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DISCUSSION PAPER

Leibniz Institute of Agricultural Development in Central and Eastern Europe

RENEWABLE ENERGY AND ITS IMPACT ON AGRICULTURAL AND RURAL DEVELOPMENT: FINDINGS OF A COMPARATIVE STUDY IN CENTRAL, EASTERN AND SOUTHERN EUROPE

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LEIBNIZ-INSTITUTE OF AGRICULTURAL DEVELOPMENT IN CENTRAL AND EASTERN EUROPE

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ABSTRACT

Rising energy prices for fossil fuels, the unreliable supply of energy imports during the last winters and – concerning the 12 new members states (NMS) – the demand by the European Union (EU) for developing National Renewable Energy Action Plans have stimulated the national discussion and political action on renewable energy (RE) among all European countries. Particularly among the 12 NMS the share of RE has increased during the last years. Among the candidate and potential candidate countries (CC and PCC) the discussion on RE has just started. When looking at the impact of RE on agricultural and rural development the effects are relatively small. An expansion of rape seed cultivation and, to a smaller extent, of the production of wood pellets could be observed. But overall the impact of RE on agricultural and rural income and employment seems to be marginal up to now. Whether it will be so in the future, depends on national policies and support programme as none of the various types of RE is competitive to fossil fuels for the time being.

JEL: O52, Q10, Q28, Q42, R11

Keywords: Renewable energy, comparative survey, agricultural and rural development, New members states of the EU, candidate and potential candidate countries.

ZUSAMMENFASSUNG

DIE AUSWIRKUNGEN VON ERNEUERBAREN ENERGIEN AUF DIE LANDWIRTSCHAFTLICHE UND LÄNDLICHE ENTWICKLUNG – ERGEBNIS EINER VERGLEICHENDEN STUDIE IN MITTEL-, OST- UND SÜDEUROPA

Die öffentliche Diskussion sowie die politischen Maßnahmen im Hinblick auf erneuerbare Energien haben im Laufe der vergangenen Jahre bei allen europäischen Staaten erheblich zugenommen. Die Gründe liegen bei den stetig steigenden Preisen für fossile Energieträger, den unzuverlässigen Lieferungen in den vergangenen Wintern sowie – besonders bei den 12 Neuen Mitgliedsstaaten (NMS) der Europäischen Union (EU) – die verbindliche Maßgabe, einen Nationalen Aktionsplan für Erneuerbare Energien zu entwickeln. Besonders innerhalb der 12 NMS hat der Anteil der erneuerbaren Energie am Gesamtenergieverbrauch zugenommen. Allerdings sind die Auswirkungen der erweiterten Nutzung von erneuerbaren Energien auf die landwirtschaftliche und ländliche Entwicklung bis dato relativ gering. Lediglich eine Ausweitung des Rapsanbau sowie in einem geringerem Maße von Holzpellets war zu beobachten. Die Auswirkungen auf Einkommen und Beschäftigung sind jedoch (noch) marginal. Inwieweit sich dies in der Zukunft ändern wird, hängt von den nationalen Politiken und Unterstützungsprogrammen ab, da bis jetzt keine Art der erneuerbaren Energien gegenüber den fossilen Brennstoffen konkurrenzfähig ist.

JEL: O52, Q10, Q28, Q42, R11

Schlüsselwörter: Erneuerbare Energien, vergleichende Analyse, landwirtschaftliche und ländliche Entwicklung, Neue Mitgliedsstaaten sowie (potenzielle) Beitrittsländer der EU.

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LIST OF ABBREVIATIONS

ALB	ALBANIA
BIH; B&H	BOSNIA & HERZEGOVINA
BUL	BULGARIA
CC	CANDIDATE COUNTRIES
CRO	CROATIA
CYP	CYPRUS
CZE	CZECH REPUBLIC
ECT	ENERGY CHARTER TREATY
EST	ESTONIA
EU	EUROPEAN UNION
GHG	GREEN HOUSE GAS
HPP	HYDROPOWER PLANTS
HUN	HUNGARY
IRENA	INTERNATIONAL RENEWABLE ENERGY AGENCY
KCAL	KILO CALORIE
KOS	KOSOVO
KWH	KILOWATT HOUR
LTU	LITHUANIA
LVA	LATVIA
MAC	MACEDONIA
MLT	MALTA
MON	MONTENEGRO
MW	MEGAWATT
NMS	NEW MEMBER STATES
PCC	POTENTIAL CANDIDATE COUNTRIES
POL	POLAND
RE	RENEWABLE ENERGY
ROM	ROMANIA
SER	SERBIA
SVK	SLOVAKIA
SVN	SLOVENIA
T	TON(S)
TOE	TONS OF OIL EQUIVALENT
TUR	TURKEY
UNFCCC	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

ACKNOWLEDGEMENTS

This paper is based on 20 country reports that form part of the results of a project called "Enlargement Network for Agricultural Policy Analysis" (acronym: AgriPolicy) which receives financial support from the European Commission's 7th Framework Program. Participants are from all NMS, CC and PCC, UK, Germany, France and the Netherlands. It lasted from June 2008 to May 2010. See www.agripolicy.net for all 20 country reports, which have been drafted by national experts. The author gratefully acknowledges the contribution of the national experts: Aheron Homzo and Robert Cela, independent experts (Albania); Aleksandra Nikolic, Sabahudin Bajramović and Draguna Ognjenović, University of Sarajevo (Bosnia-Herzegovina); Ivanov Bozhidar, University of Ploviv and Rumen Popow, Institute of Agricultural Economics, Sofia (Bulgaria); Marija Cerjak, University of Zagreb (Croatia); Theodoros Ioannou and Doros Theocharides, CTS (Cyprus); Jiri Weichet, VUZE (Czech Republic); Mati Sepp, Estonian University of Life Sciences (Estonia); Dragi Dimitrievski and Ana Kostevska, University St Cyril and Methodius (FYROM); Tibor Firenczi, Csaba Forgacs and Tamas Mizik, Corvinus University of Budapest (Hungary); Menderes Ibra, independent expert (Kosovo); Agnese Krieviņa, Latvian State Institute of Agrarian Economics (Latvia); Ovidija Eicaite and Albertas Gapsys, Lithuanian Institute of Agrarian Economics (Lithuania); Sonya Sammut, independent expert (Malta); Milan Markovic, Bozidarka Markovic, Milosav Andjelic and Jelena Knezevic, University of Montenegro (Montenegro); Zbigniew Florianczyk, Anna Wasilewska, Grzegorz Kunikowski and Piotr Gradziuk, IERIGZ (Poland); Pete Istvan and Tamas Ervin, Babes Bolyai University Cluj-Napoca (Romania); Aleksandar Bogunovic and Natalija Bogdanov, University of Belgrade (Serbia); Ivan Masár, VUEPP (Slovakia); Matej Bederač and Tamaz Cunder, University of Ljubljana, (Slovenia); Dilek Bostan Budak, Cukurova University (Turkey). The country reports' summaries and interpretations are solely the responsibility of the authors.

1 INTRODUCTION

This report summarises the findings of 20 country case studies on renewable energy (RE) and its impact on rural development. The countries are the 10 new member states (NMS-10)[1] that joined the European Union (EU) in May 2004, Bulgaria and Romania, which became member in January 2007, and 3 Candidate[2] and 5 Potential Candidate Countries[3] (CC and PCC). The CC and PCC aspire to join the EU as and when their political and economic development meets the EU membership criteria.

This report is a synthesis of the 20 background country reports. It emphasizes comparison of national strategies with regard to RE, structures and a summary of main conclusions. Yet, the issue of RE in many of these countries only recently has become a political issue. Rising energy prices for fossil fuels, the unreliable supply of energy imports during the last two winters[4] and – concerning the 12 NMS – the agreement by the EU member states for developing National Renewable Energy Action Plans (NREAP) by 30 June 2010 have stimulated the national discussion on RE. Due to historical and economic reasons but also natural conditions, the importance and focus on specific types on RE have been quite different among the countries in the region. When required this diversity is indicated in the report. Yet, further details of specific country situations shall be found in the background reports.

The structure of the synthesis report is as follows. Section 2 provides an overview of the present situation. In the Chapter 3, the major organic and inorganic sources of RE are discussed in more detail. In Chapter 4 the national policies and concepts promoting RE will be analysed. In Chapter 5 it will be assessed whether RE has an impact on the agricultural sector in particular and rural development in general. The analysis concludes in providing the major comparative conclusions, including some key policy recommendations.

2 OVERVIEW OF THE USE AND RELEVANCE OF RENEWABLE ENERGY

Since early mankind people have relied on RE for their living. People made use of wood and, later on, of wind and water. However, the interest in RE started more seriously when the limits of fossil and nuclear energy became evident. In our analysis we follow the definition of EUROSTAT which defines RE as follows: Renewable energies (RE) cover hydropower, wind energy, solar energy, biomass and wastes and geothermal energy. RE is the sum of these specific forms of energies. Biomass and wastes cover organic, non-fossil material of biological origin, which may be used for heat production or electricity generation. They comprise wood and wood waste, biogas, municipal solid waste and biofuels. Liquid biofuels mainly cover bioethanol (ethanol produced from biomass) and biodiesel (diesel produced from biomass or used fried oil). Hydropower covers potential and kinetic

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1 These are Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, and Slovenia.

2 The CC are Croatia, Macedonia and Turkey.

3 The PCC are Albania, Bosnia-Herzegovina, Montenegro, Serbia, and Kosovo (although the official status of Kosovo is still open).

4 Think for instance the gas disputes between Russia and the Ukraine, which culminated on 1 January 2006 when Russia cut off gas supplies passing through Ukrainian territory. Another dispute arose in October 2007 over Ukrainian gas debts and culminated in the gas supplies reduction in March 2008. http://en.wikipedia.org/wiki/Russia%E2%80%93Ukraine_gas_disputes - cite_note-bbc240106-3

energy of water converted into electricity in hydroelectric plants.[5] In our analysis we will distinguish – whenever possible – between more "traditional" forms of RE, like firewood and large hydropower plants and more "modern" forms of RE, like the use of wood pellets and briquettes, biogas and biofuels, wind, solar and small (micro) hydropower plants. While some of these "modern" forms were studied some decades ago already, they became popular during the 1990s and particularly since the turn of the millennium.

The measurement of energy is still confusing. While the international community agreed already during the late 1960s that "Joule" should be the only accepted indicator for energy, quite a number of other energy measurement indicators are still in use, like e.g. TOE (tons of oil equivalents), kcal (kilo calorie) or KWh (kilo watt hour). Hence, it is no surprise that the 20 country reports were using different types of measuring units. EUROSTAT uses in their tables on national energy production and demand TOE. For better comparison we converted the measuring units given in the country reports into one uniform unit.

As it becomes evident in this synthesis report, there is a lack of available data with respect to RE. For better comparison we relied first on EUROSTAT data, which cover the NMS-12 as well as Croatia and Turkey. However, EUOSTAT data are not always totally consistent with the information provided by the country reports. As these data have been approved by the national authorities, they have been preferred to the ones in the country reports when applicable. In case there had not been any EUROSTAT data available we made use of the (often scarce) information given in the respective country reports.

In the synthesis report, the data on RE is differentiated along the NMS on the one side and the three CC and five PCC on the other. Annex 1 provides a summary table for each country showing the supply and share of RE in total energy demand.

2.1 Relevance of renewable energy in national energy supply

The use of RE in the various countries in total energy demand in 2007 is quite different (Table 1). Among the NMS there are Malta and Cyprus with a very small share on the one side, and Latvia with more of one third of total energy demand on the other. All the other countries rely on RE to some extent ranging from Bulgaria with a share of 4.9% and Estonia with a share of 12.4%. Hence the reliance on fossil fuels and nuclear energy is quite high. With respect to CC/PCC, the picture looks quite different. For three countries, namely Bosnia & Herzegovina, Montenegro and Albania the share of RE comes up to one fourth or, even, one third of total energy demand. With respect to the other five countries the share comes up to 7% and 10.7%. Hence, based on these comparative data a first conclusion can be drawn: RE has a certain share in total energy demand, but in most countries it is not yet very important. In addition, RE is more important in the CC/PCC than in the NMS.

[5] Eurostat: The Eurostat Concepts and Definitions Database http://circa.europa.eu/irc/dsis/coded/info/data/coded/en/Theme9.htm (accessed 3 August 2009).

Table 1: Share of renewable energy in total energy demand (%), 2007

	NMS	CC/PCC
Important: > 10%	LVA (37.7), EST (12.4), ROM (11.8)	BIH (32.5), MON* (25.0), ALB (24.2), KOS (10.7)
Somewhat: 5-10%	SVN (9.9), LTU (8.9), SVK (5.4), CZE (5.2), HUN (5.2), POL (5.1)	TUR (9.5), SER (8.3), MAC** (8.1), CRO (7.9),
Modest: < 5%	BUL (4.9), CYP (2.4), MLT (0.2)	

Source: EUROSTAT and Country Reports 2009.

Notes: * 2006; ** 2005.

Although the share of RE in the country cases is still relatively modest, it is important to see how the supply of RE has changed during the 2000-2007 period. This perspective changes the picture. First we will look at how the supply of RE changed absolutely (Table 2) and, then, how it changed relatively (Table 3). When looking at the absolute increase in energy from RE sources, all NMS with the exception of Slovenia have increased their supply. In Slovenia, the supply of RE even declined. In the majority of countries the supply of RE increased modestly. In Romania the supply of RE increased by 16.8% and in Cyprus by 47.7% over the period. A group of four countries raised their supply of RE by almost 100% or even more. However, with respect to Malta (+ 563.7%), it has to be kept in mind that this country is starting from a very low basis.

Table 2: Change in overall production of renewable energy (%), 2000-2007

	NMS	CC + PCC
Sharp increase: > 50%	MLT* (563.7), CZE (304.0), HUN (172.9), SVK (94.3)	
Increase: up to 50%	CYP (47.7), EST (45.5), POL (31.7), LVA (28.8), BUL (27.6), LTU (23.9), ROM (16.8)	BIH (39.9), MON** (32.6), KOS (2.1)
Stagnation		
Decline	SVN (-7.9)	SER*** (-3.7), TUR (-5.4), CRO (-16.2), MAC**** (-30.5), ALB (-37.7)

Source: EUROSTAT and Country Reports 2009.

Notes: * 2003-2007; ** 2000-2006; *** 2002-2007; **** 2000-2005.

When looking at the CC/PCC the picture is not that favourable anymore. Among more than half of them the supply of RE declined and with respect to Croatia, Macedonia and Albania very significantly. In Kosovo the supply of RE almost stagnated over this period, while in B&H and Montenegro the supply increased by about the same share as in most NMS.

