Should the EU climate policy framework be reformed?

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Abstract

Though to-date the European Union (EU) has played the most significant leadership role in international negotiations to reduce greenhouse gas (GHG) emissions, the emission-reducing performance of individual EU Member states has for many been less than stellar. Several EU15 Member states continue to raise rather than lower emissions. Analysing the most successful policy instruments, this paper argues EU policy efforts could benefit from three important innovations. The following strategies – the adoption of an EU-wide FIT (feed-in tariff), an EU-wide carbon tax and more flexibility in the trading of carbon credits – could significantly improve emission reductions, their relative cost-efficiency and spread burden-sharing more evenly across technologies and Member states. This raises important questions, both about the effectiveness of EU and Kyoto-style commitments, as well as the EU Emission Trading Scheme (ETS). The commitment strategy, and in particular the EU ETS mechanism, have had the smallest impact on emission reductions. The proposed set of strategies could make a far greater contribution to future EU efforts and potentially lock in the impressive progress already made. Such a policy shift, if successful, would also greatly enhance the EU's already significant credibility and bargaining power in international climate negotiations.

Keywords: EU climate policy, Climate change mitigation, Renewable Energy, Energy Efficiency, Carbon Taxes

JEL Classification: Q48, Q58, Q54, Q56, Q43, H21

1. Introduction

The EU Climate (and Energy) policy framework[84] is in need of urgent reform. Though EU policy contains important commitments to the UNFCCC

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Acknowledgements: The author would like to thank anonymous reviewers for helpful comments. The usual disclaimers apply.

[84] For an excellent overview of the EU strategy and current status, see Morgera et al. (2011).

and Kyoto processes and further traps emissions in the vice of a complex emission trading scheme (the EU ETS), to-date these two factors have ultimately had little to do with actual progress on emission reductions. And though progress for the EU27 as a whole has been stellar—in 2009, greenhouse gas (GHG) emissions were approximately 17.3% below 1990 levels (EEA, 2010)—the two most powerful explanatory factors are the economic and energy transformation in Central and Eastern Europe and the more recent economic recession. Most, though not all, of the EU15 Member states have made little or no progress on emission reductions. Since signing the Kyoto Protocol in 1997 and despite a EU-wide commitment to reduce emissions by 8% as of 2012 and 20% as of 2020, quite a number of Member states have failed to make any progress and several continue to raise emissions.

International bargaining on emissions is tremendously important and the EU role highly important. For one, the EU has played an exceedingly important international role in promoting commitments to emission reductions and in pursuing the path of climate change mitigation and adaptation. For another, without the current international and EU policy framework, things could clearly be much worse. As a result, Member states have introduced national-level policy frameworks leading to avoided emissions and reduced energy intensity. Yet, movement toward the increased use of renewable energy sources is unevenly distributed across the EU Member states. And much of this progress is largely the result of national level policies that are relatively disconnected from the EU policy framework. In fact, the failure to promote or delegate more responsibility and authority to the EU level may mean that individual Member state efforts are at best uneven and at worst likely to lead to significant distortions in the EU marketplace.

A few simple (though politically complicated) tweaks of the EU climate policy framework could potentially go a long way to resolving and improving overall EU policy efforts. Rather than relying so heavily on the KP commitment mechanism and in particular the EU ETS system, this article recommends the EU amend the principal focus of policy efforts to a *power-switch* type model focused broadly on the rapid adoption of renewable energy sources and technologies (RES) and the more intense inclusion of *end user-based* energy efficiency strategies that raise the cost of fossil fuel use and provide stronger incentives for rapid new technology adoption in building-related energy use. Finally, the progress made in reducing emissions in particular in the New Member states of Central and Eastern Europe should be locked in by policies promoting even more extensive improvements—potentially through the use of EU Structural and Cohesion funds. Without this, economic growth and the slow but progressive enrichment of Central and East European citizens will lead to progressive increases in fossil fuel consumption.

