Forests, bioenergy and people - key elements for energy transition of South-East Europe

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Abstract

Bioenergy in its traditional forms is still very important source of energy in most of South-East European countries and will continue to be so in the foreseeable future. However, it is increasingly being used in modern applications and it is considered as an important part of energy transition which is a promising model with high economic and environmental benefits. This paper describes the current phase of energy transition in South-East Europe countries and the role of bioenergy in its implementation. The expectations and needs of South-East European countries are viewed from a bottom-up, forward looking manner in which special attention is dedicated to best practice examples where bioenergy contributed to well-being of people and local communities. This paper analyses examples and situation in Albania, Bosnia and Hercegovina, Croatia, FYR of Macedonia, Kosovo and Serbia.

Rural energy projects and bioenergy projects in particular, have great potential to create income opportunities. These opportunities fall into three broad and over-lapping categories: direct revenue or employment, general improvement in health and productivity, and expansion of rural enterprises. From a macroeconomic perspective, bioenergy contribute to all important elements of country development important for still developing South-East Europe countries. Sustainability is seen as one of the most important prerequisite for successful bioenergy strategies and the common principle of sustainability combines economics, environment, and social considerations.

Several crucial factors triggering energy transition and the role of bioenergy are within the focus of this paper: change from centrally planned to open market economy; public opinion and support as a key issue in the social perspective as well as the always present issue of energy poverty; multi-level governance models and obvious emphasis on policy barriers; and crucial socio-economic drivers and benefits of increased bioenergy utilization.

Keywords: Bioenergy, South-East Europe, Socio-economic drivers, People, Energy transition

Introduction, scope and main objectives

Energy use is closely linked to a range of social issues, including poverty alleviation, population growth, urbanisation, and creating opportunities for women. Poverty is overriding social considerations for South-East Europe and many developing countries and is one of the main threats to political stability. Although the average real income growth of South East Europe countries rebounded from negative 0.7 percent in 2012 to 1.8 percent (year-on-year) in the first half of 2013 [Vincelette, 2013], income alone is an inadequate measure of the social conditions for poor people.

Can bioenergy projects provide benefits – economic, social and other? Expectations are high but there is no guarantee that bioenergy activity will go towards satisfying local and national development needs. Key points to help ensure this are: participatory approach to identify needs and to design and implement projects; treatment of biomass production and supply as integral parts of a whole project and fostering local institutional responsibility. In order for bioenergy to have long-term prospects it must be produced and used sustainably to demonstrate its environmental and social benefits in comparison to fossil fuels.

An encouraging trend is that in many South East Europe countries policy makers are beginning to perceive the economic benefits of commercial biomass e.g. employment/earnings, regional economic gain, contribution to security of energy supply and all others. This represents a significant shift with regards to the old view where biomass was viewed as a non-commercial rural source, or poor man's fuel. Progressive cities and municipalities have already made innovative decisions to enhance the use of bioenergy within their geographic boundaries. However, many local governments still do not possess the necessary professional, administrative and financial means to plan and implement bioenergy projects at sufficient scale. Furthermore, support schemes on the national level are underdeveloped or not sufficient.

The main objective of this paper is to identify the barriers and drivers for bioenergy projects and overall sustainable energy transition for South East Europe and to provide some practical guidance and inspiration in that respect. Energy transition encompasses a reorientation of policy from demand to supply and a shift from centralized to distributed generation based on bioenergy and other renewable energy sources but also – in a broader sense, an easier access to energy.

Making the energy transition is not an easy task, especially since sustainable development based on bioenergy is sometimes considered as a luxury activity reserved for wealthy and more developed EU regions and communities. Energy transition should include the more sustainable use and more equitable share of often limited resources, including forests, which can be a significant challenge.

This paper focus is on South-East Europe, namely Albania, Bosnia and Herzegovina, Croatia, FYR of Macedonia, Kosovo, Moldova, Montenegro, Serbia and Ukraine. Many successful bioenergy projects could be highlighted where the leaders have governed and guided their communities to accept the energy transition. In contrast, there are many more examples of local governments which have been unable to develop sustainable energy policies.