However, changes in the absolute supply of RE will not necessarily lead to higher shares in total energy demand. Due to economic development the total energy demand in all NMS and CC/PCC increased as well although with different growth rates. Whether the change in absolute supply of RE translates into an increase in the share of RE in total energy demand during the period of 2000-2007 is shown in Table 3.

Table 3: Change of the share of renewable energy in total energy demand, 2000-2007

	NMS	CC + PCC
Strong increase: > 1.5%	CZE (3.73), HUN (3.14), SVK (2.56), EST (2.12)	BIH (4.62), MON* (4.14)
Slight increase: 0.5-1.5%	POL (0.93), ROM (0.89), BUL (0.71), CYP (0.54)	KOS** (0.55)
Stagnation. -0.5-0.5%	LVA (0.47), MLT* (0.18), LTU (-0.40)	
Decline: more than -0.5%	SVN (-2.38)	SER*** (-2.29); CRO (-3.55), MAC**** (-3.58), TUR (-3.63), ALB (-18.30)

Source: EUROSTAT and Country Reports 2009.

Notes: * 2000-2006; ** 2003-2007; *** 2002-2007; **** 2000-2005.
A change of 1% means a respective increase of the share in the total energy demand, e.g. from 10% (2000) to 11% (2007).

Concerning the changes in the share of RE in total energy demand, the situation among the NMS is quite diverse. On the one side, there is a group of countries which managed to come up with a quite strong increase, e.g. Czech Republic by 3.7 percentage points from 1.5% to 5.2% or Hungary by 3.1 percentage points from 2.1% to 5.2%. On the other side, there are two countries in which the share of RE actually declined; in Lithuania quite modestly by -0.4% percentage points from 9.3% to 8.9% while in Slovenia quite sharply by -2.4 percentage points (from 12.3% to 9.9%). In most NMS, the share of RE in total energy demand increased modestly, i.e. less than one percent point, from 0.2 in Malta to 0.9 in Poland. In this way, it can be concluded that almost all NMS show an increase of the share of RE in total energy demand which might reflect the fact that since they started the EU accession negotiations, RE had become a political issue.

Concerning the CC/PCC the situation is even more polarised. B&H and Montenegro show a very strong increase of more four percentage points, i.e. from 27.8% to 32.4% in B&H and from 20.8% to 24.9% in Montenegro. While Kosovo shows a slight increase in their share of RE, half of the countries show a very strong decline. Particularly, Albania shows a very steep decline of the share of RE in total energy demand: While it stood at 42.5% in 2000, it just makes up 24.2% in 2007. One of reasons – as will be discussed below – is the high dependence of most CC/PCC on hydropower whose supply fluctuates strongly due to changing annual rainfall patterns. In addition, among most CC/PCC the political discussion about "modern" types of RE has just started. Summarising, the findings show that among CC/PCC, contrary to NMS, no clear trend can be deduced.

2.2 Role of renewable energy in specific subsectors

After having discussed the role of RE in total energy demand, in general, now it will be looked at its relevance with respect to the three major forms of energy demand, i.e. electricity, heating and transport.

2.2.1 Production and share in national electricity supply

The use of RE for electricity has a long tradition. Where natural conditions are suitable, dams have been constructed and hydropower has been used. In these days, other sources of RE might be applied as well. The overall situation showing the share of RE in total electricity demand is summarised in Table 4.

Table 4: Share of renewable energy in total electricity demand (%), 2007

	NMS	CC/PCC
Important: > 10%	LVA (36.4), ROM (26.9), SVN (22.1),	MON* (77.3), BIH (63.6), ALB (52,2), SER* (39,7), CRO (25.0), MAC** (22.0), TUR (19.0)
Somewhat: 3-10%	BUL (7.6), SVK (5.2), HUN (5.1), CZE (4.7), LTU (4.6), POL (3.4)	
Modest: < 3%	EST (1.4), MLT (0.2), CYP (0.01)	KOS (0.9)

Source: EUROSTAT and Country Reports 2009.

Note: * 2006; ** 2005.

Again, among the NMS the picture is quite heterogeneous. While RE plays an important role in Latvia, Romania and Slovenia, it plays almost no role at all in Estonia, Malta and Cyprus. Concerning the other NMS the share of RE is rather modest. With respect to CC/PCC, RE plays a much more important role. In Montenegro, Bosnia and Herzegovina and Albania, RE provides more than half of the total electricity demand. Among Serbia, Croatia, Macedonia and Turkey its share is highly significant. The exception among CC/PCC is Kosovo, where RE is almost irrelevant up to now. How the share of RE in total electricity demand changed during the period 2000-2007 is shown in Table 5.

Table 5: Change of the share of renewable energy in total electricity demand, 2000-2007

	NMS	CC + PCC
Strong increase: > 1.5	ROM (6.1), HUN (3.9), SVK (3.6), POL (1.8), CZE* (1.8)	MAC*** (2.0)
Slight increase: 0.5-1.5	LTU (1.2), EST (0.9)	
Stagnation. -0.5-0.5	BUL (0.3), MLT** (0.2), CYP (0.0)	BIH (-0.4),
Decline: more than -0.5	SVN (-9.6), LVA (-11.3)	KOS**** (-1.3), SER (-1.4), TUR (-5.9), CRO (-16.8), ALB (-22.3)

Source: EUROSTAT and Country Reports 2009.

Note: * 2003-2007, ** 2000-2006, *** 2000-2005, **** 2005-2007; MON: No data.
A change of 1% means a respective increase of the share in the total electricity demand, e.g. from 10% (2000) to 11% (2007).

When looking at the changing shares of RE in total electricity demand among the 20 countries, the findings reflect the results from the changing shares of RE in total energy demand. Again most NMS show an increase of the share of RE while most CC/PCC show a decline. Romania recorded an increase by 6.1 percentage points. Slovenia and Latvia show a sharp decline over this period. The reason for both countries is similar as they observed a sharp increase in total electricity demand while the supply of RE stagnated (Latvia) or even declined a bit (Slovenia). In most of the CC/PCC there has been high fluctuations of the share of RE in total electricity demand during the last years. Nevertheless, a trend becomes obvious: While the demand in electricity is increasing, the supply of RE is steadily declining. In general, these countries are highly dependent on hydro energy in national electricity supply. The reason for the high fluctuations is the

annually changing water supply; the reason for the gradual decline is the fact that reinvestments and modernisation of the existing (large) hydropower plants are lacking. But it shows that most CC/PCC have a large potential in expanding the share of RE in electricity demand.

2.2.2 Production and share in national heating

The use of fire wood for heating and cooking is closely connected with economic development and traditions. Still in these days the use of (fire) wood is a very important source of heating in the countries of the region. When looking at the figures below, it has to be kept in mind that particularly rural households make use of firewood, which is normally not statistically recorded. Hence, it can be assumed that the share of RE in heating is larger than the figures given. Nevertheless, Table 6 provides an overview of the relevance of RE in heating among the 20 countries.

Table 6: Share of renewable energy in total heating demand (%), 2007

	NMS	CC/PCC
Important: > 15%	BUL(35.8), CYP (16,8), LTU (16.2)	BIH (68.5), SER** (22.5), MON*** (40.0), ALB**** (34.7), CRO (20.0)
Somewhat: 5-15%	LVA (14.5), EST (11.2), CZE (10.6), HUN (9.3), SVK (5.8), SVN (5.3)	MAC (10.2)
Modest: < 5%	POL (1.6), ROM (0.9), MLT* (0.2)	

Source: EUROSTAT and Country Reports 2009.

Notes: * 2006; ** estimate; *** 2005; **** 2003; TUR, KOS: No data.

Again, there is broad variation among the NMS. While the share of RE in heating is negligible in Poland, Romania and Malta, it comes up to more than one third in Bulgaria and to about one sixth in Cyprus and Lithuania. Among the remaining countries the share of RE in heating is of a certain relevance coming up to 5.3% in Slovenia up to 14.5% in Latvia. In all countries the by far largest source of RE is wood, wood waste and other forms of biomass of wood (cellulose). The other sources of RE play no or a minor role: The exceptions are Malta which completely relies on solar energy (however the overall share of RE is very small), Cyprus where solar energy contributes about 90% of the RE, and Hungary where geothermal energy contributes about 10% of RE. In Estonia, heating with peat is of some relevance although this source of energy is not grouped as RE due to its very high GHG emissions. All other sources of RE still play a minor role in supplying heat energy.

All CC/PCC rely on wood as the major source of RE in heating. However, in B&H and Montenegro hydropower is relatively important too, which contributes about 20% of RE in heating. The reason is that national electricity prices are rather low so that people heat by using electricity. The predominant source of RE for electricity in these countries is hydropower.

Table 7: Change of the share of renewable energy in total heating demand, 2000-2007

	NMS	CC + PCC
Strong increase: > 1.5	LTU (14,2), BUL (6.5), LVA (4.0), EST (3.6)	
Slight increase: 0.5-1.5	SVN (1.2), CZE (1.2), POL (1.0), ROM (0.9), HUN (0.6)	BIH (1.1)
Stagnation. -0.5-0.5	MLT** (0.2)	MAC**** (0.00)
Decline: more than -0.5	SVK*** (-11.1)	CRO***** (-1.0), ALB****** (-4.8)

Source: EUROSTAT and Country Reports 2009.

Note: * 2005-2006, ** 2001-2007, *** 2000-2006 **** 2000-2005, ***** 2004-2007, ****** 2000-2003; no data: CYP, TUR, SER, MON, KOS.
A change of 1% means a respective increase of the share in the total heating demand, e.g. from 10% (2000) to 11% (2007).

When looking how the share of RE in heating changed during the period 2000-2007, it becomes evident that most NMS increased the share of RE in heating (Table 7). Most NMS recorded a slight increase of up to 1.2 percentage points. Four countries managed to increase the share of RE significantly, i.e. more than 3.5 percentage points. Lithuania had been most successful in increasing its share from 2.0% (2000) to 16.2% (2007). This increase is particularly worth emphasising as overall demand in heat energy increased by about 30% during this period. No reason had been given. The only decline of the share of RE in heating had been observed in Slovakia. Here, the share of RE in heating declined from 16.9% (2001) to 5.8% (2007). Unfortunately, also in this case no reason had been given.

Due to lack of data no clear trend can be deduced for CC/PCC. The only conclusion which can be drawn is the fact that, while the share of RE among these countries is generally quite high, it did not change much during the last years. Only in Albania there had been a sharper decline from 39.5% (2000) to 34.7% (2003), where the major reason seems to be annual fluctuations of precipitation since not many data for the last few years are available.

2.2.3 Production and share in national transport

Most NMS started only recently with the introduction and promotion of biofuel. Most of them started in 2004/2005 with the production of biofuels. Joining the EU put this issue for most of them on the agenda. But as shown in Table 8, the share of RE in national transport is still quite low. In general, the emphasis is on biodiesel while bioethanol production and blending is lacking behind. Since most countries adopted a policy of mandatory blending in diesel and patrol, the share of biofuel will increase over the coming years.

Table 8: Share of renewable energy in total fuel demand (%), 2007

	NMS	CC/PCC
Important: > 2%	LTU (3.0), CZE (2.4)	–
Somewhat: 1-2%	CYP (1.8), MLT (1.1), SVN (1.0)	–
Modest: < 1%	HUN (0.9), POL (0.7), EST (0.2), LVA (0.1), SVK (0.1), BUL (0.1)	CRO (0.2), SER (0.2), TUR (0.2),
No biofuel	ROM	MAC, BIH, MON, KOS, ALB

Source: EUROSTAT and Country Reports 2009.

When looking at CC/PCC, most of them are just starting to discuss this issue politically. Three countries have a small share of biofuel, which is biodiesel. There is no bioethanol production. So far, there are no blending requirements among these countries. There is no mentioning that Macedonia is producing any biofuel, but it is reported that 56 petrol station in the country offer biodiesel.

3 OVERVIEW OF THE SOURCES OF RENEWABLE ENERGY

Above, it had been looked at the relevance of RE in total energy, electricity, heat and transport fuel demand and the sources of RE have been just touched briefly. In this chapter it will be analysed what sources of RE are predominant in the various countries. For a better comparison we distinguish between organic and inorganic sources of RE. In addition, we will distinguish again between "traditional" and "modern" sources as far as available data permit, as mentioned above. At a first glance it is remarkable that in most of the 20 countries under review just two sources of RE dominate and make up 90% and even more of total RE supply (Annex 2a and 2b): These two sources are (fire) wood on the one side and hydro-energy on the other. The only exceptions are Cyprus where solar energy is by far the most important source of RE, Malta, where solar energy and biofuel are the only two sources (although on a very low absolute level), Hungary where energy from municipal solid waste and geothermal energy are of some relevance and, finally, Turkey where geothermal and solar energy contribute significantly to total RE.

The findings of country reports reveal that the sources of RE are not equally relevant in all countries. As indicated above, wood and wood waste as well as hydroenergy are the most popular ones. In all NMS, with the exception of Malta, wood and wood waste are a source of RE (Annex 2a). With exception of Malta and Cyprus, all NMS rely at least to some extent on hydroenergy although its share in Estonia and Hungary is also quite modest. In 10 NMS biofuel production has been taken up (but not in Estonia and Cyprus, so far). In eight NMS (not in Malta, Cyprus, Bulgaria and Romania) biogas production has been started, but just in Czech Republic it is of some importance. Similarly, wind energy is produced in eight NMS (not in Slovenia, Malta, Cyprus and Romania), but this source is just contributing little to RE in the respective countries. In six NMS geothermal energy is processed as RE, but just in Hungary and Bulgaria it is of some relevance. Just four NMS make use of municipal solid waste, in general in form of biogas, which is of some importance in Hungary, Czech Republic and Slovakia. Similarly four NMS are making use of solar energy. As discussed above this source of RE is the major source in Cyprus and Malta, but of marginal importance in Czech Republic and Hungary.

Both CC and PCC are much more specialised in the sources of RE (Annex 2b). All of them rely on wood and wood waste as well as on hydroenergy. Solar energy is being produced in four of them, but just in Turkey this source of RE is of significance. Three countries make use of geothermal energy. Particularly Turkey and, to a smaller degree, Macedonia rely on it. Biofuel is produced by three countries, but in all of them the volume of production is still relatively small. Biogas and wind energy are just being produced by two countries of this group, only, i.e. Turkey and Croatia. So far, no country of this group has started to collect energy of municipal solid waste.