Failure to adopt these changes may result in the limited efficacy of the EU policy strategy. The reasons for this are quite simple. The strategy places its principal emphasis on emissions in the power sector and high-emitting firms and requires these firms to purchase the right to emit GHG's at a price determined by the carbon market. It thus raises the price of fossil fuel-based energy consumption, effectively introducing a carbon price. While intended to encourage a shift in the use of fossil fuels, this assumption is based on the logic that users have the ability to raise their efficiency or choose other fuel types. For coal-based electricity generation, for example, such choices are limited. While firms can elect to build new RES-based facilities and abandon older facilities, they frequently cannot simply switch fuels or update existing technology. Similar problems arise for production in high-emitting firms. While new production technologies may be around the corner, most industries have little playroom for promoting more efficient production.[85] Given this limited room for manoeuvre, the EU ETS system may target the wrong actors. Alternatively, the rapid adoption of new RES technologies or building-related energy use shows significant potential. Thus a policy strategy focused on encouraging such approaches may provide far greater potential margins for success.

In this sense, the EU commitment and EU ETS strategy should perhaps be downplayed vis-à-vis alternative strategies. As this article demonstrates, there is considerable potential for making rapid progress on the basis of a *power-shift* type model, the more rapid adoption of RES technologies and a decisive end-user strategy focused on the adoption of new technologies in building-related energy use. The EU ETS model may ultimately hamstring rapid action, since it places *too much emphasis* on the role of traditional industries (likely to favour slower depreciation of fixed capital and physical infrastructure and thus slower replacement rates)[86] and *not enough emphasis* on complementary strategies geared toward rewarding the rapid adoption of new technologies, in particular by new and more flexible actors.

Without reform, progress toward emission reductions in the EU is likely to remain at best uneven. Moreover, the ability of some countries to make decisive progress in overall emission reductions, in the rapid adoption of low carbon and energy efficient technologies and in the promotion of rapid

[85] An International Energy Agency (IEA, 2007a) study estimated the adoption of best practice technologies in the global manufacturing industry (excluding the power generating sector) could lead to emission reductions of between 7 and 12%. On average, from 2005-2008, ETS industries were responsible for 27.8% of emissions while combustion installations were responsible for 72.2% (see the online European Environment Agency data). On the other hand, some surprises are of course possible, such as recent developments in the brick industry that may make possible efficiency improvements of over 90%. See, "Silicon Valley Reinvents the Lowly Brick" (*Reuters*, Sept. 21st, 2009).

[86] The World Business Council for Sustainable Development (WBCSD) has, in various publications, emphasized the importance of accelerating capital turnover rates. See for e.g. WBCSD (2004, 2007).

technology innovation and development, means an excessive share of the emission reduction burden is borne by an uneven share of EU Member states. This raises the potential for extensive market distortions and ultimately introduces a disruptive element in the European single market space.

2. Current EU performance

The EU's current efforts at greenhouse gas (GHG) emission reductions are primarily focused on the power sector and other high-emitting industrial installations. This project essentially has three components. One is the requirement that the power sector and high-emitting industrial firms reduce their carbon output or purchase carbon allowances on the EU emission trading scheme (EU ETS) market. The second is that countries make an effort to increase their use of renewable energy sources (RES) to a negotiated share of total energy use by 2020. Finally, the EU also requires Members states to reduce energy use by 20% by 2020 and to increase energy efficiency. The Energy Efficiency Directive, a revised version of which is currently under negotiation, encourages Member states to raise their energy efficiency by approximately 20% by the year 2020. Thus, although EU MS are not moving rapidly on this front, much of the 20% reduction in energy use could potentially be made through raising energy efficiency.

In many ways, the EU is already well positioned to meet its 2020 target of reducing GHG emissions by 20% from 1990 levels. In 2009, one year into the first commitment period (2008-2012) specified in the Kyoto Protocol (KP) and still far from the second commitment period (2013-2020) specified by the EU's 2020 Energy and Climate Package, EU-27 emission reductions were 17.3% below 1990 levels (EEA, 2010, p.6, 30). Partly in order to maintain this momentum, discussions in fact revolved around whether the EU emission target should be unilaterally raised to 30%,[87] as previously discussed in the context of an international Kyoto-II-type agreement. In this discussion, however, the two principal explanations for successful EU-level emission reductions – 1) the role of economic change and concerted action in the former communist countries, now the New EU Member states, and 2) the economic crisis – are quickly forgotten. In fact, and though a few select states have achieved significant progress, little progress can be attributed to the positive actions of the EU and its Old Member states.

As illustrated in Table 1, the Central and East European New Member states have made the principal contribution to EU27 emission reductions. Moreover, this is true whether one considers 1990 the effective base year, or

[87] See e.g.: "30% greenhouse gas emissions cut 'still on the table'", (Euractiv.com, Feb. 14th, 2011), or "How to bring 30% back into the emissions debate", (Euractiv.com, May 24th, 2011).