Methodology/approach

Socio-economic impact studies are commonly used to evaluate the local, regional and/or national implications of implementing particular development decisions. The problem lies in the fact that these latter elements are not always tractable to quantitative analysis and, therefore, have been precluded from the majority of impact assessments in the past, even though at the local level they may be very significant. Local socio-economic impacts are diverse and will differ according to such factors as the nature of the technology, local economic structures, social profiles and production processes (Table 1).

Table 1: Bioenergy sector development aspects [Domac *et al.* 2005]

Dimension	Benefit
Social Aspects	Increased Standard of Living • Environment • Health • Education Social Cohesion and Stability • Migration Effects (Mitigating Rural Depopulation) • Regional development • Rural diversification
Macro Level	Security of Supply (Risk Diversification) Regional Growth Reduced Regional Trade Balance Export Potential
Supply Side	Increased Productivity Enhanced Competitiveness Labour and Population Mobility (Induced Effects) Improved Infrastructure

Demand Side	Employment Income and Wealth Creation Induced Investment Support of Related Industries
Institutional Aspects	Democratic Decision Making Participatory Process Local Problem Solving Equity

Countries in South East Europe have different characteristics, needs and size but a common point is that most of them have limited financial and technical resources. Therefore, tackling bioenergy issues is a very challenging process which requires adaptation of sustainable energy measures implementation according to the national and local characteristics.

The paper is one of the first results of an EU funded project *Sustainable Regional Supply Chains for Woody Bioenergy - BioRes* as part of the Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020). Some findings are also results of several other international projects in which authors successfully participated over the last fifteen years:

- International Energy Agency – Bioenergy Agreement Task 29: Socio-economic Drivers in Implementing Bioenergy Projects (2000-2012);
- International Energy Agency – Bioenergy Agreement Task 43: Biomass Feedstocks for Energy Markets (2013-2015);
- Intelligent Energy Europe – Biomass Trade Centre II (2011-2014);
- USAID – Overview of the South-East Europe Bioenergy Potential (2010)
- World Bank - Study and Analysis of Innovative Financing for Sustainable Forest Management in the Southwest Balkans (2012-2013)
- BIOEN – Natieonal Energy Programme on Biomass Utilization for Croatia and others.

The views presented here are results of extensive practical experience in developing and facilitating bioenergy utilization projects (municipal DH schemes, biomass boilers, pellets production etc.) in several South East Europe countries (Martinov et al, 2006; Krajnc et al, 2007; Perakis et al, 2010). Numerous inputs were also received from representatives of municipalities, associations, energy agencies, EU and international organizations active in area of biomass utilization in the South East Europe.

Key energy data for South East Europe countries are presented in the following table (Table 2).

Table 2: Bioenergy sector development aspects (IEA, 2015)

Country	Primary energy production (TJ) 2012.	Share of renewable energy consumption in %	Share of biomass consumption in %
Albania	86876,00	30,10	9,95
Bosnia and Herzegovina	279259,00	8,07	2,64
Croatia	331468,00	11,71	5,85
FYR of Macedonia	124264,00	9,71	6,38
Kosovo	99185,00	10,82	10,45
Moldova	137159,00	3,16	2,46
Montenegro	44463,00	28,95	16,99
	605495,00	13,01	7,08

Serbia			
Ukraine	5135570,00	1,63	0,81

South East Europe countries have a considerable forest biomass potential in terms of total forest area, but also in terms of the forest area per capita. The total forest area of all analysed countries is almost 200 thousand km^2, while yearly production of roundwood is approximately 38 thousand m^3 (Table 3).