When looking at the spread of the various sources of RE which are used in the various NMS, only Hungary is relying on all major types of RE. Poland, Czech Republic and Slovakia are also well diversified; they rely on all sources except one, i.e. POL and SVK no solar energy and CZE no geothermal energy. On the other side, Malta and Cyprus seem to focus (or specialise) on just two different sources of RE. Whether this might

reflect a comparative cost advantage is open, since these two countries, like most NMS, want to make use of various sources of RE in the future. In comparison, CC/PCC are much more specialised in their sources of RE. The only exceptions are Turkey and Croatia. In general, these countries have just started to analyse their potential of the various forms of RE. Only in Serbia there had been some trials during the Balkan War, but given up later on. After having shown the importance of the various sources of RE, these sources will be discussed in more detail below.

3.1 Organic sources

Based on EUROSTAT statistics the organic sources of RE are made up by wood and wood waste, biogas, municipal solid waste (which is in general used as biogas) and biofuel. The last three groups are also characterised as "modern" types of RE. Within the group of wood and wood waste we will distinguish – whenever available data permits – between "traditional" types of RE, like fire wood and "modern" types, like pellets, briquettes and cellulose.

3.1.1 Wood and wood waste

As shown above (see also Annex 2), wood and wood waste are the most important sources of RE in almost all analysed countries, with the exception of Malta and Cyprus among the NMS and Montenegro, Serbia and Albania among the CC/PCC. As discussed above (Chapter 2.2.2) the use of wood and wood waste particularly in rural areas seems to be underreported or very difficult to register statistically. Hence, it is safe to assume that the use and the share of wood and wood waste in RE are much larger. When looking at NMS, a clear pattern becomes obvious (Table 9): With the exception of Slovenia, all of them expanded their use of wood energy during the last years. Half of the NMS even showed a higher increase in the use of wood energy than in total RE. Among these countries wood as a source of RE is becoming more and more popular. Particularly, the development of three Central European countries has to be stressed, i.e. Czech Republic, Hungary and Slovakia, as these countries showed a strong increase of the overall share of RE in total energy demand (Table 3). In Slovenia, the use of wood energy declined during the last years, but not that much as the overall supply of RE. Hence, its share of RE increased.

Table 9: Changes in the production of renewable energy from wood and wood waste in relation to Total RE Production, 2000-2007

	NMS	CC + PCC	Remark
Grown faster than total RE production	LVA, CZE, SVK, HUN, BUL, ROM	MON*	share increased
Grown, but not so fast as RE production	LTU, EST, POL, CYP	BIH, KOS**	share declined
Stagnation, while RE production declined		SER	share increased
Declined, but not so fast as RE production	SVN	CRO, ALB	share increased
Declined faster than total RE production	–	MAC***, TUR	share declined

Source: EUROSTAT and Country Reports 2009.

Note: * 2000-2006, ** 2003-2007, *** 2000-2005; MLT: No RE from wood and wood waste.

Again, the development among CC/PCC is more diversified than among NMS. In four countries the use of wood energy increased, but just in Montenegro the use of wood energy increased stronger than the total supply of RE. The path of this country is in line with the one of the Czech Republic. In Bosnia & Herzegovina and Kosovo growth in the use of wood energy had been recorded, but its growth had not been that strong like the one of other sources of RE, hence its share declined. In Serbia the use of wood energy stagnated during the last years, while overall RE production declined. Hence, its share increased. In Croatia and Albania the use of wood energy declined, but not so much than the one of other sources. In these two countries, the share of wood energy actually increased during the last years. In Macedonia and Turkey a strong decline of wood energy had been observed, which was faster than of other sources. So, the share of wood energy declined during the last years.

When looking in more detail about modern forms of wood energy production and use, the information available is rather scarce. The information given in the country reports is summarised in the following Table 10:

Table 10: Change in the production of wood pellets/briquettes in NMS and CC/PCC, 2000-2007 (tons)

	2000	2007
NMS		
Lithuania	270,000	547,000
Latvia	287,000*	461,000
Estonia		377,000**
Poland	20,000***	350,000
Czech Republic	20,900*	102,000
Slovakia		68,000
CC/PCC		
Croatia	≤2,000	41,000
Bosnia & Herzegovina	3,200*	22,000
Macedonia		just started
Serbia		just started

Source: Country Reports 2009.

Note: * 2005, ** 2006, *** 2003; HUN, SVN, CYP, TUR: no information; MLT, BUL, ROM, MON, KOS, ALB: No production

A few countries reported that there is no pellet or briquette production from wood and wood waste. The major reasons seem to be that either there is no wood available (e.g. Malta), or no investments in this source of RE had been performed due to high costs, so far (e.g. Bulgaria, Romania, Montenegro, Kosovo and Albania). In a number of country reports no information had been given, hence it is not known whether there is any pellet/briquette production at all. Just Macedonia and Serbia report that pellet production had been taken up recently, but no figures had been given. Only a few countries provided some figures. But they show that pellet and briquette production are rapidly increasing. Particularly, entrepreneurs in the Baltic States and some Central European countries are investing in this source of RE. However, when producing wood pellets/briquettes, it does not necessarily mean than these "modern" forms of RE are used in the respective countries. Particularly, the Baltic States as well as Croatia and Serbia report that almost the total production is exported. Bosnia & Herzegovina exports about one third of the national production. In this way, it can be concluded that "modern" forms of wood energy start playing a more prominent role in the analysed countries, but this source of RE is not predominantly used in the

country of production, but is seen as an attractive export product. Due to the limited data availability, it is impossible to estimate the share of this "modern" form of wood energy in total wood energy demand or, even, total energy demand of the respective countries.

3.1.2 Biogas

The set-up of biogas plants and the use of biogas energy is a very young development in both groups of countries. The exceptions are Poland, Slovenia and Romania among NMS where biogas production started already during the 1980s, although Romania's production completely collapsed during the 1990s. Among the CC/PCC Croatia, Macedonia and Serbia had first biogas plants running during the 1980s, but none of those had been operational anymore during the 1990s. Hence at the start of this millennium, just Poland, Czech Republic and Slovenia among the NMS and Turkey among the CC/PCC had some biogas energy production. Most other countries started with this type of RE during the last years. With the exception of Malta, Bulgaria and Romania all NMS have installed biogas plants by now. The reasons seem to be limited supply of raw material for biogas (e.g. Malta) or limited financial resources available for investments (e.g. Bulgaria and Romania). The picture is quite different in CC/PCC. Here just Croatia and Turkey have biogas plants running while all other countries did not invest in this source of RE, so far. However, the data about biogas plants is, again, rather scarce as shown in Table 11:

Table 11: Number of biogas plants, total and managed by farmers, 2007

	Biogas plants, Total	**Biogas plants, Managed by farmers**
NMS		
Lithuania	6	1
Latvia	3	0
Estonia	n.a.	0
Poland	n.a.	n.a.
Czech Republic	105	20
Slovakia	5	4
Hungary	40	5
Slovenia	9	9
Cyprus	1	1
CC/PCC		
Croatia	13	3
Turkey	n.a.	n.a.

Source: Country Reports 2009.

Note: n.a. = not available; other countries: No biogas production.

With the exception of the Czech Republic the number of biogas plants operational is quite small. This reflects the data summarised in Annex 2: Just in this country biogas energy is of some relevance as a source of RE with respect to total energy demand. In all other countries of the region which have taken up biogas energy production, this source of RE is of marginal importance, so far. However, particularly among those countries with a big land size and large agricultural areas the potential seems to be very big. When looking at the major sources of raw material for biogas energy, the agricultural sector just plays a supporting role for the time being. The major sources are

- municipal waste water (LTU, LVA, POL, CZE);
- organic waste from food industry (LTU, SVK, CYP, TUR);
- household wastes (LVA, POL).

Those biogas plants which are run by farmers are predominantly fed with liquid manure and/or maize silage. However, almost all reports stress the fact that the potential supply of manure and energy crops is much larger. In quite a number of countries there is idle land which could be used, e.g. for cultivating energy crops. The reasons for this rather low involvement of farmers seem to be two major ones:

- There is first the financial aspect: Investment costs in biogas plants are rather high and the production of this form of energy is not competitive with respect to fossil sources of energy. Hence, investments are only done if there is financial support available. But most NMS have just started to provide such support within their national Rural Development Programmes, 2007-2013.
- The other factor seems to be a social one: Only large farms (agricultural enterprises) have enough raw materials at their disposal to run a biogas plant efficiently (i.e. but only after having received financial support). However, in most countries of the region small-scale farming, or even subsistence farming, is predominant. Hence, most of the manure on-farm is needed as organic fertilizer and, even if available for biogas energy production, collecting the raw material from a large number of farms would be very costly. These costs might be cut if farmers were better organised. But, in general, these small-scale farmers are reluctant to form self-help groups or cooperatives.

In general, the energy produced by biogas plants is supplied as electricity. Just a small share of the produced energy is used for heating. As mentioned already, most countries have a potential in expanding the production of biogas. However, where biogas production is already ongoing, it is also emphasised that public resentment is growing due to bad smells.

3.1.3 Municipal solid waste

EUROSTAT statistics differ between energy production from biogas and municipal solid waste. As shown in Annex 2a, this type of RE is of some relevance in Hungary, Czech Republic and Slovakia, while of marginal importance in Poland. The country reports do not differ between these two types. As discussed above, municipal waste water and household wastes make up an important source of biogas energy in some countries. In addition, industrial wastes and former landfills are used as a source of RE. Unfortunately, no detailed information is available.

3.1.4 Biofuel

The production of biofuel, i.e. biodiesel and bioethanol, is a very recent development in all countries analysed. There is some production in the Czech Republic during the 1990s, but given up later on. In general, biofuel became an issue on the political agenda for NMS when joining the EU. With respect to CC/PCC the use of biofuel became an issue when prices for fossil fuel sky-rocked and the discussion started to reduce the production of Greenhouse Gases in line with the Kyoto Protocol. In the following chapter, we will distinguish between biodiesel and bioethanol.

With respect to **biodiesel**, most NMS have started biodiesel production between 2002 and 2004. Only Estonia reported any production at all, so far. However, it is importing some biodiesel. Among CC/PCC Croatia started in 2006 while Macedonia, Serbia and Bosnia & Herzegovina just took up production, recently. Turkey seems to import some biodiesel, while in Montenegro, Kosovo and Albania biodiesel does not play any role at all, so far. The information provided by the country reports, although very limited, is summarised in Table 12.

Table 12: Production and share of biodiesel, 2007

	No. of companies	Production (t)	Share in diesel	Remarks
NMS				
LTU	3	26,000	4.5	
LVA	6	9,000	0.2	exports
EST	–	–	0.2	all imported
POL	15	47,500	0.7	
CZE	17	61,000	2.4	
SVK	n.a.	46,000	0.1	mostly exports
HUN	2	7,000	1.2	
SVN	3	11,000	1.2	50% exported
MLT	2	1,000	2.2	
CYP	1	1,000	3.7	imports
BUL	20	9,000	0.1	
ROM	n.a.	36,000	–	
CC/PCC				
CRO	2	n.a.	0.2	imports
TUR	–	–	0.5	imports
SER	1	25,000	1.7	
B&H	1	n.a.	0.0	

Source: Country Reports 2009; production figures for NMS: European Biodiesel Board, in: *Agra Europe: Agra Facts. No. 56 (2009),* Bonn, p. 3.

Note: n.a. = not available.

In general, biodiesel is blended in diesel. The share is relatively small, but especially among NMS it is planned that it will increase over time due to mandatory blending. Among the CC/PCC the share of biodiesel is even smaller. In general, it is used by farmers. The major source of biodiesel production is rape seed. In addition, wastes of cooking oil (e.g. CZE, CYP, CRO, B&H) is used as raw material for this source of RE. In Macedonia imported soybean oil is used for biodiesel production where production has started in 2008.

The production and use of **bioethanol** is still at its infancy. Due to mandatory blending requirements within the EU it is becoming more important in NMS. Nevertheless in Malta, Cyprus and Romania is of no relevance up to now. Among the CC/PCC bioethanol is not an issue at all, so far. Based on the information available, the situation among NMS looks as follows (Table 13).

It is assumed that bioethanol production will go up in the next years due to mandatory blending requirements. Particularly, the Czech Republic recorded a big increase in national production going up from 300 t in 2007 to about 60,000 t in 2008. However, in all countries bioethanol demand (like the demand for biodiesel) depends on national blending requirements and tax incentives. Otherwise both types of biofuel are not competitive with fossil fuels.

Table 13: Production and share of bioethanol in NMS, 2007

	No. of companies	Production (t)	Share in petrol demand	Remarks
LTU	1	15,000	1.5	imports
LVA	1	14,200	0.1	exports
EST	–	–	0.3	all imported
POL	13	92,700	2.3	
CZE	3	300	0.1	50% imported
SVK	n.a.	n.a.	0.1	
HUN	2	n.a.	0.5	
SVN	–	–	0.2	all imported
BUL	1	n.a.	n.a.	

Source: Country Reports 2009.

Note: n.a. = not available.

3.2 Inorganic sources

Based on EUROSTAT statistics the inorganic sources of RE are made up by hydro-energy, wind energy, solar energy and geothermal energy. Again, the last three groups are also be characterised as "modern" types of RE. Within the group of hydro-energy we will distinguish – whenever available data permits – between "traditional" types of RE, like large and medium-sized hydro-power plants and "modern" types of RE, like micro hydro-power plants.

3.2.1 Hydro-energy

Next to wood and wood waste hydropower is the most important source of RE in most countries of the region. Among NMS it is of significant importance (i.e. its share is higher than 10% of total RE production) in Slovakia, Slovenia, Romania, Bulgaria and Latvia. In Malta and Cyprus there is no hydropower at all, while in Estonia and Hungary it is of marginal relevance (Annex 2a). With respect to CC/PCC hydropower is a very important source of RE in all countries, with the exception of Kosovo where it just makes up a small share of total RE production. In some countries, like Croatia, Montenegro and Albania it is the most important source of RE. When looking at the development of hydropower production during the last years (Table 14), the trend among both groups of countries is quite similar, i.e. among most of them an increase in hydro-energy production can be observed. However, when looking at this development, it has to be kept in mind that hydropower is highly dependent on annual rainfall patterns and power production therefore fluctuates on a year-by-year basis.

Most NMS showed an increase of hydropower production, but Estonia, Hungary and, to some extent, Lithuania and Poland started from a quite low level. Two big hydropower producing countries, i.e. Slovakia and Slovenia recorded a decline in absolute production. Among CC/PCC most countries recorded an increase in hydropower production. The exceptions are Croatia and Albania, which showed a sharp decline. The reasons seems to be that in 2007 the water supply in the dams had been rather low in these countries, but also that outdated technologies are still used which urgently need re-investments.