1997, the year in which the Kyoto Protocol was finally signed (at which point countries were aware what their "effective" targets would be). Though a large share of the total EU27 emission reductions occurred in the Central and East European Member states prior to the signing of the Protocol (in 1997), emission reductions continue to be made well after that date. In fact, post-1997 the largest share of emission reductions is still contributed by the NMSs. The positive performance of the Central and East European states is marred only by the negative performance of Slovenia. In this last country, emissions have grown by a significant amount, both before and after 1997.

Finally, though the relative performance of the Central and East European states is in part explained by the adoption of low emission reduction targets (lower targets translate into higher performance), the New Member states adopted remarkably strict targets compared to some of the former "*cohesion*" Member states (those Western EU15 Member states previously the principal recipients of EU Structural and Cohesion funding—in particular Spain, Portugal, Greece and Ireland) and countries like Cyprus and Malta (who recently adopted formal targets similar to those of the cohesion countries). While the former *cohesion* countries were permitted to raise emissions under the KP framework, the Central and East European Member states—despite considerably lower levels of economic development—were all required to adopt emission reduction targets between 6% and 8%.[88]

Though the performance illustrated in Table 1 the standard approach for representing progress on emission reductions, little about how individual Member states have performed relative to each other and to economic and financial constraints is revealed. This analysis adopts two strategies for standardizing and comparing individual Member state performance based on two key factors: *population*- and *income-weighted* measures of individual Member state contributions to emission reductions. These weights are chosen because they represent the most relevant determinants of "equitably" based burden-sharing – emission reduction shares based on per capita emissions and relative wealth.

The EEA is responsible for collecting the EU GHG emission data used for UNFCCC reporting. In order to assess the relative contribution of EU Members states to GHG emission reductions, this data is analyzed comparing 2008 levels to 1990. For the analysis herein, 2008 GHG emissions are subtracted from 1990 levels and this number is divided by the total EU27 contribution to emission reductions. This relative share of emission reductions is then divided by the individual Member state's relative share in EU27 population and income (GDP).

[88] Some have argued that the targets adopted by the New Member states were in fact well above what one might have expected under ordinary circumstances (see Bhatti et al., 2010). Moreover, this is a common theme in the EU climate policy framework (see Ellison, 2008; Ellison and Hugyecz, 2008).

The corresponding output provides two numbers that express the number of times an individual Member state has surpassed (or undershot) its *expected performance* based on its relative share of the EU population, or relative income (GDP). Since countries that have increased (not *reduced*) their emissions are represented by negative contributions, results are also expressed as negative numbers in the output data, thus indicating movement in the opposite direction. Finally, since Cyprus and Malta have recently adopted Kyoto targets, they have also been included in the analysis.

Table 1. EU member state performance on Kyoto Protocol (2008 / 1990 and 2008 / 1997)

	2008/1990	2008/1997	Kyoto Target	Surplus/Deficit
Latvia	-55.6%	-1.6%	-8.0%	47.6%
Lithuania	-51.1%	6.9%	-6.0%	45.1%
Estonia	-50.4%	-4.3%	-8.0%	42.4%
Romania	-39.7%	-13.2%	-8.0%	31.7%
Bulgaria	-37.4%	-12.3%	-8.0%	29.4%
Slovakia	-33.9%	-3.6%	-8.0%	25.9%
CzR	-27.5%	-7.8%	-8.0%	19.5%
Hungary	-24.9%	-7.2%	-8.0%	16.9%
Sweden	-11.7%	-12.6%	4.0%	15.7%
Poland	-12.7%	-10.8%	-6.0%	6.7%
France	-6.4%	-6.7%	0.0%	6.4%
UK	-18.6%	-11.2%	-12.5%	6.1%
Greece	22.8%	9.5%	25.0%	2.2%
Germany	-22.2%	-11.6%	-21.0%	1.2%
Finland	-0.3%	-6.7%	0.0%	0.3%
Belgium	-7.1%	-8.2%	-7.5%	-0.4%
Netherlands	-2.4%	-8.3%	-6.0%	-3.6%
Portugal	32.2%	10.4%	27.0%	-5.2%
Ireland	23.0%	9.0%	13.0%	-10.0%
Italy	4.7%	2.5%	-6.5%	-11.2%
Denmark	-7.4%	-20.2%	-21.0%	-13.6%
Slovenia	15.2%	9.4%	-8.0%	-23.2%
Luxembourg	-4.8%	27.5%	-28.0%	-23.2%
Austria	10.8%	5.0%	-13.0%	-23.8%
Spain	42.3%	23.6%	15.0%	-27.3%
Malta	44.2%	18.7%	0.0%	-44.2%
Cyprus	93.9%	41.1%	0.0%	-93.9%
EU27	-11.3%	-5.3%	-8.0%	3.3%
EU15	-6.5%	-4.4%	-8.0%	-1.5%
CEE10	-27.3%	-9.3%	-7.6%	19.7%

