	6%
8	Waste	Solid waste disposal on land	3,839	4%
9	Other	Several other sectors	14,758	14%
Total				**100%**
Total without removals			**103,235**	
10	Forestry	Forestry	-12,725	
Total with removals			**90,510**	

Source: "Efficient ways for GHG emissions reductions within the post-Kyoto framework in Serbia", Ministry of Environment, Mining and Spaial Planning of Serbia, 2012.

Table 2: Emissions reductions obtained by the implementation of reduction measures in 2020

Sectors	n°	Measures	Emission reductions in 2020 ($ktCO_2e$/year)		Emission reductions in 2020 by sectors ($ktCO_2e$/year)		Emission reductions in 2020 by sectors (%)	
			Low scenario	High scenario	Low scenario	High scenario	Low scenario	High scenario
Energy	1	Increase energy efficiency in new coal power plants	124	247	1,408	2,779	64%	57%
	2	Energy generation from biomass	56	111				
	3	Construction of CCGT plants (replacement of coal by gas)	677	1,355				
	4	Wind power	93	186				
	5	PV solar power	46	93				
	6	Small hydro power plants	56	74				
	7	Improvement of electricity grids	356	712				
Industry	8	Cogeneration from waste heat in cement production	17	34	161	378	7%	8%
	9	Fuel switch in large combustion installations	13	25				
	10	Use of fly ashes in cement industry	18	35				
	11	Energy efficiency increase in large combustion installations	113	283				
Buildings	12	Lighting - switch incandescent to CFL (residential and service)	33	109	134	359	6%	7%
	13	Insulation of residential buildings	7	9				
	14	Insulation of commercial/institutional buildings	6	9				
	15	Increase heating efficiency in buildings	40	121				
	16	Increase air conditioning systems efficiency in buildings	17	34				
	17	Replacing electrical household appliances with more efficient ones	31	77				
Transport	18	Insertion of gasoline and diesel hybrids	6	13	228	834	10%	17%
	19	Accelerated replacement of old vehicles with more efficient ones	16	32				
	20	Purchase of high efficient vehicles instead of standard ones	35	71				
	21	Improvement of inefficient roads with high levels of traffic	10	25				
	22	Reduce road transport for passenger and goods by increasing other transportation modes (rail way and water way)	124	618				
	23	Use of biofuels	37	74				
Forestry	24	Afforestation of agricultural land (agricultural abandoned land and change of soil use)	150	300	175	350	8%	7%
	25	Rehabilitation of degraded and barren land	25	50				
Agriculture/ Manure	26	Feed improvement and supplements for livestock	0.05	0.6	20	71	1%	1%
	27	Reduction of synthetic fertilizer use for reducing nitrogen leakage	4	6				
	28	Biogas production on pig farms and electricity production	16	65				
Waste management	29	Closure of dump sites and landfill gas capture and flaring	18	36	64	146	3%	3%
	30	Landfill gas capture and electricity generation	19	39				
	31	Waste recycling	9	36				
	32	Waste composting	17	35				
Total emissions reduction (with forestry measures)			2,190	4,916	2,190	4,916	100%	100%
Total emissions reduction (without forestry measures)			2,015	4,566	2,015	4,566		

Source: "Efficient ways for GHG emissions reductions within the post-Kyoto framework in Serbia", Ministry of Environment, Mining and Spaial Planning of Serbia, 2012.

The reductions range between 7% in the building and 8% in transportation sector, and up to 57% in the energy production sector. As for the transportation, the reduction of road transport for passengers and goods, and increase in the railway and water way transportation modes, will be contributing by 54,4% to the total in this category. In the building sector, the measures including the insulation of residential buildings, insulation of commercial and institutional buildings, increased heating efficiency in buildings, and increased air-conditioning systems efficiency in buildings, contribute by 52,2% in respective category.

The highest potential for the emission reductions is seen in the energy sector. The measures to be taken also include energy generation from biomass, construction of CCGT plants, wind power, PW solar power, small hydro power plants, and improvement of electricity grids. All of these are in compliance with the general policy on climate change and measures already established to meet the challenge.