Table 14: Changes in the production of renewable energy from hydropower in relation to Total RE Production, 2000-2007

	NMS	CC + PCC	Remark
Grown faster than total RE production	LTU, EST,	BIH, KOS*	share increased
Grown, but not so fast as RE production	POL, CZE, HUN, BUL, ROM	MON**	share declined
Grown, while total RE production declined		MAC***, TUR,	share increased
Declined, but total RE production grown	LVA, SVK,		share declined
Declined faster than total RE production	SVN	CRO, SER, ALB	share declined

Source: EUROSTAT and Country Reports 2009.

Note: * 2003-2007; ** 2000-2006; *** 2000-2005; MLT, CYP: No RE from hydropower.

The traditional source of hydropower had been large dams. In many countries first dams had been built during the late 19th and early 20th centuries. In general, big hydropower plants (HPP) are predominant, but during the last years the number of small and micro-power plants increased rapidly. While large hydropower plants can be seen as the "traditional" mode of RE production, the small and micro-power plants will be seen as a "modern" form. Nevertheless, it is understood that some small HPP might have been built a long time ago. As it was out of scope for this report to check the age of the respective small HPP and the border line between small HPP and micro HPP was not always well-defined in all analysed countries, we understand in this analysis of "traditional" forms of HPP as large ones and "modern" forms as small and micro ones. The following Table 15 provides a rough overview.

With the exception of Estonia which records a very low level of hydropower production, the share of "modern" forms of HPP stands between two and about 25%. The general pattern looks like this: Those countries where hydro-energy is an important source of RE, the share of "modern" forms is relatively small. Among those countries where hydro-power is not very relevant, the share of "modern" forms is more significant. There is just one exception. In Slovenia, the share of "modern" forms comes up to about 10% of total hydropower production. The rapid installation of new micro-turbines during the last years seems to be the major reason.

All countries report that there is a big potential in expanding hydropower production. The exceptions are Malta and Cyprus where there is no hydropower at all and Estonia and Hungary where it plays a marginal role. In these countries the natural conditions are not so favourable for HPP. While most countries mention the potential in building new HPP, many also stress the need for re-investments in already existing HPP. In many Balkan countries, including Bulgaria and Romania buildings are depreciated and applied technology is, by far, outdated. But with respect to building new HPP many reports point out that the general public is not in favour of large dams anymore. Similarly, it is emphasised that environmental issues, including nature and landscape protection play a large role in these days. Hence, while the physical potential might be big, the scope for implementing schemes is rather limited. Micro-turbines and small HPP are an option which many countries in the region want to follow in the years to come.

Table 15: Number of large and small and micro hydropower plants and their share in total hydropower production, 2007

	Large hydropower plants	Small, micro hydropower plants	Share of small, micro HPP in total hydropower production (%)
NMS			
LTU	1	80	20
LVA	3	150	2.4
EST	–	n.a.	100
POL	n.a.	69	3
CZE	9*	1,300	25
HUN	4	36	25
SVN	18	424	10
BUL	14	121	n.a.
ROM	15	395	n.a.
CC/PCC			
CRO	17	13	1.1
MAC	7	23	8
TUR	9	50	2
SER	9**	10	0.2
B&H	14	30	2
MON	2	7	n.a.
KOS	1	2	25
ALB	11	37	1

Source: Country Reports 2009.

Note: * Plus 51 medium sized HPP; ** plus 6 medium sized HPP; n.a. = not available; MLT, CYP: no hydropower; SVK: No data.

3.2.2 Wind energy

The use of wind energy for electricity is a relatively young phenomenon in the region. First trials were reported in Latvia in 1996 and Estonia in 1997, respectively. In general, countries just started a few years ago. When looking at the present situation, almost all NMS have started in building up wind energy plants while just Croatia and Turkey from the CC/PCC have started with this type of RE production (Table 16):

Table 16: Significance of wind energy in NMS and CC/PCC, 2007

	Starting year	No. of wind parks	Energy supply (MW)
NMS			
LTU	2002	36	52.3
LVA	1996	15	25.2
EST	1997	1	4.8
POL	2001	160	~250.0
CZE	2004	30	113.8
HUN	2001	13	n.a.
SVN	(2008)	2	2.5
BUL	2001	26	40.7
ROM	2006	5	n.a.
CC/PCC			
CRO	2005	2	17.2
TUR	2000	10	146.4

Source: Country Reports 2009.

Note: n.a. = not available; MLT, CYP, MAC, SER, B&H, MON, KOS, ALB: No wind energy; SVK: No data.

When looking at the absolute figures of energy supply by this source of RE, Poland, Turkey and Czech Republic are the leading countries. All reports stated that there is a big potential in installing and/or expanding wind parks in the respective country. In general, it is anticipated that the supply of this form of RE will grow during the coming years. Just the reports on Slovakia, Slovenia and Bulgaria had been a bit restraint in the potential of this form of RE in their respective countries. While there is large potential in using this form of energy, most country reports also stated that there are strong limitations which have to be assessed first when investing in this source of RE. The major ones look as follows:

- instability of wind power;
- spoiling the natural landscape;
- noise emittance;
- affecting animals (birds) in their natural habitat;
- competing with environmentally protected areas.

In general, many reports highlight the strong local opposition against wind parks close to their living areas. Hence it is often difficult to find prospective areas for wind energy which do not affect the local population and are not touching natural reserve areas. In addition, there is a strong volatility in power supply by the wind plants due to irregular natural wind power. This requires large investments in the national power grids in absorbing this volatility. Most countries are starting to do these necessary investments. Hence, the maximum capacity of wind parks in most countries is still limited. Similarly, many prospective areas for wind energy are not connected at all with the national power grid. Again, this requires big investments in the years to come.

3.2.3 Solar energy

The production of solar energy is again a very recent development in NMS and CC/PCC. As discussed above, the installation of solar energy plants is not fairly well spread over the region. Just four countries of the NMS (i.e. Cyprus, Malta, Czech Republic and Hungary) and four of CC/PCC (i.e. Turkey, Croatia, Albania and Kosovo) produce solar energy of a certain quantity which is statistically recorded (Annex 2a and 2b). However,

the country reports reveal more countries are already starting in experimenting with this source of RE. While the information is rather sketchy it is summarised in the following Table 17:

Table 17: Significance of SOLAR ENERGY IN NMS and CC/PCC, 2007

	Starting year	Installations	Energy supply (MW)
NMS			
POL	2002	households	0.6
CZE	2004	households, public buildings	n.a.
HUN	2001	16 parks	44.5
SVN	2002	65 households	< 5.0
MLT	n.a.	4 parks, households, public buildings	381.0
CYP	1980s	no park, 90% of households, 50% of hotels	n.a.
BUL	n.a.	4 parks, 30,000 households	0.9
CC/PCC			
CRO	n.a.	4 parks	45.5
MAC	n.a.	n.a.	12.0
TUR	n.a.	11,500 installations (households, public buildings)	n.a.
SER	n.a.	28,000 installations in 1998, no actual information	n.a.
KOS	2003	2 parks	n.a.
ALB	2001	private households, 3 parks	n.a.

Source: Country Reports 2009.

Note: n.a. = not available; LTU, LVA, EST, POL, SVK, SVN, ROM, B&H: First trials with solar energy; MON: No solar energy.

The production of solar energy is steadily growing. In general, private households and public buildings are the leaders in installing this technology for getting hot water and for heating. Solar parks are installed in just a few countries; Hungary seems to be leading in this respect. Among the countries with a significant supply of solar energy, Cyprus and Turkey use it exclusively for heating. The use of photovoltaic solar energy, i.e. for electricity, is in most countries in the starting/trial phase. Only Malta reports a significant supply of electricity through this source.

Most countries plan to expand the use of this source of RE. Since this technology is relatively expensive, it is mostly started with public buildings. Similarly, private households mostly in urban areas are encouraged to install solar collectors. Due to lower number of sunshine hours per year the Northern countries have a certain disadvantage compared to those in the Southern part of Europe in using this technology. In general, it can be concluded that solar energy is just at its infancy and its broader prospects will be in the Southern countries.

3.2.4 Geothermal energy

Geothermal energy is a just a marginal source of RE in the region, so the information about this RE is very small. Just six NMS record a supply by this source, but it is of significance only in Hungary and Bulgaria (Annex 2a). However, in Hungary there had been no additional investments in this source of RE during the last years, anymore, so its

share is gradually declining. Among CC/PCC it is recorded in three countries (Annex 2b). Particularly Turkey relies on this source of RE, to a small extent also Macedonia. In general, geothermal energy is used for heating. The reports on Turkey, Macedonia and Serbia emphasise that much of this form of RE is used for heating green houses. Only from Serbia it is reported that it want to expand its reliance from this source of RE. Therefore, it can be concluded that, overall, this source of RE is of marginal relevance now and will be so in the future.

4 NATIONAL POLICIES AND CONCEPTS PROMOTING RENEWABLE ENERGY

The rapid repercussions of climate change and limits of traditional energy sources have become more and more evident since the 1990s. Within the United Nations Framework Convention of Climate Change (UNFCCC) most countries of the world committed themselves to reduce greenhouse gas emissions which was particularly specified in signing the Kyoto Protocol. All countries under analysis support the objectives of the Kyoto Protocol. In addition, all NMS and CC/PP have joined two additional international bodies which aim at increasing energy efficiency and promoting environmental friendly sources of energy, i.e. the Energy Charta Treaty (ECT) on the one side and the International Renewable Energy Agency (IRENA) on the other. The ECT, established in the early 1990s, is a multilateral framework with the objective to develop, promote and increase energy performance standards of all types of energy demanding devices. IRENA, established in 2009, aims at promoting a rapid transition towards a widespread and sustainable use of renewable energy worldwide. Almost all NMS, CC and PCC have joined ECT and IRENA (see Table A3 in the Annex)[6].

In this chapter, it will be looked at the national policies and concepts with respect to the promotion of RE. As most sources of RE, particularly the "modern" ones, are not competitive with other forms of energy for the time being, they were and still are supported by financial incentives which have to be decided politically at national and EU levels.

4.1 National policies

The discussion about RE has a long tradition within the EU. Hence, all NMS were confronted with this issue when they started negotiations about accession. Since having joined the EU, all of them have adopted the policy targets of RE in line with the EU directives. All NMS have legally committed themselves to achieve certain mandatory targets of RE shares with respect to (a) total energy demand, (b) electricity demand, and (c) in national transport. These targets have to be met by 2010 and 2020, respectively. Depending on the natural and economic conditions these targets might differ from country to country. Concerning CC/PCC most of them have committed themselves to adopt a mandatory target with respect to the share of RE in total energy demand. Only, Turkey, Serbia and Albania have not defined any targets, so far. Croatia is the only country among CC/PCC which has adopted also mandatory targets for electricity demand and national transport. The need to harmonise national energy policies with EU requirements, but also EU financial support to achieve them had been important reasons for many countries to adopt the mandatory targets, like Latvia, Estonia, Hungary, Cyprus, Bulgaria and Romania among NMS and Macedonia, Serbia, Bosnia & Herzegovina and Montenegro among CC/PCC. In addition, almost all countries of the region have adopted the Kyoto Protocol which commits them to reduce Green House Gas (GHG) emissions during the next years.

[6] For more information: UNFCCC: http://unfccc.int, ETC: www.encharter.org, IRENA: www.irena.org.

Hence, almost all of the countries are politically committed to follow these two interrelated objectives.

In a nutshell, the objectives of the countries in the region can be summarised as follows:

- promote energy security (reduce dependency from energy imports);
- reduce GHG-emissions, and
- increase the share of RE in energy demand.

These objectives have been endorsed, in general, although in many countries an increase in energy efficiency seems to be even more important at this stage. This issue is particularly of relevance among NMS in Lithuania, Slovakia, Malta, Bulgaria and Romania. Among most of the CC/PCC this point has been mentioned as a very important one. Within NMS public debate has started during the last years, but in general it is a debate between insiders and experts. The awareness among the general public is, in general, weak. So there was only in some countries a debate whether an increase of RE might negatively affect national food security, e.g. in the Czech Republic. Only Macedonia and Kosovo decided not to focus on bioenergy, but on other forms of RE in order to ensure national food security.

In each country up to 10 national experts on RE were asked about their opinion with respect to national RE policies. In particular, it had been assessed about guiding principles of RE policies and the major policy strategies. The opinions of the experts were summarised by the national author(s) into a six-step scale, ranging from 0 (= not relevant at all) to 5 (= highly relevant). Since these statements are not based on structured guidelines and the experts could be selected by will, their statements just provide a glance and should be seen like that. These statements are summarised in Table 18 for the NMS and Table 19 for CC/PC, respectively.

Table 18: Relevance of selected political issues by national experts from NMS

	Relevant (4-5)	**Somewhat relevant (2-3)**	**Not relevant (0-1)**
Guiding principles			
National independence from imports	BUL (5), LVA (5), SVN (5), SVK (5), LTU (4), HUN (4), MLT (4), EST (4)	CZE (3), POL (3), ROM (2), CYP (2)	
Need for substituting fossil fuels	LTU (5), EST (5), ROM (5), CZE (5), SVK (5), MLT (4), BUL (4),	HUN (3), SVN (3)	CYP (1), LVA (1), POL (1)
Strategies			
Development of national RE concept	EST (5), CZE (5), HUN (5), SVN (4), MLT (4), CYP (4)	LTU (3), POL (3), SVK (3), BUL (3), ROM (3)	LVA (1)
Focus on organic RE	LVA (5), EST (4), POL (4), HUN (4)	LTU (3), CZE (3), SVK (3), SVN (3), ROM (3), MLT (2), CYP (2)	
Focus on inorganic RE	CYP (5), LTU (4), MLT (4), ROM (4)	EST (3), CZE (3), SVK (3), HUN (3), SVN (3), BUL (3), LVA (2), POL (2)	
Financial support in promoting RE	LTU (5), LVA (5), EST (5), CZE (5), CYP (5), ROM (5), HUN (4), SVN (4), BUL (4)	MLT (3), POL (2), SVK (2)	
Stimulating private sector	LTU (4), POL (4), HUN (4), SVN (4), CYP (4)	LVA (3), EST (3), CZE (3), MLT (2), BUL (3), SVK (2)	ROM (1)

Source: Country Reports 2009.