Source: own calculations based on Eurostat/EEA online data.

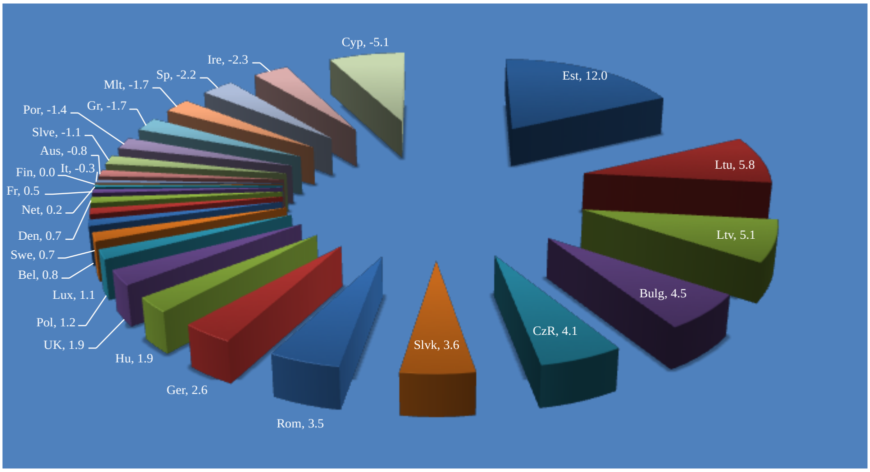
Interpreting these results is straightforward. Both population and income-weighted contributions of individual EU Member states yield an output of “1” if countries have reduced emissions by *as much as one would expect* given their relative population and/or income shares. In other words, a country with 12% of the EU population might be expected to contribute 12% to the total GHG emission reductions, yielding a value of "1". Between 0 and 1, countries are making progress but have thus far not managed to reduce their emissions by as much as one would expect given their relative population/income share. Numbers greater than "1" suggest that individual Member states have surpassed what one would expect. Negative numbers indicate that Member states are increasing emissions rather than reducing them. Further, there should be no expectation that countries will perform the same on both population and income-weighted measures. In fact, significantly less developed countries may perform poorly with respect to population shares, but significantly better based on relative income.

Countries not achieving what one would expect based on their relative population or income shares still have the opportunity to do this given that the first Commitment Period (CP1) runs from 2008-2012. In addition, these numbers do not encompass emission reductions for 2009, the year most strongly affected by the recent economic crisis, or the remaining years in CP1. Further drops in emissions have likely resulted in some countries, in particular those hardest hit by the recession. However, including 2009 data could be misleading since it is unlikely the levels recently achieved will be maintained.

Weighted on the basis of population shares, the Central and East European New Member states all represent the forerunners in the EU effort to reduce GHG emissions (Figure 1). Estonia, for example has delivered an effort 12 times what it should have contributed based on its relative share in EU population. Cyprus, on the other hand, lies at the opposite end of the circle. To-date, Cyprus has raised GHG emissions fully 5.1 times the amount it should have reduced them based on its relative population shares. Similarly, Ireland has raised emissions approximately 2.3 times the amount it should have reduced them. Similar results are found for Greece (1.7 times), Portugal (1.4 times), Slovenia (1.1 times), Austria (0.8 times) and Italy (0.3 times). Only a select set of *old* EU Member states have managed to reduce emissions beyond what one would expect based on their EU population shares (Germany,[89] the UK, and Luxembourg). Several other countries have at least made progress in reducing emissions, though for the most part they remain below what one would expect based on their relative population shares (Belgium, Sweden, Denmark, the Netherlands, France and Finland). Among the Central and East European states, Slovenia stands out as the only country to move in the wrong direction, away from its Kyoto target.

