Strategic analysis for the bioenergy sector in Western Balkan countries as well as Moldova and Ukraine

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ABSTRACT: The main purpose of this work is to present a strategic analysis of the bioenergy sector in the western Balkan region, namely Albania, Bosnia & Herzegovina, Croatia, FYROM, Montenegro and Serbia, as well as Moldova and Ukraine and evaluate the factors that hinder or foster future development. The study firstly reviews the renewables & the bioenergy sector in the countries based on national level information for biomass supply and use and then provides a coherent analysis for the opportunities and threats of the bioenergy & biofuels sectors at national and regional levels. The results show that biomass is the dominant RES in the region and is widely used for heating in the residential sector. However, despite the good potential and favourable geopolitical conditions further development of the bioenergy sector will require harmonisation of efforts concerning the development of a favourable legislative framework and support mechanisms and the development of coherent statistics at local administrative level.

Keywords:

1 INTRODUCTION

The main purpose of this work is to present a strategic analysis of the bioenergy sector in the western Balkan region, namely Albania, Bosnia & Herzegovina, Croatia, FYROM, Montenegro and Serbia, as well as Moldova and Ukraine and evaluate the factors that hinder or foster future development.

2 APPROACH

The work is structured in two sections:

- A review of the bioenergy sector in the countries based on national level information for biomass supply and use.
- ➤ A SWOT analysis for the bioenergy & biofuels sectors at national and regional levels.

2.1 Review

The bioenergy sector in the under analysis countries has been reviewed (based on a commonly formatted structure) in terms of supply options and role in the national markets for renewables and energy. 2.2 SWOT analysis

SWOT analysis groups key pieces of information into two main categories:

- Internal factors The strengths and weaknesses internal to the system under consideration.
- External factors The opportunities and threats presented by the external environment.

The internal factors may be viewed as strengths or weaknesses depending upon their impact on the objectives.

In this work SWOT analysis has been used to set the scene for bioenergy and identify the factors that may hinder or foster its future implementation.

3 BIOENERGY IN THE ENERGY COMMUNITY

The current use of biomass is shown along with the total primary energy supply (TPES) and the total renewables (RES) participation in the energy mix for each country separately in Table I. Large discrepancies between national statistical biomass data and experts' estimations were observed in Moldova, BiH and Serbia. Experts' estimations on the current use of biomass in Moldova are 9 times higher than the official number. In Serbia large volumes of fuel wood coming from private forests and used for household heating are not registered according to a FAO project survey [1], while the same is true for BiH.

Table I: Total Primary Energy Supply (TPES) and RES					
participation (large hydro included). National official					
statistical data and national experts' estimations (in					
brackets). (PJ)					

Country	TPES	Total		Biomass	
2008*		RES	heat	electr.	transport
AL[2]	88.7	23.3	9.0 (9.8)		
BA[2]	234.6	22.1	7.7 (16.3)		(n.g.)
HR	413.2	64.5	13.4		(0.1)
FYROM	121.0	11.1	7.1 (~9.0)		(n.g.)
MD	91.8	3.5	3.2 (30.3)		(n.g.)
ME	95.33	5.51			
SR	393.6	46.0	12.7		1.3
			(51.9) (only woody	biomass)
UA	5,751	151	26		

* 2007 for BA & FYROM

The most significant source of biomass is fuelwood, which accounts for more than 80% of the total biomass use in all of the countries under study, being used primarily in household heating.

The only exception is Moldova, where half of the population is rural and the high prices of conventional fuels have led to a significant level of exploitation of field crops residues and orchards and vineyards prunings. Wood industry residues are used for industrial heating and the production of pellets and briquettes, which is a fast growing industry, in BiH, Croatia, Serbia and Ukraine. As far as biomass boilers in wood industry are concerned, most of them are old and need refurbishment or replacement. In Ukraine field crop and agroindustrial residues are also used in wood fuels production. Pellets and briquettes are mostly exported to EU countries, since domestic markets are not developed yet.

Other forms of biomass, i.e. agroresidues and animal waste, remain to a large extent unexploited with the exception of Moldova. However, several units operating on agroresidues or manure have been installed lately and even more projects are in the pipeline for implementation mostly in Serbia and Ukraine. Peat is currently used for heat production only in Ukraine (around 5 PJ).