The experts stress the fact that national policies promoting RE are primarily motivated by the objectives of achieving national independence from foreign fossil fuel supplies and of reducing their dependence on fossil fuels in general. However, the objective of substituting traditional fossil fuels was not that strong among all countries. Particularly experts from Poland, Latvia and Cyprus did not endorse that need. With the exception of Latvian experts, all saw the need for a more focused national concept promoting RE. Most experts supported the need to promote organic and inorganic sources of RE in their respective countries. Just Cyprus and Malta focused strongly on the inorganic sources, while Latvia and Hungary saw more potential in promoting organic sources. Almost all experts emphasized the need for financial support in promoting RE because of the limited competitiveness of RE with fossil fuels. Although the private sector is actively investing in RE production plants, the experts did not see a strong role by it. This might reflect the fact that the private sector is only investing if state support is provided.

Concerning the CC/PCC experts' opinions show a slightly different focus as shown in Table 19 below.

Table 19: Relevance of selected political issues by national experts from CC/PCC

	Relevant (4-5)	**Somewhat relevant (2-3)**	**Not relevant (0-1)**
Guiding principles			
National independence from imports	CRO (4), SER (4)	BIH (3), ALB (3), MAC (2), TUR (2)	
Need for substituting fossil fuels	SER (5), CRO (4),	TUR (3), ALB (3), MAC (2), BIH (2)	
Strategies			
Development of national RE concept	CRO (5), MAC (5), SER (5), ALB (5), TUR (4), BIH (4)		
Focus on organic RE	TUR (4)	CRO (3)	MAC (1), ALB (1), SER (0), BIH (0)
Focus on inorganic RE	MAC (5), TUR (5), SER (4), BIH (4), CRO (4), ALB (4)		
Financial support in promoting RE	SER (5), BIH(5), CRO (4), MAC (4)	TUR (3)	ALB (0)
Stimulating private sector	CRO (5), BIH (4)	MAC (3), TUR (3), SER (3), ALB (2)	

Source: Country Reports 2009.

Note: MON, KOS: No data.

With respect to the guiding political principles only Croatia and Serbia among CC/PCC seem to be motivated by the objectives of achieving a higher energy independence and the need of substituting traditional fossil fuels. All experts are of the opinion that a national concept for the promotion of RE is of high relevance, but in general it is missing. The focus seems to be very strongly on inorganic sources of RE. Just the Turkish experts also saw good prospects in promoting organic sources of RE. Again, like their colleagues from NMS, the strong need for financial support in promoting RE production had been stressed. The role of the private sector had only been stressed by the Croatian and Bosnian experts.

4.2 National concepts and programmes

All NMS have developed strategies and programmes to encourage the national production of RE since under economic terms most sources of RE are not competitive. In general, these programmes focus on investment grants, tax abatements, obligatory blending requirements and mandatory purchase prices of electricity produced by RE. In specific, these programmes look as follows:

- Investment grants for building production facilities for RE: In general, there is a maximum capacity which will be supported, e.g. 10 MW in Lithuania and 5 MW in Slovenia. Similarly, countries might focus on special sources of RE. The countries providing these grants mentioned in the reports are: LTU, LVA, POL, CZE, SVK, HUN, SVN, MLT, CYP and CRO.
- Subsidies in building connecting links from newly RE production plants to the national power grid: LTU, POL;
- Minimum blending requirements for biofuel; started gradually, but now it is adopted by all NMS and Croatia.
- Tax reductions for biofuel: LTU, LVA, CZE, HUN, SVN, MLT, CYP, BUL.
- Mandatory purchase prices (i.e. above market prices) for electricity produced by RE plants. In general, these higher prices are guaranteed for about 12 to 15 years: all NMS with the exception of POL, and CRO.
- Financial support for farmers cultivating energy crops, as promoted within the EU up to 2009: LTU: rape seed, 45 EUR/ha; POL: willow, no figures; CZE: energy crops in general, no figures; EST: natural grass for energy purposes, no figures; SVN: energy crops, 32 EUR/ha and CRO: rape seed, 35 EUR/ha.
- Reimbursement of investment costs for establishing forest plantations: LTU: 40% of investments; CZE: no figures.

This overview shows that while all NMS and Croatia follow the same broad directives they all focus differently. It was beyond the scope of this study to come up with facts and figures with respect to the financial volumes of the various programmes. Most of the funds for these programmes either come up from special energy programmes, but also from the Rural Development Programme 2007-2013 as will be discussed below (Chapter 5.2). The comparative analysis also shows that the discussion about RE in CC/PCC has just started only. In general, with the exception of Croatia in none of these countries, a national strategy has been developed, so far. Hence, there are in general no financial support programmes for expanding the production of RE. Yet, all of them are politically committed to harmonise national legislation with EU directives in the years to come.

Although the political discussion about RE is running for some time in NMS and support programmes have been put into place, the implementation is no smooth sailing. In general, funds are always short but two more points have been brought forward which have to be tackled by the respective countries.

- While the individual countries have implemented policies and programmes promoting RE, it has been complained that very often countries lack a concise strategy. Rules and regulations often change which does not encourage interested investors to make long term commitments. This issue has been especially mentioned for LTU, LVA, CZE, HUN, SVN, MLT and BUL for the NMS as well as for all CC/PCC.
- Closely related to the point mentioned above comes the fact that various ministries at different administrative levels are involved in implementing RE policies. Seldom, they collaborate efficiently with each other. Hence, potential investors have to

deal with many administrative barriers. This point was mentioned for LTU, SVN and BUL among NMS and CRO, MAC, TUR, SER and B&H among CC/PCC.

In this way it can be concluded that while programmes have been implemented they in general are not running efficiently. In addition, all CC/PCC with the exception of Croatia are just beginning to design a strategy promoting RE as reflected by the statements.

5 IMPACT OF THE PROMOTION OF RENEWABLE ENERGY

So far, the discussion focused on the relevance of RE in national energy demand, the major types of RE in the respective countries and the national policies which, in general, aim at promoting RE. In this chapter, it will be looked at the repercussions and impact of RE. We will focus on two dimensions: First it is looked at the agricultural and forestry sectors in particular and, second, at the development of rural areas in general.

5.1 Impact on the agricultural and forestry sectors

While the production of RE is growing, it became evident from the discussion above (Chapter 3.1) that bio-energy production in form of biogas and biofuels based on annual crops is just starting. In general, all reports emphasise the employment and income potential if biomass production could be enlarged. However, concerning the cropping patterns in the region, not many changes have been reported up to now. It is difficult to assess statistically the size of area cultivated by energy crops as, in general, they are mostly adopted for human consumption as well. Four reports provide national figures about the percentage share of area under energy crops; i.e. Lithuania, Latvia and Czech Republic about 5% and Slovakia about 3.3%. In six countries no energy crops are grown at all yet; besides Malta and Cyprus these are MAC, MON, KOS and ALB where RE production based on biomass plays a marginal role only. However, in many countries the area under rape seed cultivation has expanded rapidly during the last years (Table 20). While rape seed is also used in human consumption, we understand this rapid expansion also as an (indirect) indicator for the growing importance of RE among farmers.

Table 20: Change of rape seed area under cultivation, 2000-2007 (ha)

	2000	2007
NMS		
Lithuania	0	124,800
Latvia	6,900	99,200
Estonia	28,800	73,600
Poland	437,000	797,000
Czech Republic	325,000	338,000
Slovakia	n.a.	153,831
Hungary	121,838	223,579
Slovenia	122	5,358
Bulgaria	9,500	54,000
Romania	68,000	87,700*
CC/PCC		
Croatia	10,000	13,000
Turkey	82	10,700
Serbia	6,300	12,900
Bosnia & Herzegovina	0	1,578

Source: Country Reports, 2009.

Note: n.a. = not available; * 2005; MLT, CYP, MAC, MON, KOS, ALB: No energy crops.

While other crops are also used for bio-energy production, e.g. cereals including maize and sun flower the area under cultivation with respect to these crops did not change much during the last years. Hence, with respect to these crops the impact of RE is negligible. The expansion in the cultivation of rape seed is seen by most farmers as a new source of farm income. Among NMS rape seed production also seemed to have been encouraged by the subsidies for energy crops under the EU. Among CC/PCC the increase of rape seed cultivation is not that impressive as in NMS. If there is limited national demand, rape seeds are in general exported to neighbouring countries, e.g. by Estonia. But the increase of the share of rape seeds in the crop rotation brings also a couple of repercussions to the farmers which have partly contradictory effects:

- Improvement of crop rotation leading to an increase of the yields of cereals (LVA, SVN).
- Reduction of fertilizer applications (LVA) while others claim an increase in fertilizer and pesticides needs (SVN).
- Decrease by fixed machine costs due to better utilisation (LVA). However, rape seed cultivation requires special technical know-how and special machines, hence specific additional investments.
- Reduction of soil erosion during winter season (SVN).

While an expansion of the area under rape seed is envisaged and a pre-conditions to meet the RE targets due to higher production volumes of biogas and biofuel, almost all reports emphasise a severe social repercussion: While in almost all countries of the region small scale farming predominates, rape seed production is, in general, taken up by larger farms (agricultural holdings) only (e.g. LVA, POL, HUN, SVN, BUL, CRO). But also the reports on B&H and KOS where no energy crops are grown for the time being, stress the fact that energy crop production might be a potential source of income for large farmers only. A certain minimum size for cultivating these crops (in terms of area and economic size) seems to be necessary. As small scale farmers in the region are reluctant to organise themselves in order to increase economies of scale and their bargaining power, they are also not acceptable as input providers for (potential) biogas and biofuel producers. The country reports just mention two cases where it is tried to overcome this disadvantage: (1) In Latvia there is a cooperative established in 2000 which is promoting rape seed production. It is also investing in the value-added chain up to a biodiesel production plant which becomes operational in 2009. (2) In Croatia, recently a rape seed producer association has been established. However, in both cases no more information has been provided.

In this way, it can be concluded that the cultivation of energy crops in general and of rape seed in particular does not, in general, provide any employment and income potential for most (small scale) farmers in the region. This is also reflected by the observation that, if farmers, engage in bio-energy production, these are the bigger ones. So it is reported from Cyprus that five of the biggest farms have invested jointly in a biogas plant to make use of their pig and chicken manure.

With respect to forestry the available information is very scarce. While most countries report that the area under forestry is gradual increasing, the volume of wood cuttings and pellet/briquette production is also increasing (as shown in Table 10 above), not much is known whether that has any impact on the farming population. In the following Table 21 some information is summarised. We assume that in those countries where private ownership of forests is predominant, people make particularly use of wood and wood waste for heating and cooking purposes. Some countries, i.e. all three Baltic States, Czech Republic, Hungary and Croatia report an increase in the size of fast growing energy trees during the last years. On the other side, Turkey reports a stagnation of the area under energy trees

during the last years. No reasons were given. There had been no information whether the expansion of the use of wood and wood waste will bring any additional employment and income effect for the agricultural population.

Table 21: National area under forests and private ownership, 2007

	National area under forestry (%)	Remarks
NMS		
Lithuania	31.2	228,600 owners of forest land (not only farmers)
Latvia	50.4	30% owned by farmers
Estonia	47.9	39% owned privately
Poland	28.1	
Slovenia	~ 60.0	75% owned privately (314,000 owners); 90% of farmers (67,000) own forest land
Romania	28.3	
CC/PCC		
Croatia	47.0	22% owned privately
Serbia	25.6	33% owned privately
Bosnia & Herzegovina	53.4	
Kosovo	42.0	
Albania	38.2	2% owned privately, 33% owned by communes

Source: Country Reports 2009

Note: All other countries: No information

Although the data available is quite limited, it can be concluded that the expansion of bio-energy production had a very modest impact on the agricultural and forestry sectors. The only measurable change is the expansion of the cultivated area under rape seed. The area under other (potential) energy crops did not change much during the last years. Similarly, in many countries the area under fast growing trees has been expanded but from a very low level and figures had not been available.

Box 1: Main barriers facing farmers in investing in RE

The findings of the country reports show that investments in RE are not very popular among farmers in the region. The major reasons look as follows:

- fragmented farm structures, i.e. small farms sizes and small plots leading to limited land available for energy crops, limited supply of other types of biomaterial (e.g. dung and manure) for bioenergy and no own (spare) funds for any investments in any type of RE production
- high level of fragmentation of forestry property
- high initial investments costs; most farmers and forestry owners lack these funds
- lack of markets for bio energy crops and other bio material
- almost no credit facilities available in support of RE production
- lack of knowledge about any support measures promoting RE production
- if knowledge available, in general, cumbersome and lengthy application process for getting permission and, if available, for any (financial) support
- lack of know-how on technologies in RE production
- lack of advisory services promoting RE
- due to socialist experience, farmers and small scale forestry owners very reluctant to organise themselves for overcoming these barriers jointly

Source: Country Reports 2009.

Since there are not many statistical data available, again selected national experts had been asked whether the promotion and expansion of RE production will become a relevant source of employment and income for the agricultural and forestry sectors in their respective countries. As above their answer were summarised in the national reports on a scale between 0 = not at all up to 5 = very high. The national findings are summarised in Table 22. Since these experts were not selected on a random scale, their answers are not representative in a statistical sense, but provide a first glance.

Table 22: Assessment of the impact of re on employment and income in the agricultural and forestry sectors by national experts

		High (4-5)	Somewhat (2-3)	None (0-1)
Employment	NMS		EST (3), HUN (3), SVN (3), POL (2), CZE (2)	LVA (1), MLT (1), CYP (1), BUL (1), ROM (1)
	CC/PCC	TUR (4)	SER (3), BIH (3)	CRO (0), ALB (0)
Income	NMS	LVA (4)	EST (3), CZE (3), SVN (3), ROM (3), CYP (2)	POL (1), HUN (1), MLT (1), BUL (1)
	CC/PCC	BIH (5), TUR (4); SER (4)		ALB (1), CRO (0)

Source: Country Reports 2009.

Note: LIT, SVK, MAC, MON, KOS: No data.

In general, the experts only anticipated a modest employment if no effect at all, if RE production will be expanded in their respective countries. Concerning RE as a potential source of income the experts, in general, are a bit more optimistic, particularly in Latvia, Serbia, Bosnia & Herzegovina and Turkey but these effects seem to be small and mostly concentrated on larger farms and forestry owners.

Box 2: Opinion of farming communities about the options of re as a future source of income

While investment of (mostly small-scale) farmers and forestry owners in RE is marginal up to now, there are options that they might increase over time. However, the following pre-conditions have to be met:

- when looking at EU-15, many farmers see RE as an additional source of employment and income
- due to lack of competitiveness, state support is needed to achieve attractive prices for bioenergy crops and RE (e.g. grants, tax reductions, fixed purchase prices)
- final consumer prices have to be risen; in some countries of the region still extremely low and often electricity is not paid at all by large groups of consumers
- a clear-cut policy strategy is needed which should not be changed too often (long-term framework conditions and commitments)
- administrative hurdles have to be minimized

Source: Country Reports 2009.