[89] Because of German Unification in 1990 and the role of East Germany, Germany represents something of an anomaly and exhibits some traits similar to those in the Central and East European NMS.

Figure 1. Population - weighted contribution (total emission reductions, 2008/1990)

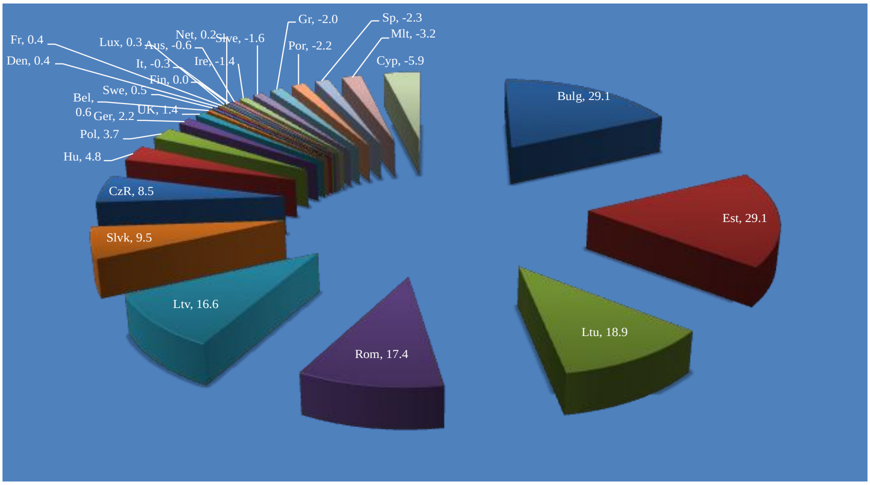


Sources: own calculations based on data from EEA (2010) and Eurostat online population data.

Analysis based on each Member state's relative share of EU income (GDP) yields similar results (Figure 2). Though the ordering of countries changes, the basic principle remains the same. Based on their relative wealth in the EU, the New Member states have again contributed far more to Kyoto emission reductions than one would expect. Bulgaria tops this list, having contributed 29.1 times what it should have contributed based on relative wealth. This time the contrast in relative effort is starker than before, suggesting an effort that is even (29.1/4.5 = 6.5) 6.5 times greater than what one would expect based on relative EU population shares.

On the other end, Cyprus again remains near the top of the list of poor performers, having increased its emissions by 5.9 times more than it should have reduced them based on its relative share of EU wealth. And this time both Malta and Cyprus remain at the bottom of the pack. Further, many EU15 Member states are in a similar position (Spain, Portugal, Greece, Ireland, Austria and the Netherlands). This time, only two EU15 Member states have contributed more to emission reductions than one would expect based on relative wealth (Germany and the UK). Since first commitment period ends only in 2012, several countries have at least made progress in the right direction (Belgium, Sweden, Denmark, France, and Finland). Slovenia again remains the lone exception among the Central and East European New Member states, having raised emissions approximately 1.6 times more than it should have reduced them based on relative wealth.

Figure 2. Income - weighted contribution (total emission reductions, 2008 / 1990)



Sources: own calculations based on data from EEA (2010) and Eurostat online GDP data.

This second set of findings is particularly important in the context of arguments that wealthier states should bear a larger share of the burden of reducing emissions. This basic principle is well integrated and enshrined into thinking under the UNFCCC and IPCC frameworks, as well as the EU policy context. In all three of these contexts, less wealthy states are generally granted a framework that allows them to continue to grow economically without significantly challenging them on emission reductions (as reflected, for example, in the emission reduction targets of the former EU cohesion countries, Malta and Cyprus).

The EEA has illustrated that the second largest contributor to EU27 emission reductions is the economic recession (EAA, 2010, Figure 4.1., p. 31). Moreover, given the fact that the Central and East European states were typically more immediately and dramatically affected by the recession, one should expect emission reductions to again be significantly greater in the New Member states. This point is substantiated by the most recent EEA GHG inventory submission to the UNFCCC. Based on this data, the NMS reduced emissions by 10.3% in 2009, while the EU15 only witnessed emission reductions of 6.2%[90]. As suggested by the EEA projections for future emissions, the EEA does not expect this decline in emissions to last. In February 2011, there were in fact already signs EU27 emissions were again on the rise.[91] And, a joint report from the PBL

[90] These numbers are calculated on the basis of data in Table ES.3 (EEA, 2011, vii).