The document has clearly indicated that the building sector could substantially contribute, and the first measures are already taking place. Recently, the "Energy Passport Act" (equivalent to LEED) has been adopted. The regulation set by the Act requires that every new building, prior to getting the use permit, has to pass the energy efficiency test. The Act will be in force starting September 2012, and the standards are defined for the individual homes, residential buildings, public buildings, offices, buildings for different utilities and services, and any other building with the exception of those with no heating and cooling (specific warehouses, for instance), or buildings that are in use during the heating/cooling season for a period shorter than one quarter of the season. It is also planned to start the

energy rehabilitation program of the existing building stock which is also required to match the energy efficiency standards in each category respectably.

5. Reshaping Behavior at the Local Level: the Result Producing Schemes

As local communities are places where actions become reality and where changes actually happen, they are also places where shifts in attitudes and behavior are most visible. In the Serbian space there are many good initiatives and examples of the already undertaken projects, all of them underline the importance of empowering the local level to safeguard their environs (Bajić-Brković, Brković, Sretović, 2012). Most of them are taken by local governments, stakeholders or citizens which speak about the raising awareness and the pro-action attitudes they have. As a rule these are the small scale projects which fall within the jurisdiction of local decision-making what secures a quick start-off, and easy monitoring once they are in operation. The majority of projects are in energy production plants based on hydro potential, biomass and bio-gas.

5.1. Responsible governments make it happen

Out of 900 potential sites identified for the hydro energy production, at 90 sites the construction has already started, or will be in the near future. In addition, 30 of the existing small hydro plants are scheduled for revitalization and modernization. The newly planned complex with a cascade of ten small hydro plants at the river Ibar (Brković, Sretović, Cvetinović, 2011), or the Studenica and Drvengrad (Sretović, Brković, Cvetinović, 2011) plants clearly illustrate this newly established trend.

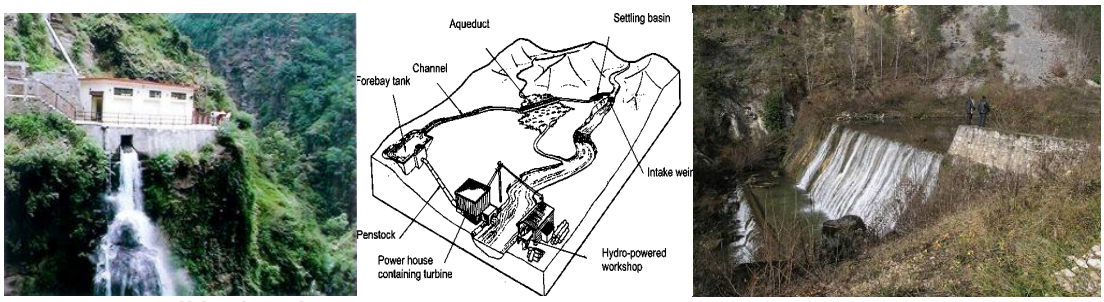

Image 3: Small hydro plants
Source: Jaroslav Černi Institute for the Development of Water Resources, Belgrade, Serbia

Small hydro plants will substantially contribute to the reduction of GHG emissions, and will play an important role in saving the environment. All recently undertaken studies have confirmed that these structures provide an added value to the areas where they are built:

- "They do not occupy large territory
- While in construction or operation, they do not flood and destroy villages and
- cultivated areas
- They are regarded as beneficial projects of small investment as they can completely meet local needs for energy
- Their production is ecologically clean
- They make isolated areas energy independent and improve the quality of life of local citizens
- If necessary, they still can be connected to larger power networks
- Since these projects are made using local traditional styles and natural materials,

they give additional recognition to these areas and boost their local identity
- Although small, they can support local economy in agriculture, tourism, etc.
- These systems are convenient for supplying energy in isolated and scattered communities in mountainous regions
- They do not disturb local habitats and natural environment
- These projects promote legally regulated, locally conditioned and non-formal modes of participation in the decision making process, and permit them to influence regulations on all levels inside Serbian society" (Sretović, Brković, Cvetinović, 2011).

The biogas plants are among the leading small scale projects undertaken by local governments, due to their size, technology, availability of local resources and relatively low cost which local governments can afford within their thin budgets. All of them are located in very small communities, often in underdeveloped regions where local governments daily struggle how to allocate scarce resources and make priorities for their communities. For instance, the municipality of Pozarevac made a critical shift once the local government decided to start an environmentally sound and climate responsive energy production for the villages within the municipality. There are two projects currently in progress. The villages Bradarac, Maljurevic and Babusinac, with no connection to the distant heating system, will get their homes warm thanks to the biomass energy plant whose construction is about to start. The plant will use the crop residue, out of which the pellets and briquettes will be made. Similar examples come from many villages and small municipalities in Vojvodina region, like in Subotica, Bac, and many others. While in some communities they are built to enhance local economy, in majority they are aimed to increase clean energy supply for their citizens. Getting stronger in making their environment clean and healthy is a thrust these communities have embarked upon.