Table 3: Key forestry data (World Bank 2015, FAO 2015)

Country	Total forest area (km2) 2012.	Forest area per capita (km2 / capita)	Roundwood production (1000 m3)
Albania	7740,2	0,0027	1180,0
Bosnia and Herzegovina	21850,0	0,0057	3797,0
Croatia	19268,0	0,0045	5714,0
FYR of Macedonia	10072,0	0,0047	558,0
Kosovo	4810,0	0,0027	-
Moldova	3952,0	0,0011	352,0
Montenegro	5430,0	0,0087	915,0
Serbia	28078,0	0,0039	7549,0
Ukraine	97570,0	0,0021	17506,0

Results

Bioenergy projects have the potential to provide a range of benefits to South East Europe countries, but a number of barriers still need to be overcome. Key drivers and barriers for more successful implementation of bioenergy concepts are presented in the following text.

The drivers and motivation for energy transition or more concretely for developing sustainable energy project in local governments can be structured as described below.
(1) Potential push: This applies to most South East European countries given their important forest areas and potential. Biomass heating plants in remote municipalities on FYROM, Kosovo or Croatia are examples of successful push strategies.
(2) Market push: Import of affordable energy plants equipment is facilitated by the suitable support from manufacturing companies. Good examples are numerous bioenergy boiler projects for public buildings where biomass boiler technology is taking over the market very rapidly. This leads to low investment and maintenance costs.
(3) Utilizing the established trade routes and business links: Most of the biomass trade between South-East Europe countries and the EU is performed in integration with the trade of forest products. The most obvious example are pellets which are the subject of large scale trade and export from Serbia to Italy, Slovenia, Greece and Bulgaria - in 2013, total of 37 pellet plants were in operation in Serbia with production capacity of 489.000 tons. Most of that pellet production, app. 89% is being exported as domestic market is still under development [Glavonjić, 2013].
(4) Incentives and other financial support mechanisms: Incentives based on political decisions are a strong driver in South East Europe countries. This includes feed-in tariffs, grant subsidies or favourable loans. A good example is a boost of renewable energy applications in Croatia after establishment of

national Environment Protection and Energy Efficiency Fund (EPEEF) established in 2003 based on polluter pays principle. In total EPEEF up to September 2013 supported with app. 65 mil. Euros various investment projects of total value of 387 mil. Euros [Glavonjić, 2013].
(5) Being the first! or local pride is an important driver in South-East Europe countries. Sometimes political leaders or entrepreneurs with strong vision have had a leading role for the development sustainable energy project or overall energy transition.
(6) Keep money at home! is another significant driver connected with positive perception of bioenergy sources as local and own sources of energy.
(7) Unexpected accidents/opportunities: Ice storms, forest fires, etc. may lead to short term imbalances in the supply. Such short term opportunities can lead to new trade patterns, some of which may remain also when the conditions return to normal. For example, the 2013's ice storms in Croatia (Gorski kotar region) left a significant amount of wood (degraded forests) which can be used as a source of wood chips.

Based on own experiences, literature review and interviews with everyday exchange with local governments, a number of potential barrier categories for bioenergy in South East Europe have been identified. The barriers presented below may vary a great deal in terms of scope, relevance and how they are perceived.
(1) Economic barriers: competition of renewable energy with fossil fuels on a direct production cost basis (excluding externalities). Support systems like governmental RD&D programs, tax cuts and exemptions, investment subsidies, feed-in tariffs for renewable electricity, mandatory use of renewables or quotas only rarely exist.
(2) Financial barriers: Limited financial capacity is a serious barrier for many local governments, whose budgets due to limited territories/number of inhabitants are too low to enable serious investment projects. Unfavourable tax income position versus central governments adds to this barrier. Reliance on very limited budgets places municipalities in a vulnerable position and unable to conduct larger investment projects.
(3) Social barriers can be specific for each particular renewable energy source but the most common are - lack of knowledge and information, long-term process of changing the behaviour, incorrect understanding of the real nature and all issues connected with sustainable energy, lack of interest and motivation, underestimation of small people power and influence.
(4) Capacity barriers: for most local governments a massive training and technical assistance to improve their administrative capabilities to be capable of developing innovative programs is still needed.
(5) Transparency barriers: a common problem is low budget transparency which depends on the strength of local democratic institutions. This is not directly connected with energy transition but creates the overall unfavourable framework.
(6) Technical barriers mostly belong to the fact that most of the energy efficiency and renewable energy equipment available today on the market is not being produced locally – it comes from import. However, problems with standardisation, logistics, technical knowledge needed for maintenance and operation are very limited.
(7) Logistical barriers are dominantly present in area of biomass utilisation - lack of technically mature pre-treatment technologies in compacting biomass at low cost to facilitate transportation. Local transportation by truck (both in biomass exporting and local supply) is a high cost factor, which influences the overall energy balance and total costs.
(8) Political consistency: the political dimension of energy transition is more than just a set of effective policies – it involves political decisions made at the right time and in the right direction so to keep public attention focused on the issues of sustainability, to keep the flow of public and private investments in renewable energy projects and managing the conflicts that arise. A significant barrier is caused by changes in the government in local administrations – newly appointed government often questions already started projects of the previous administration interrupting their implementation and creating setbacks.
(9) Land availability, deforestation and potential conflict with food production - still not a big issue for South-East Europe but should be considered for the future. In practice food availability is not the problem, but the lack of purchasing power of the poorer part of the population.