[91] See for example: “Europe's CO2 emissions growing with the economy” (EurActiv.com, Feb. 28th, 2011).

Netherlands Environmental Assessment Agency and the European Commission's JRC noted that EU27 emissions rose 3% in 2010 (PBL-JRC, 2011, p.11).

These findings raise important questions about the future. A very large share of emission reductions in the EU27 results from the role played by the Eastern Enlargement. Without this, the EU would not easily illustrate that emission reductions can be achieved and pursued in a collective framework (such as the EU or the UNFCCC's Kyoto Protocol). In fact, few EU15 Member states are able to demonstrate emission reductions are possible while at the same time pursuing economic growth. Despite exceptions—the UK, Sweden, (perhaps Germany), and France (based on relative income shares)—most of the EU15 Member states have been unable to make significant progress on reducing emissions without significant reductions in economic growth (the economic recession) or the opportunity to make use of the various UNFCCC *flexible mechanisms* (i.e. the Clean Development Mechanism and Joint Implementation) (EEA, 2010). Despite the declared goal of achieving an 8% reduction in emissions by 2012 and 20% by 2020, many individual MS remain quite far from achieving even the first of their EU-level burden-sharing commitments. *Actual* performance is worse in some cases.

3. EU vs. national-level policy effectiveness?

As suggested above, the most efficient and effective emission reducing tools to-date have been the Eastern Enlargement and economic change in the Central and East European Member states and the economic recession. However, other factors also contribute to important progress toward emission reductions in individual Member states. In what follows, the rate of adoption of new renewable technologies in individual EU Member states is analyzed based on the same basic logic as above. The relative "effort" or performance of individual member states is measured against what one might expect based on relative EU population shares and/or wealth, using data for the period 1990-2009.

Population-weighted analyses of the rapid adoption of renewable energy technologies across the various EU27 Member states suggest two important observations. First, a number of individual EU15 Member states are frequently the most important contributors to the rapid adoption of *certain types* of renewable energy technologies. Thus, when looking at wind power, Denmark, Spain, Portugal, Germany, Ireland and Sweden are far and away the most successful promoters adopting significantly larger shares of wind power relative to their share of the EU population. Denmark in particular has adopted 4 times what one might expect given its relative EU population share. Sweden on the other hand, at 1.4 times, is close to what one might expect.

[See Figures 3 - 8 from the annex]

Second, the rapid adoption of renewable energy sources frequently occurs in countries one might not expect given natural endowments of wind, solar radiation and/or the availability of biomass. Thus for example, while Spain is far and away the most prominent adopter of solar photovoltaic (PV) power cells on the basis of population share, Germany and Luxembourg are in second and third place, well ahead of Italy, Greece, Portugal and other southern countries with significantly larger natural endowments of solar radiation. Thus, national level strategies for the rapid adoption of renewable technologies presumably play a significant role in explaining at least some of the cross-country variation in EU Member state RES adoption.

Similar claims can be made about the adoption of other RES technologies. For example, while the availability of wind power is significantly greater in countries like the UK, performance on the adoption of wind power pales in comparison to other countries like Germany. With regard to solar thermal energy generation, while some of the countries at the top of the scale like Cyprus and Greece may not surprise, other countries like Austria (in second place) is entirely unexpected. Here again, national-level strategies plays an important role.

Analyzing the data in the context of relative income likewise provides some interesting observations, particularly with regard to more conventional claims that the high cost of renewable energy represents a barrier for the less advanced economies or that incentives are not likely to be useful in countries where there is little available capital. Taking wind power as the first example (Figures 3 a, b), Portugal now tops the scale of rapid adoption based on its relative share of EU income. And Bulgaria now takes 4^{th} place (at 1.9 times), Estonia 6^{th} place (at 1.6 times), and Lithuania 9^{th} place at 0.9 times what one would expect based on relative income. For Solar PV (see Figures 5 a, b), though no NMS has adopted more than one might expect based on relative income, the Czech Republic places surprisingly high, especially relative to the quite large number of other EU15 Member states with significantly higher amounts of solar radiation that place considerably lower on the scale (e.g. Portugal and Italy). Similar claims can likewise be made regarding solar thermal adoption (Figures 6 a, b) and Malta, Slovenia, the Czech Republic, Bulgaria and Slovakia.