Some local governments have placed an emphasis on monitoring critical components in making their communities climate responsive. Interesting examples come from Pancevo or Indjija, where sophisticated GPS based on-line systems were established to provide daily information on air quality (Brković, Sretović, 2012). The others have opted for educational programs, like Subotica or Majdanpek.

Many of these projects have been initiated in cooperation and partnership between public and private sector, and citizens. In some cases, NGOs play an important role, while in others they come out of citizens' initiatives. What makes all these efforts particularly valuable is a change that could be observed in the way local governments behave and communicate with their citizens, and their newly born responsiveness to the local needs and actions arising at the local level. In that way, some of them gained a new recognition among the citizens, while contributing to the growing civic pride.

5.2. Local stakeholders taking a lead

Not all the actions and projects are taken by local governments. Many of them have been started by different interest groups, local stakeholders or private parties from the "outside world". A small scale hydro plant "Studenica", initiated by a group of monks from the Monastery Studenica, stands as the most outstanding example as many different and special requirements were to be fulfilled in order to get it approved and the construction started. The plant was built in the immediate surrounding of the monastery which is part of the UNESCO World Heritage, while the whole monastery complex, as well as the plant, are located in the biosphere reserve of Golija mountain, the first national resort protected by MAB UNESCO, which is also a first category natural park, according to Serbian's Act on Cultural Heritage. The construction was started in 2007 while the plant was put in full operation in 2011. It

provides green energy, has no effect on the surroundings, and supports all the energy needs inside the monastery complex what makes them entirely energy self-sufficient.

In raising public awareness, the media plays an important role. There are virtually dozens of TV or radio talk shows and educational programs that have the issue of climate change, and environmental concerns in general as their major theme. Some of them are entirely devoted to the green development and building energy responsible human habitats. Among the most popular which are being broadcasted over the country are "Zeleno jutro" ("Green Morning"), and "Eko-balans" ("Eco-Balance"). Local stakeholders often organize actions and programs for local population which are very popular among the citizens, and are accordingly covered by media.

5.3. Citizens in action

Local population appears to be not only a third partner, or a recipient of services, but often a leader in making their communities for better. Green Movement in Serbia is not as strong as in some other European countries, yet the influence it has on local affairs, and actions taken by local population are remarkable, especially vis-à-vis the scarce resources they have. Their actions are often carried out in cooperation with foreign grant organization, or are subsidized by national government or local firms.

An illustrative example comes from Ilandža, a village of only 2500 inhabitants, in the vicinity of Belgrade, which will become an energy independent place, thanks to the initiative of the villagers who decided to make their community green, climate responsive and sustainable. The villagers have initiated a construction of the factory for production of bio-diesel and bio-gas, exclusively for local consumption. This is the first among series of projects they have embarked on, and the initiative was supported by the Fund for Environmental Development of the Republic of Serbia and Vojvodina Secretariat for Agriculture.

6. Messages for Planning

Serbia has approached the matter of climate change by responding at both national and local level. Yet, the responses developed at the national level are by far more advanced and forward-thinking. So far, the energy policy planners have played a major role, and were supported by planning specialists in the areas of transportation, environmental protection and urban planning.

As for the local level, most of the initiatives have been taken apart from local planners, or with their rather marginal involvement. The main "players" have been local governments, third parties or citizens, while the respective comprehensive response from the profession is still missing. Although the results achieved so far, and the projects whose implementation is in progress, speak about a changing attitude toward climate change, a systematic and institutionally managed process of adapting planning practice to the new requirements is still at the very early stage. Yet, there is a need for planning practice to be innovated as well, and Serbian planning is faced with a task to reconsider its state of affairs, and rethink how to cope with a new challenge in a more systematic and consistent way (Bajić-Brković, 2012). The experience gained so far has provided some important messages:

- Climate change manifestations take place on a large scale, however they are generated locally. Thus, the problem should be addressed where it starts, and it is up to local

planning to take the "fast forward" approach if it is to cope with the phenomenon in a productive and result producing way.