Lastly, the biofuels market is underdeveloped in all of the studied countries. Small amounts of biodiesel, less than 1% of the diesel consumption, are produced in BiH, Croatia, Fyrom, Moldova and Serbia. Moreover, electricity production from biomass is negligible and therefore biomass is used mainly for heat production.

The technical potential of various sources of biomass according to biomass expert's estimations is shown in Table II (the biodegradable part of municipal solid waste and sewage sludge from wastewater treatment plants is not included). In Serbia, FYROM and Croatia biomass from forestry and agriculture could make an equal contribution to the total biomass supply, while in Albania, BiH and especially Montenegro woody biomass from forestry is dominant.

On the contrary, in Moldova and Ukraine agricultural biomass is significantly higher. It is noteworthy that the estimated energy crops potential is very high in Ukraine, while it makes also a significant contribution to the Montenegro biomass supply potential in the form of short rotation forestry.

It is also remarkable that biofuels production potential has been evaluated just for Serbia and Ukraine so far.

 Table II: Technical biomass potential (PJ) [3]. Reference

 period within the study: AL:2006-2009, BA:2004,

 HR:2000-2006, MK:2009, MD:2008, ME:2009,

 SR:2003-2009, UA:2007-2008.

	Forestry	Agro residues	Animal manure	Bio fuels	Energy crops	Potential
AL	8.4 [4]	5.6	n.a.			14.0
BA	23.4	9.6	0.5			33.5
HR	12.1	11.4	2.0			25.5
FYROM	8.2	7.1	0.9			16.2
MD	5.2	38.8				44.0
ME	9.5	0.7			4.9	15.1
SR	62.5	68.1	1.8	8.0		140.4
UA	48.6	375.6	72.0	82.9	452.6	1045 1
UA	13	1045.1				

At this point it should be noted that the potentials given in Table II depend largely on the various assumptions that have been made for their calculation as well as on the depth of the analysis made in each case. As for an example, the biofuels potential is not estimated in Croatia, FYROM and BiH despite the fact that biodiesel is already produced in small quantities in these countries. Furthermore, these numbers are based on studies carried out in different years and some of them date back to 2001. Therefore, it is made clear that a re-evaluation and reassessment of the potentials is necessary by applying a uniform approach in all of the studied countries. In this context a "Regional Biomass Study" is carried out in the framework of the SYNENERGY project that will be concluded in September 2010.

The current level of biomass use (according to experts' estimations in Table I) is around 50% of the technically exploitable biomass (as provided by the national experts so far) for most the studied countries (Table III). Moldova is again an exception with current level of biomass use around 70%.

In Albania the percentage is also high, however firewood is currently used in an unsustainable way, since the loggings are higher than the forest increment according to a FAO study [4].

On the contrary, Ukraine uses just a minor part (2,5%) of its biomass resources, while Serbia's percentage is also relatively low due to the fact that agroresidues remain unexploited.

Table III: The current biomass use (experts' estimation) as a percentage of the technical biomass potential (A) and the technical biomass potential as a percentage of the current TPES (B) for the studied countries.

	AL	BA	HR	FYROM	MD	ME	SR	UA
A	70	49	53	56	69		37	2.5
В	16	14	6	13	48	16	36	18

Furthermore, the reported biomass technical potential is

very high for Moldova and Serbia, when compared to the country TPES (Table III) and could contribute decisively to the countries' energy independence.

For the rest of the countries biomass could be the most significant RES with a contribution of more than 10% in the energy mix in 2020.

Croatia is an exception here, where the estimated biomass potential sums up to 6% of the 2008 TPES.

4 SWOT ANALYSIS

The results of the analysis are presented in the common SWOT table forms and are based on recent national reports as well as selected experts opinions.