Thus national level policies play an important role in contexts where the natural advantages of individual technologies alone (as in the case of solar thermal in countries like Cyprus and Greece, and countless other examples) do not immediately encourage rapid adoption. This basic analysis further underscores the observation that although relative income represents an important barrier to the rapid adoption of renewable energy technologies, this obstacle can be overcome with inventive strategies. Moreover, the selective redistribution of resources to less advanced countries would presumably have further beneficial impacts on the rapid adoption of renewable energy technologies.

The adoption of biomass-based renewable energy technologies (district-heating, electricity generation, combined heat and power as well as individual household use) provides an additional important example (Figures 4 a, b). Based on population-weighted measures, the use of biomass in primary energy production is far and away the highest in Finland, Sweden, Estonia and Austria. Finland hosts 8 times and Sweden 6.2 times more biomass-based energy production than expected based on their share of EU population and Estonia hosts 3.4 times more.

Based on income-weighted measures, however, the positions of individual countries change significantly: Latvia jumps to first place (at 11.8 times what one would expect) and Estonia, Romania, Lithuania and Bulgaria to 2nd, 4th, 5th and 6th respectively. Only Finland remains in the top 5, in third place (at 6 times). This significant change in the relative positions of individual countries is presumably related to two factors: the relative cost of biomass-based energy resources (more competitive than other available RES technologies) and the relative availability of biomass material in some (though not all) of these countries. A varied mix of relative cost and resource abundance also presumably explains the relative positions of Malta, Slovenia, the Czech Republic and Slovakia with regard to solar thermal adoption.

Looking at the share of total renewable energy sources in primary energy production (Figures 7 a, b) across the EU27 (because of limitations with regard to new capacity, hydropower is excluded from these numbers), a number of the EU15 Member states rank quite high based on relative population shares (in particular Sweden, Finland and Austria). Only a few New Member states produce more primary energy than one would expect based on relative population shares (Latvia, Slovenia and Estonia). However, based on relative income shares, a significantly large share of NMS comes out on top (in particular Latvia and Estonia, followed by Finland, Romania, Sweden, Bulgaria and Lithuania). The same analysis can be performed on the basis of the RES share in gross inland consumption (Fig. VIII, a, b). The basic findings do not really change. In particular, based on relative income shares, the same set of NMS comes out on top. Moreover, and more importantly perhaps, not a single NMS (including Slovenia) produces ***or*** consumes less RES energy than one would expect based on relative income shares. However, the same cannot be said for the majority of old EU Member states. Fully 9 out of 15 old EU Member states both produce ***and*** consume less RES energy than one would expect based on relative income shares.

These numbers are surprising given the conventional impression of lagging performance in the New Member states. To raise the level of irony a notch, back in 2008, it was once recommended that the Central and East European New Member states postpone investment in renewable energy resources until the technologies had become more mature and prices had declined. However, as clearly illustrated in Table 2, the Central and East European New Member states have witnessed the highest rate of growth of renewable energy technologies. Though of course these countries have started from a somewhat lower level of renewable energy development, the use of renewable energy technologies rose 185% between 1990 and 2009, compared to only 126% in the Old EU member states (see Table 2).

Table 2. Change in renewable and bio-energy use, 2009 / 1990

	Change in RES use, exclud. Hydro (GIC 2009/1990)	Wood and Wood Waste Share of RES (GIC 2009)	Change in Wood and Wood waste Use (PEP 2009/1990)	Change in Wood and Wood waste Use (GIC 2009/1990)
EU27	133%	45%	85%	88%
EU15	126%	41%	62%	68%
NMS10	185%	76%	192%	174%
Austria	79%	46%	0%	83%
Belgium	386%	56%	139%	290%
Bulgaria	231%	67%	340%	329%
Cyprus	1533%	16%	50%	167%
CzR	171%	73%	143%	123%
Denmark	237%	52%	90%	164%
Estonia	290%	95%	348%	270%
Finland	44%	81%	50%	42%
France	35%	48%	0%	0%
Germany	493%	36%	281%	281%
Greece	89%	38%	-11%	-11%
Hungary	152%	77%	117%	128%
Ireland	433%	21%	70%	79%
Italy	157%	22%	310%	376%
Latvia	50%	80%	156%	91%
Lithuania	178%	86%	189%	167%
Luxembourg	611%	27%	127%	127%
Malta	0%	0%	0%	0%
Netherlands	377%	35%	189%	259%
Poland	302%	82%	258%	258%
Portugal	65%	52%	13%	13%
Romania	233%	71%	538%	522%
Slovakia	270%	51%	290%	273%
Slovenia	70%	48%	81%	61%
Spain	156%	27%	9%	9%
Sweden	39%	54%	67%	67%
UK	581%	24%	331%	447%

Source: own calculations based on Eurostat online data.