Discussion

Although many aspects are different and the overall situation can be quite specific, the overall process of energy transition can be simplified as follows (Domac et al, 2011):

- Defining a vision (through political statement, declaration or similar);
- Developing sound policies (municipal, regional and national plans, procedures and regulations that affect energy and climate issues) – many South-East Europe countries still have to set a clear framework to steer its energy and climate goals and to set their policies;
- Making partnerships and ensuring key support (e.g. from energy or development agencies, consultants, etc.);
- Early stage involvement of citizens (communication, mobilisation, participation);
- Demonstration or *flagship* projects (leading by example) – projects in area of the local authority's own buildings and facilities, vehicle fleet, etc.;
- Capacity building – investing the necessary human and financial resources;
- Wider scale implementation – involvement of entrepreneurs and industry (local, regional, national);
- Systematic evaluation of impacts and determination of progress towards the objective.

Several factors create a challenging framework for energy transition and bioenergy - e.g. ageing infrastructure which now has to react to increasing demand. On the other hand, European energy legislation requests significant sustainability level of energy sector in the South-East Europe countries as a part of their joining process. Additional challenge is the negative legacy of centrally planned economies. Dedication to a well-functioning market oriented economy seems to be a precondition that would lead to energy transition and successful bioenergy utilization.

Conclusions/outlook

Most major world challenges - security of energy supply, investment/economic growth and climate change are present in South East Europe as well and these are the top priority of almost every local and national government. To ensure the quality of life expected by their citizens, and to improve it for most of South East Europe countries, a new economic and technical approach need to be applied, in particular:

- Present governance of the energy sectors in South-East Europe countries should be fundamentally modified for each country in a transparent, efficient and competitive way – giving more autonomy to local governments.
- Unlike their EU peers, South-East countries face a complicated challenge - there is so much work to be done in setting the market on *the right track*. Political support coming from the European Commission and other EU institutions is certainly a crucial factor in achieving ambitious bioenergy goals.
- The need for structural reforms to make stimulating business environment for both public and private investments is very evident, especially in the context of removing legislative barriers for bioenergy projects.
- Sustainable energy development can only be adequately addressed if action is taken at all levels of government: international, national, regional and local.
- Employment is a function of bioenergy. The quantity and quality of employment depends upon on stages in the overall bioenergy system cycle (i.e. production, conversion, end use) and conversion process (i.e. tree plantation for electricity production).
- Among other renewables, bioenergy is the most promising for many South East Europe countries as its mobilization can provide large employment generation schemes, can be linked to ecosystem conservation, and even rehabilitation and can have a significant impact on global climate change.

- Bioenergy (together with the other renewable energy technologies) should be promoted due to its potential contribution to energy security.
- Deployment of bioenergy sector has also the high potential for job creation, improved industrial competitiveness, regional development and the development of a strong export industry.

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