4.1 Energy Community

 Table IV:
 SWOT analysis in the Western Balkans,

 Moldova & Ukraine.
 Vestern Balkans,

Strengths	Weaknesses
 Significant biomass potential Experience in biomass research and exploitation (boilers, combustion research) Significant existing utilization Acknowledged role and importance by decision makers 	 Limited capital flow for new investments Restricted knowledge on biomass potentials prohibits fast development of strategies and investment opportunities Limited use of solid biomass for district heating, CHPs and electricity production (traditional use vs modern use) Delays on implementation of policies Lack of support mechanisms in most cases Scattered ownership of agricultural land prohibits economies of
Opportunities	Threats
 Existing boilers in wood industry use fossil fuels or need re-furbishment. Electricity or CHP in wood industry Substantial use of firewood but old fashioned- not high efficiency stoves Development of regional pellets and briquettes market Development of a regional biofuels market Attraction of additional investments by the Kyoto Protocol mechanisms. Creation of new jobs New opportunities under 	 Lack of coherent statistics at regional level Issues with illegal cuttings from forest Low electricity prices from fossil fuels Low competitiveness of agricultural systems Lack of well structured proposals for targeted investments Unstable legislative framework in some cases

	Directive		
•	Good potentia	l for	local
_	Our entropicities	france	15 £1
•	replacement	in	DH
	plants		

4.2 Albania

Key features of the bioenergy sector in the country include:

- Fuelwood is currently the only biomass source used for energy purposes. The recorded consumption in 2008 was 8.8 ktoe in industry, 180 ktoe in households, 21.3 ktoe in services and 5 ktoe in the agricultural sector.
- Biomass is mainly used for heat production.
- Other forms of biomass, e.g. agro-residues and animal waste, remain unexploited.

Table V: SWOT analysis in Albania.

Strengths	Weaknesses
 Transport sector is the most consuming- biofuels 	 Not high intensity industries in Albania, mainly food industry No data on biomass consumption by sectors No data on wastes Responsibility on biomass lies with several ministries
Opportunities	Threats
 RES & EE laws prepared, now in parliament (based on the EU directives) There is an active biofuels law Small scale heat in public buildings Big use of firewood but old fashioned- not high efficiency stores 	• Issues with illegal cuttings from forest (non technical barriers in the sector)

4.3 Bosnia & Herzegovina

Key features of the bioenergy sector in the country include:

- Almost 50 % of the area of Bosnia and Herzegovina is covered by forests, making forest biomass potential substantially high. However, agricultural residues have also good energy potential in the regions of Northern, Central and Southern Bosnia and Herzegovina.
- Current biomass use amounts to 7% of TPES (2008), mainly fuelwood and wood waste.
- Wood industry residues are used for industrial heating, however, biomass boilers in wood industry need refurbishment- replacement.
- Fast growing industry of pellets and briquettes.

Table VI: SWOT analysis in Bosnia & Herzegovina.

Strengths	Weaknesses
Competitive advantages	• Generally bad

		1	
	for exploitations of		economical and
	biomass (land, forest,		financial situation
	climate, etc)	•	Inability of self-
•	Sufficient reserves with		financing of
	high opportunities for		investment and
	electricity and heat		landing (insufficient
	generation (large		own capital, and big
	percentage of biomass		costs of investment
	that is not used at all)		capital)
•	Pre-war experience in	•	Very complicated
	biomass research and		procedures to get a
	exploitation (boilers)		loans for some serious
	combustion research)		investments in this
•	Sufficient educated		sector
•	human resources within	•	Stagnation in further
	usage of biomass	•	davalarment of new
	usage of biomass		technologie for
•	A lot of small and similar		technology for
	municipalities with		production and use of
	developed wood		biomass/waste (low
	processing industry, with		percentage on R&D at
	opportunities to use		all, there is no any
	waste biomass for heat		systematic approach
	and electricity		for that)
	production on the local	•	General situation in
	level,		energy sector in BiH –
•	Very close perspective of		artificial division of
	promotional measures		the energy sector
	for bioenergy production		according to national
	and use		regions is still present
	and use.		(compatition
			(competition
			conditions for
			business are not the
			same around the
			country)
		•	Stagnation in education
			and building of human
			capacities (very low
			interesting and small
			number of new
			aducated people for
			biomaga/wasta was)
			L and a set
		•	Low prices of
			electricity from
			biomass/waste plants
		•	There are no incentives
			for biomass/waste
			production and use
		•	Complicated legislative
			for PPP realization.
		•	Public procurements
On	portunities	Th	reats
- P	Employment there 1		Ungustamatia1
•	development of other	•	unsystematic and
	development of whole		unsustainable
	bioenergy chains		exploitation of forests
•	Sustainable exploitation		and land, especially
	of all biomass sources		torest residues
•	Growth in local heat and		(wastes)
	electricity demands	•	Dependence, to some
•	Possibility of attraction of		extent, on imported
	foreign and private		technology
	investors (especially in	•	Low level of R&D and
	co-combustion plants)	-	technological
ç	Vorus importante a la la la		development
•	very important ecological		aevelopment
	aspects using	•	No new employment in
	biomass/waste (apart		this sector
	from reduction of GHG	•	No further and better
	emissions, clearance of		local development
	lands and forests too)	•	No diversification of
•	Technological		energy supply side
-	development in the field		Insufficient
	of biomaga/wasts	•	development of CMC
	of biomass/waste use	1	development of SME
	$(\mathbf{D} \boldsymbol{\theta}_{\mathbf{P}} \mathbf{D})$		1 1 1 1