- There is an array of proactive measures available for local planning, tailored to meet local resources, needs and circumstances.
- Climate change is a multifaceted phenomenon, and should be approached accordingly. It is up to local planners and local governments to look for partners and work on making partnerships;
- Learning from others, and inviting other disciplines to work together with planners is necessary; experts in energy, climatologists or natural scientist should sit on planning teams and planners should learn how they view cities and towns; working with others gives a unique opportunity to look at the problem from different perspectives, which brings in new understanding and knowledge unknown before;
- Aspects or features which do not seem relevant at the moment of plan-making, may become so in the future; thus, visionary planning should be embraced as a general framework even for small actions; planners should employ different timeframes, and think on a long run;
- Planners should reconsider methodologies and instruments they use, in order to make them applicable to the new tasks; cooperating with other disciplines may be beneficial and may open new opportunities to enrich their work;
- In reconsidering their methodologies and tools they use, planners should expand their work and include those who only recently joined planning profession; the IT specialist offer an enormous contribution to planning that in Serbia has not been fully recognized so far; yet, new technologies could be successfully employed throughout the planning process, and in the post planning project life in particular;
- Moving fast forward in the case of climate change challenges stands for taking actions now for better cities of tomorrow.

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References:

1. Bajić-Brković,Milica, Brković Matija, Sretović Višnja (2012) "Low Carbon Urban Development in Serbia: Challenges and Opportunities on the Local Level", *Facta Universitatis*, Vol. 10, No. 1 (September).

2. Bajić-Brković,Milica (2012) "Klimatske promene i urbani razvoj: šta mogu da urade lokalne samouprave u Srbiji", in: APPS: *Lokalna samouprava u planiranju i uredjenju naselja",* APPS, Zlatibor, Serbia

3. Brković, Matija, Sretović Višnja, Cvetinović Marija (2011) "Green Energy to Support Liveability: A Case Study Energy Shift to the Small Hydro-Systems in Serbia", in: *Liveable Cities: Urbanizing World, Meeting the Challenge*, 47th ISOCARP Congress, Wuhan, China.

4. Brković, Matija, Sretović Višnja (2012) "Urban Sensing-Smart Solutions for Monitoring Environmental Quality:Case Studies from Serbia", 48th ISOCARP International Congress: *Fast Forward: Planning in a (hyper) dynamic urban context*, Perm, Russia.

5. EU Council of Ministers for Urban Development and Territorial Cohesion (UTDC), (2007b) „The Leipzig Charter on sustainable European Cities", available at: http://www.eu2007.de/en/news/download_docs/mai/0524/AN/075DokumentLeipzigCharta.pdf.

6. IPCC (2007) „Summary for Policymakers", in: *Climate Change 2007: Mitigation, Contribution of Working Group III to the Fourth Assessment report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

7. Marković, D., Čeperković, B., Vlajčić, A., & Resl, S. (2009), *Bela knjiga Elektroprivrede Srbije (White Book of Electric Power Industry of Serbia*), EPS, Beograd, retrieved July 29, 2011, from http://www.eps.rs/publikacije.htm.

8. Ministry of Environment, Mining and Spatial Planning of Serbia (2011) *Efficient ways for GHG emissions reductions within the post-Kotyo framework in Serbia,* Ministry of Environment, Mining and Spaial Planning of Serbia, Republic of Serbia.

9. Ministry of Environment, Mining and Spatial Planning of Serbia (2010) *Nationally Appropriate Mitigation Actions – NAMAs*, Ministry of Environment, Mining and Spatial Planning of Serbia, Republic of Serbia.

10. Ministry of Environment and Spatial Planning of Serbia (2005) *Energy Sector Development: Strategy of the Republic of Serbia,* Ministry of Mining and Energy, Republic of Serbia.

11. Ministry of Infrastructure and Energy. (2007, 2009). *Program ostvarivanja stategije razvoja energetike Srbije od 2007. do 2012. godine (Implementation Program for Strategy of Energy Development by 2012),* Službeni Glasnik Republike Srbije, Republika Srbija.

12. Sretović Višnja, Brković, Matija, Cvetinović, Marija (2011) "Green Energy and Cultural Heritage Preservation: Case Studies from Serbia", in: *Liveable Cities: Urbanizing World, Meeting the Challenge*, 47th ISOCARP Congress, Wuhan, China.