5.2 Impact on rural development

Besides an impact on the agricultural and forestry sectors in particular, the promotion and expansion of RE production might have also an impact on the rural economy in general. Most of the newly RE plants are already or will be located in the rural areas, with the exception of municipal solid waste plants and solar collectors at household level which might have good prospects in mostly urban areas. The country reports mention that there might be employment and income effects in building and servicing RE plants in the rural areas.

Table 23: Assessment of the impact of re on rural development by national experts

		High (4-5)	Somewhat (2-3)	None (0-1)
Role of RE in rural development programmes	NMS	EST (5), CZE (4)	POL (3), HUN (3), SVN (3), BUL (3), ROM (2)	LVA (1), MLT (1), CYP (1)
	CC/PCC		CRO (3), TUR (3), SER (3), BIH (3)	ALB (1)
Employment (non-farm)	NMS	EST (5)	LVA (3), CZE (3), HUN (3), POL (2), SVN (2), MLT (2), CYP (2), BUL (2), ROM (2)	
	CC/PCC	TUR (4), BIH (4)	ALB (3), SER (2)	CRO (0)
Income (non-farm)	NMS	EST (5), ROM (4)	LVA (3), CYP (3), CZE (2), HUN (2), SVN (2), MLT (2), BUL (2)	
	CC/PCC	BIH (5), TUR (4), SER (4)	ALB (2)	CRO (0)

Source: Country Reports 2009.

Note: LIT, SVK, MAC, MON, KOS: No data.

While statistical data is very limited and it had been out of scope of this analysis to collect primary data, national experts had been asked how they assess the role of RE in rural development and whether they anticipate employment and income effect in the rural areas if or once RE production will be expanded in their respective countries. The national findings are summarised in Table 23.

According to experts' opinion, RE just plays a limited role in rural development programmes in their countries. Just in Estonia and Czech Republic experts stress the fact that RE is properly considered in the national programmes. On the other side, national experts in Latvia, Slovenia, Malta and Cyprus among NMS and in Albania make it very clear that RE just plays a marginal role in rural development programmes in their respective countries, so far. National experts see a limited employment and income potential within the rural areas. Particularly experts in Estonia, Turkey, Serbia, Bosnia & Herzegovina and, to some extent, in Romania are quite optimistic. On the other side, experts from Croatia are extremely pessimistic. However, national reports are short of providing any rationale for these opinions. If at all, it is referred to national programmes, including Rural Development Programmes 2007-2013 where some financial support for the establishment of RE plants is available. In this way, it can be concluded that some modest impact with respect to employment and income will be expected due to an expansion of RE production, but the impact is very vague. Just in Slovakia and Bosnia & Herzegovina a first estimation with respect to employment effects has been conducted. In

Slovakia, it is assumed if the RE-targets will be met by 2020, about 5,000-6,000 additional jobs will be created. In Bosnia & Herzegovina it is estimated if the country can use just half of its natural potential, about 5,000 new jobs will be created. But, in total, it is doubtful whether RE production will stop the rural-urban migration pattern observed all over the region.

Box 3: Role of rural development policy in the development of RE sector

Since RE is not competitive, the EU and national governments provide grants, tax reductions, rules for mandatory blending and fixed prices for RE as incentives in encouraging more investments in RE. Among the NMS, the Rural Development Programme 2007-2013 provides different measures which directly or indirectly promote the production of RE. Under Axis 1 the focus is on the needs of the agricultural holding itself while under Axis 3 the focus is on RE as a new source of income in diversifying rural economies. However, not all NMS have opened their national RD programmes in support of RE in the same manner. The major issues look as follows:

- high administrative hurdles and long delays in getting any grant approved
- public financial support in general too limited to have a significant impact
- in some countries: public support still too focused on farms and not on the general supply, e.g. many grants require farmers to use RE on-farm only which is not economic due to the small-scale and fragmented farm structure (sale to others is not allowed); farmers might reduce their energy costs, but cannot increase their income
- strong guiding role of governments in using RE sources in their own facilities is stressed: stronger awareness building among the population is needed
- in most CC/PCC: no link of RD programmes with the promotion of RE, so far

Source: Country Reports 2009.

In this analysis we did not focus specifically on the environmental impact of RE production. In general, RE was seen to have a positive impact. Just one country report challenged this positive view in highlightening the negative side of intensive biomass cultivation on the environment.

6 CONCLUSIONS AND POLICY RECOMMENDATIONS

The 20 country reports show that the promotion of RE has become a political top priority in all NMS and CC, while it is slowly creeping up the political agenda in PCC. The promotion of RE is closely linked to the implementation of the Kyoto Protocol. In addition, most countries emphasise the need of improving energy efficiency. In this final chapter we will briefly discuss the major conclusions and present some recommendations for future development.

6.1 Concluding observations

Within the EU all member states, including NMS, have adopted targets with respect to the shares of RE concerning total energy demand, electricity demand and national transport. Some CC/PCC did the same since during the last years they will be required to do the same in the accession process. These targets have to be met by 2010 and 2020, respectively. Since RE, at this stage of development, is economically not competitive with fossil fuels, EU and most national governments in the region are prepared to provide

financial incentives in promoting RE. Among NMS the share of RE in total energy demand stands between 5% and 12% and has grown during the last years although total energy demand has been growing as well. Among CC/PCC the share of RE is, in general, higher compared to NMS, but it has been declining during the last years.

By far the major sources of RE among all countries in the region with the exception of Malta and Cyprus are (large-scale) hydropower and (fire) wood. We grouped these two sources of RE under the label of "traditional" sources of RE. The use of wood as pellets or briquettes, biogas including the processing of municipal solid waste, biofuel, micro-hydropower schemes, wind and solar energy as well as the use of geothermal energy we grouped together as "modern" sources of RE. Among NMS these modern sources of RE have a share with respect to total RE supply from one to five percent. It stands at 100% in Malta (solar energy and biofuel) and 83% in Cyprus (solar energy), but both countries still show a very small share of RE in total energy demand. Its share comes up to 10% and more in the Czech Republic and Slovakia (biogas including municipal solid waste processing) as well as in Hungary (biogas including municipal solid waste processing and geothermal energy). Among CC/PCC its share stands between zero and two percent. Only Turkey shows a share of about 15% due to a large supply of geothermal energy and the steady expansion of solar energy.

The expansion of RE in general and its various forms depends on three major factors, i.e. the economic, natural and social ones.

- The economic potential, or financial resources, of the respective country is almost a precondition in promoting RE since none of the modern sources of RE are economically competitive. Without state subsidies, all these new sources of RE would be in pilot stage only and would play no role at all in meeting the total energy demand. Due to co-financing a large part of that burden is taken over by the EU, but nevertheless a certain share has to be financed by national budgets and/or consumers. So the expansion of RE is restricted by the available financial resources. Otherwise, interested entrepreneurs are frightened off by the high initial investment costs and the not cost-covering market prices.
- The natural conditions of the respective country favour one source of RE over another one. The Northern European countries have less potential in making use of solar power than countries in Southern Europe due to shorter sunshine hours per year. On the other side, countries in Northern and Central Europe are more favoured in producing biomass than countries in Southern Europe due to more favourable precipitation patterns. Those countries endowed with more mountains have a higher potential of making productive use of hydropower. In this way, we conclude that while a mix of various sources of RE might be desirable countries will ultimately specialise on those sources which are best adjusted to the national natural conditions.
- Finally, the majority of the country reports emphasise the social repercussions of RE expansion. Most countries of the region are dominated by small scale farming and small scale forestry ownership. In order to produce biomass for RE a certain minimum size seems to be a pre-requisite. Hence, most farmers and forestry owners cannot participate in this new type of farm and forestry activity. A way out might be a better organisation of interested small scale farmers in self-help groups or cooperatives, but most farmers of the region are still reluctant in joining these types of organisation. In this way, most country reports conclude that the employment and income effects of RE expansion among the agricultural and forestry sectors as well as in rural regions in general will be very modest.

In all countries of the region, RE will stay on as an important political objective for future development. Its rate of expansion depends on the resources available in the respective country and the EU. Hence, at this stage it will be open whether all countries will meet their respective RE targets by 2010 and 2020, respectively.

6.2 Policy recommendations

All country reports acknowledge the fact that RE is and will remain an important political issue for the years to come. In general, the need of expanding RE is accepted by the respective societies. While most country reports have listed a number of, sometimes very detailed, recommendations, we will discuss at this stage the most important ones.

- It is no surprise that the call for more financial resources has been listed in most country reports. More financial support is not only needed for meeting the RE targets in time, but also to improve the efficiency of existing hydro and thermo power plants, i.e. modernisation and re-investments.
- But almost all country reports emphasise the need to "make more" out of the available financial support. On the one side, there is a lack of a consistent and long-term oriented policy which gives strong guidelines to potential investors. On the other side, many reports complain about the high administrative barriers and "red tape" that potential investors face if they want to go into RE. Various ministries and administrative levels are involved when deciding on licences and financial support. This procedure should be streamlined and simplified for potential investors.
- In general, the debate about RE is restricted to experts and insiders and public participation is weak. In many reports it is demanded that the general public should be more involved and public knowledge about energy in general and RE in specific should be increased.
- In some reports it is missed a clear link between public support in expanding RE and the need to achieve competitiveness over time. In general, RE as such is already seen as a good development. What is missed is an exit strategy once RE pays for itself without public support anymore.
- As discussed above small scale farmers and forestry owners have just a limited option in participating in RE production. The majority of reports discussed this issue, but just one country report stated this aspect as a recommendation. Nevertheless based on the country reports we see the need that a higher share of farmers and forestry owners has to participate in RE production in the future. This can only be accomplished if these groups are better organised.
- There is a need in better and more reliable data about the use of the respective sources of RE. While at national level information is already sketchy, it is often missing at household and regional levels.

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ANNEX

Annex 1 **Relevance of renewable energy on total energy demand, 2000-2007: Country tables**

Annex 2 **Major types of renewable energy in New Member States as well as in the candidate countries and potential candidate countries, 2007**

Annex 3 **The membership of NMS and CC/PCC in the International Renewable Energy Agency (IRENA) and in the Energy Charter Treaty (ECT)**

ANNEX 1

Table A1: Lithuania

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**7070**	**8135**	**8639**	**8984**	**9146**	**8615**	**8431**	**9151**
Total energy production	3162	4080	4812	5105	4963	3683	3244	3521
Supply by RE	**656**	**658**	**706**	**708**	**745**	**776**	**813**	**813**
Biomass and wastes	627	630	666	677	706	734	776	766
Wood/wood waste	627	630	665	675	701	722	759	732
Biogas	0	0	1	2	2	2	2	2
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0	0	0	0	3	11	15	32
Wind energy	0	0	0	0	0	0	1	9
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	29	28	30	28	36	39	34	36
Geothermal energy	0	0	9	3	3	3	2	2
Share %	**9.28%**	**8.09%**	**8.17%**	**7.88%**	**8.15%**	**9.01%**	**9.64%**	**8.88%**
Biomass and wastes	8.87%	7.74%	7.71%	7.54%	7.72%	8.52%	9.20%	8.37%
Wood/wood waste	8.87%	7.74%	7.70%	7.51%	7.66%	8.38%	9.00%	8.00%
Biogas	0.00%	0.00%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0.00%	0.00%	0.00%	0.00%	0.03%	0.13%	0.18%	0.35%
Wind energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.10%
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	0.41%	0.34%	0.35%	0.31%	0.39%	0.45%	0.40%	0.39%
Geothermal energy	0.00%	0.00%	0.10%	0.03%	0.03%	0.03%	0.02%	0.02%

Source: EUROSTAT, Country Report Lithuania, 2009.

Table A2: Latvia

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**3746**	**4092**	**4021**	**4289**	**4406**	**4492**	**4625**	**4764**
Total energy production	1409	1523	1609	1730	1840	1856	1842	1797
Supply by RE	**1393**	**1506**	**1575**	**1728**	**1837**	**1854**	**1839**	**1794**
Biomass and wastes	1150	1263	1362	1529	1565	1564	1603	1555
Wood/wood waste	1150	1263	1361	526	1558	1554	1586	1532
Biogas	0	0	1	4	7	8	8	8
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0	0	0	0	0	2	9	16
Wind energy	0	0	1	4	4	4	4	5
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	242	244	212	195	267	286	232	235
Geothermal energy	–	–	–	–	–	–	–	–
Share %	**37.19%**	**36.80%**	**39.17%**	**40.29%**	**41.69%**	**41.27%**	**39.76%**	**37.66%**
Biomass and wastes	30.70%	30.87%	33.87%	35.65%	35.52%	34.82%	34.66%	32.64%
Wood/wood waste	30.70%	30.87%	33.85%	12.26%	35.36%	34.59%	34.29%	32.16%
Biogas	0.00%	0.00%	0.02%	0.09%	0.16%	0.18%	0.17%	0.17%
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.19%	0.34%
Wind energy	0.00%	0.00%	0.02%	0.09%	0.09%	0.09%	0.09%	0.10%
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	6.46%	5.96%	5.27%	4.55%	6.06%	6.37%	5.02%	4.93%
Geothermal energy	–	–	–	–	–	–	–	–

Source: EUROSTAT, Country Report Latvia 2009.

Table A3: Estonia

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**4999**	**5114**	**4970**	**5454**	**5655**	**5559**	**5420**	**6029**
Total energy production	3301	3307	3505	4060	3848	4010	3879	4423
Supply by RE	**512**	**552**	**568**	**667**	**681**	**692**	**645**	**745**
Biomass and wastes	512	551	567	665	678	686	637	735
Wood/wood waste	510	549	565	663	676	682	633	731
Biogas	2	2	2	3	2	4	4	4
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–
Wind energy	0	0	0	1	1	5	7	8
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	0	1	1	1	2	2	1	2
Geothermal energy	–	–	–	–	–	–	–	–
Share %	**10.24%**	**10.79%**	**11.43%**	**12.23%**	**12.04%**	**12.45%**	**11.90%**	**12.36%**
Biomass and wastes	10.24%	10.77%	11.41%	12.19%	11.99%	12.34%	11.75%	12.19%
Wood/wood waste	10.20%	10.74%	11.37%	12.16%	11.95%	12.27%	11.68%	12.12%
Biogas	0.04%	0.04%	0.04%	0.06%	0.04%	0.07%	0.07%	0.07%
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–
Wind energy	0.00%	0.00%	0.00%	0.02%	0.02%	0.09%	0.13%	0.13%
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	0.00%	0.02%	0.02%	0.02%	0.04%	0.04%	0.02%	0.03%
Geothermal energy	–	–	–	–	–	–	–	–

Source: EUROSTAT, Country Report Estonia 2009.