SME industry	production and use
development (production	 No foreign investors
of compressed fuels	 Lack of promotional
from biomass/waste for	mechanisms for
export)	bioenergy production
 Local development 	and use
• Development of ESCO	 Some environmental
companies or other	effects of
forms of the PPP	unsustainable
• Potential for EE in wood	production and use of
processing industry as	biomass/wastes
well as agroindustry by	sources
using waste biomass	• No or bad legislative
from the processes.	framework for
• Development and	biomass/waste
production of domestic	production and use
equipment for biofuel	
production or biomass	
1150	

4.4 Croatia

Key features of the bioenergy sector in the country include:

- The most important source of biomass for energy is wood from forestry and wood processing. The total forest and forest land area in Croatia amounts to 2 688 690 ha, with approximately 78 % managed by the public company 'Hrvatske šume', Ltd. Zagreb. This may prove a key factor to facilitate the development of the energy market.
- Agricultural biomass residues (mainly from wheat and maize) can be found in both Eastern Croatia and coastal zone but to a large extent they remain unexploited.
- Animal manure is expected to deliver a modest contribution to bioenergy in Croatia as cattle breeding has been on a steady decrease in the last years.
- Fuelwood mainly consumed in residential sector for heating purposes.
- Wood industry residues are used for industrial heating, however, biomass boilers in wood industry need refurbishment- replacement.
- Currently there are 9 plants producing 172.5 ktonnes of pellets and and 19.4 ktonnes of briquettes. Nearly 80% of the pellets and 50% of the briquettes are exported.

Table VII: SWOT analysis in Croatia.

Strengths	Weaknesses
 High potential – agriculture, forestry, wood industry Well developed forest industry Recent policy framework supporting RES/ biomass Rapid development of pellet production 	 No reliable statistics at municipal level for wood supply No biomass CHP in wood industry General reluctance within households to invest in pellet boilers Poor development of domestic market (households, public or commercial buildings)
Opportunities	Threats
• Existing boilers in wood industry use fossil fuels	 Complicated and long procedure for licences

4.5 FYROM

Key features of the bioenergy sector in the country include:

- The average share of firewood in the national energy balance is approximately 8-10% for the last 30 years.
- Presently, wood and charcoal take about 80% of the biomass use for energy production. Other 20% consist of burning the vineyard branches, rice shells, orchard branches, straw of grains, etc..
- All the biomass is used for heat production.

Table VIII: SWOT analysis in FYROM.

Strengths	Weaknesses
• Firewood covers 8- 9% and is forecasted to cover more in the future	 Public utility with low flexibility on innovations Collection/ pre-sorting of wastes is a major issue No organised production of energy crops Lack of clear policy, targets and monitoring instruments
Opportunities	Threats
 Big use of firewood but old fashioned- not high efficiency stoves Promote de-centralised / autonomous energy producers (users) Biogas 'centralised' units (small scale animal farms) High amounts of agricultural wastes Small scale heat for agro- industries, wood industries, etc. 	 Decrease of forest land and of annual reforestation Arable cropland increased and the increase came from the rainfed crops

4.6 Moldova

Key features of the bioenergy sector in the country include:

- High proportion of rural population & high prices of imported conventional fuels have led to significant exploitation of agro-residues.
- Current biomass consumption amounts almost to 25% (of TPES in 2008).
- The available solid biomass is mostly used in rural areas by private householders for heating, cooking and heat water supply, as well as for heating public

buildings (schools, hospitals, etc).