Table A4: Poland

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**90807**	**90821**	**89418**	**91774**	**92232**	**93556**	**98113**	**97982**
Total energy production	78443	79373	79056	78703	77951	77714	76845	71632
Supply by RE	**3809**	**4078**	**4141**	**4158**	**4325**	**4552**	**5055**	**5018**
Biomass and wastes	3625	3874	3933	3996	4126	4340	4844	4760
Wood/wood waste	3594	3831	3901	3921	4062	4166	4588	4550
Biogas	29	35	32	39	47	54	62	65
Municipal solid waste	2	1	0	1	1	16	39	44
Biofuels	0	7	0	36	17	108	154	101
Wind energy	0	1	5	11	12	12	22	45
Solar energy	0	0	0	0	0	0	0	0
Hydro energy	181	200	196	144	179	189	176	202
Geothermal energy	3	3	6	7	8	11	13	10
Share %	**4.19%**	**4.49%**	**4.63%**	**4.53%**	**4.69%**	**4.87%**	**5.15%**	**5.12%**
Biomass and wastes	3.99%	4.27%	4.40%	4.35%	4.47%	4.64%	4.94%	4.86%
Wood/wood waste	3.96%	4.22%	4.36%	4.27%	4.40%	4.45%	4.68%	4.64%
Biogas	0.03%	0.04%	0.04%	0.04%	0.05%	0.06%	0.06%	0.07%
Municipal solid waste	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.04%	0.04%
Biofuels	0.00%	0.01%	0.00%	0.04%	0.02%	0.12%	0.16%	0.10%
Wind energy	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.05%
Solar energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hydro energy	0.20%	0.22%	0.22%	0.16%	0.19%	0.20%	0.18%	0.21%
Geothermal energy	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%

Source: EUROSTAT, Country Report Poland 2009.

Table A5: Czech Republic

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**40533**	**41513**	**42020**	**45613**	**45883**	**45311**	**46373**	**46241**
Total energy production	29566	30198	30396	34073	32781	32434	33216	33348
Supply by RE	**595**	**687**	**851**	**1514**	**1919**	**2012**	**2200**	**2404**
Biomass and wastes	444	510	637	1394	1743	1803	1973	2210
Wood/wood waste	319	368	493	1253	1513	1537	1716	1948
Biogas	36	37	36	41	50	56	63	76
Municipal solid waste	88	105	108	100	106	97	95	96
Biofuels	0	0	0	0	73	112	99	90
Wind energy	0	0	0	0	1	2	4	11
Solar energy	0	0	0	0	2	2	3	4
Hydro energy	151	177	214	119	174	205	219	180
Geothermal energy	–	–	–	–	–	–	–	–
Share %	**1.47%**	**1.65%**	**2.03%**	**3.32%**	**4.18%**	**4.44%**	**4.74%**	**5.20%**
Biomass and wastes	1.10%	1.23%	1.52%	3.06%	3.80%	3.98%	4.25%	4.78%
Wood/wood waste	0.79%	0.89%	1.17%	2.75%	3.30%	3.39%	3.70%	4.21%
Biogas	0.09%	0.09%	0.09%	0.09%	0.11%	0.12%	0.14%	0.16%
Municipal solid waste	0.22%	0.25%	0.26%	0.22%	0.23%	0.21%	0.20%	0.21%
Biofuels	0.00%	0.00%	0.00%	0.00%	0.16%	0.25%	0.21%	0.19%
Wind energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Solar energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hydro energy	0.37%	0.43%	0.51%	0.26%	0.38%	0.45%	0.47%	0.39%
Geothermal energy	–	–	–	–	–	–	–	–

Source: EUROSTAT, Country Report Czech Republic 2009.

Table A6: Slovakia

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**17545**	**19261**	**19324**	**19233**	**19130**	**19054**	**18832**	**18074**
Total energy production	5971	6366	6485	6281	6151	6251	6302	5622
Supply by RE	**506**	**768**	**723**	**638**	**758**	**881**	**886**	**983**
Biomass and wastes	100	336	260	331	397	473	501	589
Wood/wood waste	100	267	251	300	350	398	409	484
Biogas	0	5	3	4	6	5	8	7
Municipal solid waste	0	25	4	26	29	35	42	38
Biofuels	0	39	3	2	12	36	42	59
Wind energy	0	0	0	0	1	1	1	1
Solar energy	0	0	0	0	0	0	0	0
Hydro energy	406	424	453	299	353	399	378	383
Geothermal energy	0	9	9	8	8	8	6	10
Share %	**2.88%**	**3.99%**	**3.74%**	**3.32%**	**3.96%**	**4.62%**	**4.70%**	**5.44%**
Biomass and wastes	0.57%	1.74%	1.35%	1.72%	2.08%	2.48%	2.66%	3.26%
Wood/wood waste	0.57%	1.39%	1.30%	1.56%	1.83%	2.09%	2.17%	2.68%
Biogas	0.00%	0.03%	0.02%	0.02%	0.03%	0.03%	0.04%	0.04%
Municipal solid waste	0.00%	0.13%	0.02%	0.14%	0.15%	0.18%	0.22%	0.21%
Biofuels	0.00%	0.20%	0.02%	0.01%	0.06%	0.19%	0.22%	0.33%
Wind energy	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%
Solar energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hydro energy	2.31%	2.20%	2.34%	1.55%	1.85%	2.09%	2.01%	2.12%
Geothermal energy	0.00%	0.05%	0.05%	0.04%	0.04%	0.04%	0.03%	0.06%

Source: EUROSTAT, Country Report Slovakia 2009.

Table A7: Hungary

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**25021**	**25495**	**25929**	**27054**	**26557**	**28041**	**27783**	**27020**
Total energy production	11215	10842	11132	10684	10166	10439	10353	10174
Supply by RE	**516**	**491**	**889**	**921**	**966**	**1225**	**1352**	**1404**
Biomass and wastes	415	387	784	818	860	1118	1245	1288
Wood/wood waste	356	323	734	777	821	1040	1128	1146
Biogas	0	2	2	5	6	7	12	17
Municipal solid waste	58	62	48	36	33	66	94	108
Biofuels	0	0	0	0	0	5	11	17
Wind energy	0	0	0	0	1	1	4	9
Solar energy	0	1	2	2	2	2	2	3
Hydro energy	15	16	17	15	18	17	16	18
Geothermal energy	86	86	86	86	86	87	86	86
Share %	**2.06%**	**1.93%**	**3.43%**	**3.40%**	**3.64%**	**4.37%**	**4.87%**	**5.20%**
Biomass and wastes	1.66%	1.52%	3.02%	3.02%	3.24%	3.99%	4.48%	4.77%
Wood/wood waste	1.42%	1.27%	2.83%	2.87%	3.09%	3.71%	4.06%	4.24%
Biogas	0.00%	0.01%	0.01%	0.02%	0.02%	0.02%	0.04%	0.06%
Municipal solid waste	0.23%	0.24%	0.19%	0.13%	0.12%	0.24%	0.34%	0.40%
Biofuels	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.04%	0.06%
Wind energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Solar energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hydro energy	0.06%	0.06%	0.07%	0.06%	0.07%	0.06%	0.06%	0.07%
Geothermal energy	0.34%	0.34%	0.33%	0.32%	0.32%	0.31%	0.31%	0.32%

Source: EUROSTAT, Country Report Hungary 2009.

Table A8: Slovenia

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**6425**	**6745**	**6842**	**6921**	**7129**	**7299**	**7340**	**7346**
Total energy production	3085	3146	3322	3245	3435	3479	3415	3437
Supply by RE	**788**	**776**	**715**	**714**	**822**	**774**	**771**	**726**
Biomass and wastes	458	450	431	460	470	476	462	445
Wood/wood waste	454	446	426	454	463	469	449	429
Biogas	4	4	5	6	7	7	8	12
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0	0	0	0	0	0	5	4
Wind energy	–	–	–	–	–	–	–	–
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	330	326	285	254	352	298	309	281
Geothermal energy	–	–	–	–	–	–	–	–
Share %	**12.26%**	**11.50%**	**10.45%**	**10.32%**	**11.53%**	**10.60%**	**10.50%**	**9.88%**
Biomass and wastes	7.13%	6.67%	6.30%	6.65%	6.59%	6.52%	6.29%	6.06%
Wood/wood waste	7.07%	6.61%	6.23%	6.56%	6.49%	6.43%	6.12%	5.84%
Biogas	0.06%	0.06%	0.07%	0.09%	0.10%	0.10%	0.11%	0.16%
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.05%
Wind energy	–	–	–	–	–	–	–	–
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	5.14%	4.83%	4.17%	3.67%	4.94%	4.08%	4.21%	3.83%
Geothermal energy	–	–	–	–	–	–	–	–

Source: EUROSTAT, Country Report Slovenia 2009.

Table A9: Malta

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**807**	**908**	**829**	**911**	**930**	**943**	**897**	**946**
Total energy production	–	–	–	–	–	–	–	–
Supply by RE	**–**	**–**	**–**	**0,0235**	**0,314**	**1,17**	**3,83**	**1,77**
Biomass and wastes	–	–	–	–	–	–	–	–
Wood/wood waste	–	–	–	–	–	–	–	–
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	0,0235	0,314	1,17	1,32	1,77
Wind energy	–	–	–	–	–	–	–	–
Solar energy	–	–	–	–	–	–	2,51	–
Hydro energy	–	–	–	–	–	–	–	–
Geothermal energy	–	–	–	–	–	–	–	–
Share %	**–**	**–**	**–**	**0.003%**	**0.03%**	**0.12%**	**0.43%**	**0.19%**
Biomass and wastes	–	–	–	–	–	–	–	–
Wood/wood waste	–	–	–	–	–	–	–	–
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	0.003%	0.03%	0.12%	0.15%	0.19%
Wind energy	–	–	–	–	–	–	–	–
Solar energy	–	–	–	–	–	–	0.28%	–
Hydro energy	–	–	–	–	–	–	–	–
Geothermal energy	–	–	–	–	–	–	–	–

Source: Country Report Malta 2009.

Table A10: Cyprus

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**2389**	**2418**	**2437**	**2651**	**2450**	**2468**	**2609**	**2726**
Total energy production	44	44	45	48	48	48	50	65
Supply by RE	**44**	**44**	**45**	**48**	**48**	**48**	**50**	**65**
Biomass and wastes	9	10	10	12	9	6	6	11
Wood/wood waste	9	10	10	12	9	6	6	11
Biogas	0	0	0	0	0	0	0	0
Municipal solid waste	0	0	0	0	0	0	0	0
Biofuels	0	0	0	0	0	0	0	0
Wind energy	–	–	–	–	–	–	–	–
Solar energy	35	34	35	36	40	41	43	54
Hydro energy	–	–	–	–	–	–	–	–
Geothermal energy	–	–	–	–	–	–	–	–
Share %	**1.84%**	**1.82%**	**1.85%**	**1.81%**	**1.96%**	**1.94%**	**1.92%**	**2.38%**
Biomass and wastes	0.38%	0.41%	0.41%	0.45%	0.37%	0.24%	0.23%	0.40%
Wood/wood waste	0.38%	0.41%	0.41%	0.45%	0.37%	0.24%	0.23%	0.40%
Biogas	0	0	0	0	0	0	0	0
Municipal solid waste	0	0	0	0	0	0	0	0
Biofuels	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wind energy	–	–	–	–	–	–	–	–
Solar energy	1.47%	1.41%	1.44%	1.36%	1.63%	1.66%	1.65%	1.98%
Hydro energy	–	–	–	–	–	–	–	–
Geothermal energy	–	–	–	–	–	–	–	–

Source: EUROSTAT, Country Report Cyprus 2009.

Table A11: Bulgaria

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**18647**	**19386**	**18999**	**19547**	**18988**	**19986**	**20543**	**20341**
Total energy production	9834	10290	10530	10098	10169	10553	10911	9805
Supply by RE	**780**	**696**	**832**	**952**	**1009**	**1149**	**1173**	**995**
Biomass and wastes	550	547	643	691	737	743	774	711
Wood/wood waste	550	547	643	691	737	743	769	709
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0	0	0	0	0	0	5	2
Wind energy	0	0	0	0	0	0	2	4
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	230	149	189	260	272	373	364	247
Geothermal energy	0	0	0	0	0	33	33	33
Share %	**4.18%**	**3.59%**	**4.38%**	**4.87%**	**5.31%**	**5.75%**	**5.71%**	**4.89%**
Biomass and wastes	2.95%	2.82%	3.38%	3.54%	3.88%	3.72%	3.77%	3.50%
Wood/wood waste	2.95%	2.82%	3.38%	3.54%	3.88%	3.72%	3.74%	3.49%
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.01%
Wind energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.02%
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	1.23%	0.77%	0.99%	1.33%	1.43%	1.87%	1.77%	1.21%
Geothermal energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%	0.16%	0.16%

Source: EUROSTAT, Country Report Bulgaria 2009.

Table A12: Romania

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**37129**	**36899**	**38494**	**40234**	**39597**	**39250**	**40732**	**40083**
Total energy production	28658	27612	28008	28278	28406	27438	27401	27619
Supply by RE	**4040**	**3419**	**3748**	**4061**	**4594**	**4984**	**4831**	**4717**
Biomass and wastes	2763	2130	2351	2903	3160	3229	3235	3325
Wood/wood waste	2763	2130	2351	2903	3160	3229	3235	3304
Biogas	0	0	0	0	0	0	0	1
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0	0	0	0	0	0	0	19
Wind energy	0	0	0	0	0	0	0	0
Solar energy	0	0	0	0	0	0	0	0
Hydro energy	1271	1283	1380	1140	1420	1737	1578	1373
Geothermal energy	7	5	17	18	13	18	18	20
Share %	**10.88%**	**9.27%**	**9.74%**	**10.09%**	**11.60%**	**12.70%**	**11.86%**	**11.77%**
Biomass and wastes	7.44%	5.77%	6.11%	7.22%	7.98%	8.23%	7.94%	8.30%
Wood/wood waste	7.44%	5.77%	6.11%	7.22%	7.98%	8.23%	7.94%	8.24%
Biogas	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%
Wind energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Solar energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hydro energy	3.42%	3.48%	3.58%	2.83%	3.59%	4.43%	3.87%	3.43%
Geothermal energy	0.02%	0.01%	0.04%	0.04%	0.03%	0.05%	0.04%	0.05%

Source: EUROSTAT, Country Report Romania 2009.

Table A13: Croatia

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**7830**	**7970**	**8260**	**8845**	**8861**	**8934**	**8962**	**9351**
Total energy production	3566	3733	3693	3732	3856	3783	4130	4035
Supply by RE	**879**	**855**	**757**	**800**	**977**	**901**	**929**	**737**
Biomass and wastes	374	292	296	381	379	355	412	366
Wood/wood waste	374	292	296	381	379	353	410	361
Biogas	0	0	0	0	0	3	1	2
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0	0	0	0	0	0	0	4
Wind energy	0	0	0	0	0	1	2	3
Solar energy	0	0	0	0	0	0	0	1
Hydro energy	505	563	461	419	598	545	516	364
Geothermal energy	0	0	0	0	0	0	0	3
Share %	**11.23%**	**10.73%**	**9.16%**	**9.04%**	**11.03%**	**10.09%**	**10.37%**	**7.88%**
Biomass and wastes	4.78%	3.66%	3.58%	4.31%	4.28%	3.97%	4.60%	3.91%
Wood/wood waste	4.78%	3.66%	3.58%	4.31%	4.28%	3.95%	4.57%	3.86%
Biogas	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.01%	0.02%
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%
Wind energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Solar energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hydro energy	6.45%	7.06%	5.58%	4.74%	6.75%	6.10%	5.76%	3.89%
Geothermal energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%

Source: EUROSTAT, Country Report Croatia 2009.

Table A14: Macedonia

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**2757**	**2669**	**2883**	**2732**	**2740**	**2765**	**–**	**–**
Total energy production	–	–	–	–	–	–	–	–
Supply of RE	**321**	**222**	**226**	**312**	**303**	**223**	**–**	**–**
Biomass and Waste	206	146	148	181	165	96	–	–
Wood and wood waste	206	146	148	181	165	96	–	–
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–
Hydro energy	100	54	65	118	127	128	–	–
Solar energy	–	–	–	–	–	–	–	–
Geothermal	16	23	13	13	12	–	–	–
Share %	**11.66%**	**8.33%**	**7.82%**	**11.42%**	**11.07%**	**8.08%**	**–**	**–**
Biomass and Waste	7.46%	5.45%	5.13%	6.63%	6.01%	3.46%	–	–
Wood and wood waste	7.46%	5.45%	5.13%	6.63%	6.01%	3.46%	–	–
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	3.64%	2.01%	2.25%	4.31%	4.64%	4.62%	–	–
Geothermal	0.56%	0.86%	0.45%	0.48%	0.43%	–	–	–

Source: Country Report Macedonia 2009.

Table A15: Turkey

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**77624**	**71609**	**75465**	**79402**	**81999**	**85340**	**94663**	**101510**
Total energy production	26808	25161	24648	23873	24212	23626	26540	27279
Supply by RE	**10149**	**9424**	**10077**	**10036**	**10783**	**10131**	**10541**	**9604**
Biomass and wastes	6546	6303	6039	5783	5550	5332	5162	5023
Wood/wood waste	6541	6297	6032	5775	5542	5325	5133	4994
Biogas	5	6	7	8	7	7	8	15
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0	0	0	0	0	0	21	14
Wind energy	3	5	4	5	5	5	11	31
Solar energy	262	287	318	350	375	385	402	420
Hydro energy	2655	2064	2896	3038	3963	3402	3804	3083
Geothermal energy	684	764	820	860	891	1007	1162	1048
Share %	**13.07%**	**13.16%**	**13.35%**	**12.64%**	**13.15%**	**11.87%**	**11.14%**	**9.46%**
Biomass and wastes	8.43%	8.80%	8.00%	7.28%	6.77%	6.25%	5.45%	4.95%
Wood/wood waste	8.43%	8.79%	7.99%	7.27%	6.76%	6.24%	5.42%	4.92%
Biogas	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.01%
Wind energy	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.03%
Solar energy	0.34%	0.40%	0.42%	0.44%	0.46%	0.45%	0.42%	0.41%
Hydro energy	3.42%	2.88%	3.84%	3.83%	4.83%	3.99%	4.02%	3.04%
Geothermal energy	0.88%	1.07%	1.09%	1.08%	1.09%	1.18%	1.23%	1.03%

Source: EUROSTAT, Country Report Turkey 2009.

Table A16: Serbia

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**–**	**–**	**7179**	**7549**	**7903**	**7606**	**7599**	**8242**
Total energy production	–	–	12681	13789	14349	14730	14787	16659
Supply of RE	**–**	**–**	**1139**	**1019**	**1189**	**1269**	**1169**	**1097**
Biomass and Waste	–	–	239	239	239	239	239	247
Wood and wood waste	–	–	239	239	239	239	239	239
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	8
Wind energy	–	–	–	–	–	–	–	–
Hydro energy	890	910	900	780	950	1030	930	850
Solar energy	–	–	–	–	–	–	–	–
Geothermal	–	–	–	–	–	–	–	–
Share %	**–**	**–**	**10.56%**	**8.93%**	**9.75%**	**10.25%**	**9.54%**	**8.27%**
Biomass and Waste	–	–	3.33%	3.17%	3.02%	3.14%	3.15%	3.00%
Wood and wood waste	–	–	3.33%	3.17%	3.02%	3.14%	3.15%	2.90%
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	0.10%
Wind energy	–	–	–	–	–	–	–	–
Solar energy	–	–	–	–	–	–		–
Hydro energy	–	–	7.23%	5.76%	6.73%	7.11%	6.39%	5.18%
Geothermal	–	–	–	–	–	–	–	–

Source: Country Report Serbia 2009.

Table A17: Bosnia & Herzegovina

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Total energy demand	**4849**	**4760**	**4666**	**4940**	**5195**	**5487**	**5651**	**5822**	**5996**
Total energy production	–	–	–	–	–	–	–	–	–
Supply of RE	**1349**	**1524**	**1294**	**1471**	**1553**	**1703**	**1794**	**1889**	**1990**
Biomass and Waste	933	1022	923	1070	1024	1126	1188	1253	1322
Wood and wood waste	933	1022	923	1070	1024	1126	1188	1253	1322
Biogas	–	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–	–
Hydro energy	416	502	371	401	529	577	606	636	668
Solar energy	–	–	–	–	–	–	–	–	–
Geothermal	–	–	–	–	–	–	–	–	–
Share %	**27.83%**	**32.01%**	**27.73%**	**29.78%**	**29.89%**	**31.04%**	**31.75%**	**32.45%**	**33.19%**
Biomass and Waste	19.24%	21.47%	19.78%	21.66%	19.71%	20.52%	21.02%	21.52%	22.05%
Wood and wood waste	19.24%	21.47%	19.78%	21.66%	19.71%	20.52%	21.02%	21.52%	22.05%
Biogas	–	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–	–
Solar energy	–	–	–	–	–	–	–	–	–
Hydro energy	8.59%	10.54%	7.95%	8.12%	10.18%	10.52%	10.72%	10.93%	11.14%
Geothermal	–	–	–	–	–	–	–	–	–

Source: Country Report Bosnia & Herzegovina 2009.

Table A18: Montenegro

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**995**	**952**	**1045**	**1060**	**1086**	**1007**	**1098**	**–**
Total energy production	–	–	–	–	–	–	–	–
Supply of RE	**207**	**221**	**155**	**214**	**283**	**224**	**274**	**–**
Biomass and Waste	31	36	36	52	50	50	57	–
Wood and wood waste	31	36	36	52	50	50	57	–
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–
Hydro energy	176	186	119	162	233	174	217	–
Solar energy	–	–	–	–	–	–	–	–
Geothermal	–	–	–	–	–	–	–	–
Share %	**20.81%**	**23.25%**	**14.81%**	**20.22%**	**26.10%**	**22.22%**	**24.95%**	**–**
Biomass and Waste	3.11%	3.75%	3.42%	4.94%	4.61%	4.96%	5.21%	–
Wood and wood waste	3.11%	3.75%	3.42%	4.94%	4.61%	4.96%	5.21%	–
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–
Solar energy	–	–	–	–	–	–	–	–
Hydro energy	17.70%	19.50%	11.39%	15.28%	21.49%	17.26%	19.74%	–
Geothermal	–	–	–	–	–	–	–	–

Source: Country Report Montenegro 2009.

Table A19: Kosovo

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total energy demand	**–**	**–**	**–**	**2055**	**1972**	**2036**	**2048**	**1997**	**2137**
Total energy production	–	–	–	–	–	–	–	–	–
Supply of RE	**–**	**–**	**–**	**222**	**229**	**228**	**227**	**227**	**229**
Biomass and Waste	–	–	–	216	216	216	216	216	218
Wood and wood waste	–	–	–	216	216	216	216	216	218
Biogas	–	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–	–
Hydro energy	–	–	–	6	12	12	11	10	10
Solar energy	–	–	–	0	0	0	0	0	0
Geothermal	–	–	–	–	–	–	–	–	–
Share %	**–**	**–**	**–**	**10.80%**	**11.59%**	**11.22%**	**11.11%**	**11.35%**	**10.70%**
Biomass and Waste	–	–	–	10.53%	10.97%	10.62%	10.56%	10.83%	10.21%
Wood and wood waste	–	–	–	10.53%	10.97%	10.62%	10.56%	10.83%	10.21%
Biogas	–	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–	–
Solar energy	–	–	–	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%
Hydro energy	–	–	–	0.27%	0.62%	0.59%	0.53%	0.51%	0.47%
Geothermal	–	–	–	–	–	–	–	–	–

Source: Country Report Kosovo 2009.

Table A20: Albania

1000TOE/Year	2000	2001	2002	2003	2004	2005	2006	2007
Total energy demand	**1797**	**1928**	**1828**	**2003**	**2251**	**2050**	**2148**	**1966**
Total energy production	987	933	896	1012	1178	1149	1237	1080
Supply of RE	**763**	**667**	**664**	**717**	**811**	**713**	**705**	**475**
Biomass and Waste	303	296	296	228	268	230	229	214
Wood and wood waste	303	296	296	228	268	230	229	214
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–
Hydro energy	460	367	364	485	539	469	474	255
Solar energy	–	4	4	4	4	4	2	6
Geothermal	–	–	–	–	–	–	–	–
Share %	**42.46%**	**34.59%**	**36.32%**	**35.80%**	**36.02%**	**34.78%**	**32.82%**	**24.17%**
Biomass and Waste	16.86%	15.35%	16.19%	11.38%	11.91%	11.22%	10.66%	10.88%
Wood and wood waste	16.86%	15.35%	16.19%	11.38%	11.91%	11.22%	10.66%	10.88%
Biogas	–	–	–	–	–	–	–	–
Municipal solid waste	–	–	–	–	–	–	–	–
Biofuels	–	–	–	–	–	–	–	–
Wind energy	–	–	–	–	–	–	–	–
Solar energy	–	0.20%	0.20%	0.19%	0.17%	0.20%	0.10%	0.32%
Hydro energy	25.60%	19.04%	19.91%	24.23%	23.94%	23.36%	22.06%	12.97%
Geothermal	–	–	–	–	–	–	–	–

Source: Country Report Albania 2009.

ANNEX 2

Annex 2 a: Major types of renewable energy in the 12 New Member States (% of Total RE Production), 2007

	LTU	LVA	EST	POL	CZE	SVK	HUN	SVN	MLT*	CYP	BUL	ROM	No. of Countries
Wood/ w-waste	90.0	85.4	98.1	90.7	81.0	49.2	81.6	59.1	–	16.9	71.3	70.0	11
Biogas	0.2	0.4	0.5	1.3	3.2	0.7	1.2	1.7	–	–	–	–	8
Municipal solid w.	–	–	–	0.9	4.0	3.9	7.7	–	–	–	–	–	4
Biofuel	4.0	0.9	–	2.0	3.7	6.0	1.2	0.5	34.5	–	0.2	0.4	10
Hydro-power	4.4	13.1	0.3	4.0	7.5	39.0	1.3	38.7	–	–	24.8	29.1	10
Wind	1.1	0.3	1.1	0.9	0.5	0.1	0.6	–	–	–	0.4	–	8
Solar	–	–	–	–	0.2	–	0.2	–	65.5	83.1	–	–	4
Geo-thermal	0.2	–	–	0.2	–	1.0	6.1	–	–	–	3.3	0.4	6

* 2006

Source: EUROSTAT.

Note: Due to rounding not always 100.0%.

Annex 2 b: Major types of renewable energy in the 3 candidate and 5 potential candidate countries (% of Total RE Production), 2007

	CRO	MAC*	TUR	SER	BIH	MON**	KOS	ALB	No. of Countries
Wood/ w-waste	49.0	54.3	52.0	21.8	66.3	20.9	95.4	44.9	8
Biogas	0.3	–	0.2	–	–	–	–	–	2
Municipal solid w.	–	–	–	–	–	–	–	–	–
Biofuel	0.5	–	0.1	0.7	–	–	–	–	3
Hydro-power	49.4	41.9	32.1	77.5	33.7	79.1	4.5	53.8	8
Wind	0.4	–	0.3	–	–	–	–	–	2
Solar	0.1	–	4.4	–	–	–	0.1	1.3	4
Geo-thermal	0.4	3.8	10.9	–	–	–	–	–	3

* 2004; ** 2006

Source: EUROSTAT and Country Reports 2009.

Note: Due to rounding not always 100.0%.

ANNEX 3

Annex 3: The membership of NMS and CC/PCC in the International Renewable Energy Agency (IRENA) and in the Energy Charter Treaty (ECT)

	International Renewable Energy Agency (IRENA) as of 6 October 2009	Energy Charter Treaty (ECT) as of September 2009
NMS		
Lithuania	26.01.2009	05.04.1995
Latvia	26.01.2009	17.12.1994
Estonia	11.06.2009	17.12.1994
Poland	26.01.2009	17.12.1994
Czech Rep.	–	08.07.1995
Slovakia	26.06.2009	17.12.1994
Hungary	–	27.02.1995
Slovenia	26.01.2009	17.12.1994
Malta	29.06.2009	17.12.1994
Cyprus	26.01.2009	17.12.1994
Bulgaria	26.01.2009	17.12.1994
Romania	26.01.2009	17.12.1994
CC/PCC		
Croatia	–	17.12.1994
Macedonia	26.01.2009	26.03.1998
Turkey	26.01.2009	17.12.1994
Serbia	26.01.2009	accession pending
Bosnia & Herzegovina	23.06.2009	14.06.1995
Montenegro	26.01.2009	–
Kosovo	–	–
Albania	11.06.2009	17.12.1994

Source: www.irena.org (accessed 28 October 2009).
www.encharter.org (accessed 28 October 2009).

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