• Over the last couple of years, in the frame of a GEF project, 11 straw boiler-houses have been implemented, supplying a series of public buildings.

Table IX: SWOT analysis in Moldova.

Strengths	Weaknesses
 Existing favourable legislation for RES/ biomass Good agricultural biomass potential 	 No use of solid biomass for district heating, CHPs and electricity production
Opportunities	Threats
 Increasing number of straw boilers in public buildings Local biodiesel production directed solely to exports 	A strong dependence of climatic conditions (droughts, floods)

4.7 Montenergo

Key features of the bioenergy sector in the country include:

- Montenegro has both forest and agricultural biomass feedstocks deriving from forest and wood processing operations, viticulture and olives.
- The residual wood from hardwood is traditionally used for heating in households in heaters.
- Small production of briquettes in some woodprocessing companies is used in local markets.

Table X: SWOT analysis in Montenegro.

Strengths	Weaknesses
 Significant biomass potential, Accessibility of unused land for growing the fast-growing plantations for energy use, 	 Lack of research of bioenergy resource potential, Very poorly developed forestry, Very poorly developed wood-processing
• Decrease in CO ₂	 Lack of own financial resources,
 emissions, Support of development of forestry and wood- processing industry, Generation of significant amount of energy from RES, Generating energy surplus 	 Lack of program for potential investors, Lack of adequate regulatory stimulation, Lack of knowledge and public information about energy potential of biomass
Opportunities	Threats
 Improving energy stability, Direct replacement for fossil fuels, Export of energy, Increase of national product: New employment options Development of local businesses 	 Fossil fuel might be cheaper Intensive energy generation from: sun, wind or geo potential

•	Use of investment from	
	Kyoto protocol	

4.8 Serbia

Key features of the bioenergy sector in the country include:

Table XI: SWOT analysis in Serbia.

Strengths	Weaknesses
 High biomass potential National Biomass Action Plan is currently being developed Ambitious national RES targets are set Feed-in tariffs for bio- electricity 	Large number of small private owned forests- difficult to manage
Opportunities	Threats
 Direct substitution of natural gas Export of biomass pellets Space heating in households and buildings using biomass pellets or briquettes Co-firing or total replacement in district heating plants firing heavy oil or coal Production of electricity utilizing agricultural and wood wastes Production of biofuels for transport. 	 Illegal forest cuttings Low reforestation rates Low price of electricity results to low use of biomass heating purposes (households use electricity for heating)

4.9 Ukraine

Key features of the bioenergy sector in the country include:

- Current biomass use comprises of 80% fuelwood and 20% peat.
- Wood industry residues are used for industrial heating, however, biomass boilers in wood industry need refurbishment- replacement.
- Fast growing industry of pellets and briquettes.
- Vast unexploited potential of agricultural residues.
- Several units operating on agro-residues or manure have been installed lately; even more projects are in the pipeline of implementation.
- Increased interest for investment on biomass for electricity generation following the introduction of green tariffs in 2009.

Table XII: SWOT analysis in Ukraine.

scientific basis	of demonstration
 Successful pilot and 	projects; communication
demonstration projects	between the bioenergy
already exist	sector actors
	 Unstable political
	situation
	 Underdeveloped
	feedstock and
	equipment markets
Opportunities	Threats
 Strengthening energy security Direct substitution of natural gas Export of biomass/biofuels Creation of new jobs Development of local economy Attraction of additional investments by the Kyoto Protocol mechanisms 	 Potential competition with food production World prices of fossil fuels could become lower Competition with the third world countries in cheap biomass production

5 CONCLUSIONS- RECOMMENDATIONS

Biomass is the dominant RES in the region and is widely used for heating in the residential sector.

Despite the good potential and favourable geopolitical conditions implementation of investments will require harmonisation of efforts concerning the following two issues:

• Development of a favourable legislative framework and support mechanisms.

Concerning issues related to planning and policy (licensing, auditing, etc.) any type of future action, both at regional and national levels should be linked to current developments in the field at European and global level (e.g. sustainability, biomass trade, certification, etc).

• Coherent statistics at local administrative level.

Important barriers which prohibit the credibility of data in the biomass assessments are the prevailing discrepancies in national statistics, the lack of data at local level as well as the language barrier (in a few countries, several pieces of update info/ data are at local language with limited translation).

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