At the same time, in the NMS, a relatively large share of this gross inland consumption is from biomass resources, 95% for Estonia, 86% for Lithuania, 80% for Latvia, 77% for Hungary and 71% for Romania. While Latvia, Estonia and, to a lesser extent, Lithuania have a relatively extensive forest cover, Romania has significantly fewer available forest resources (MCPFE 2007: pp. 6, 8). Moreover, the use of biomass resources in Central and Eastern Europe has experienced quite rapid rates of growth. As a share of primary energy production (figures for Gross Inland Consumption are also included in Table 2), between 1990 and 2008 the use of biomass has grown some 174% in the ten New Member states compared to only 68% in the EU15. Though these numbers disguise some important outliers—e.g. biomass use in the UK has grown by 447%, in Italy by 376% and in Germany by 281% between 1990 and 2009—over the same period biomass use has grown most significantly in Romania (522%), Bulgaria (329%), Slovakia (272%), Estonia (270%), Poland (258%), Lithuania (167%) and Hungary (128%). Whether this represents a threat to available resources and the imperative of sustainable forest management remains to be seen.

The above data overwhelmingly illustrate two important points. ***First***, the adoption of RES technologies is extremely uneven across EU Member states. Moreover, as noted above, variation in the rate of adoption of renewable technologies is not solely influenced by relative national endowments. This in turn suggests that national level strategies for promoting the rapid adoption of renewable technologies vary significantly in relative effectiveness across Member states. ***Second***, relative income appears to play a strong role in determining what kind of renewable technologies are adopted. The New Member states favour less costly renewable energy technologies, in particular woody biomass. However, as illustrated above, *some* of the NMS have begun adopting significant amounts of wind or solar PV. Thus, apart from some natural locational advantages, national-level incentive systems presumably play an important role.

Thus strategies that encourage the adoption of a broader range of renewable energy technologies across the broad range of EU Member states seem desirable. Moreover, the relative advantages arising from the promotion of technology innovation and development across a broad set of technologies should be self-evident.

4. A more effective Toolkit? Refining EU climate change mitigation tools

Much could be done to speed up progress on the climate mitigation agenda and simultaneously to speed greater innovation and dissemination of renewable energy technologies in the EU. Though the EU and the MS have committed to significant emission and energy use reduction goals, the tools put into place to achieve those goals have the unintended consequence of reducing the overall efficiency of emission reduction efforts.

The reasons for this are straightforward. *First*, as illustrated above, beyond the Eastern Enlargement and the economic recession, most of the major progress is related to policy strategies that are *not the direct result* of EU policy efforts but instead are primarily related to national-level policy strategies and efforts. *Second*, the emission reduction potential in sectors *outside* the EU ETS is substantial, in particular in the areas of reducing building-related energy use, transport and LULUCF. Yet these sectors are typically not well mobilized in the EU Energy and Climate Package. *Third*, the EU climate strategy remains heavily compartmentalized. Countries have obligations in each of several categories: the EU ETS, the adoption of RES technologies, increasing energy efficiency and the reduction of energy use. The consequence is that individual Member states can ostensibly exceed their RES targets and reduce their emissions to well over the current 20% goal required by the EU Energy and Climate package for 2020, but still be required to meet EU ETS targets. Such a model is both awkward and inefficient.

A more successful EU strategy should *first* find ways of building upon the more successful RES technology adoption strategies introduced in individual Member states, *second* find ways of mobilizing the potential both in other non-ETS sector activities and across ETS and non-ETS sectors, and *third* develop mechanisms for linking each of these different areas in a more flexible carbon trading framework in order to mobilize trade in particular *across* ETS and non-ETS sectors. The current EU climate policy framework, the EU ETS, RES technology adoption targets and EU energy efficiency guidelines may encourage continued efforts on the part of individual MS, the power sector and high-emitting firms. However, the introduction of more effective tools could potentially push MS to go much further.

While the economic recession has affected all MS, its transient nature means its effects will not be long-lived and significant reversals will result. Further, though much of the experience of the NMS cannot be repeated, locking-in some of this progress as quickly as possible and building upon it would be advantageous. FIT systems, as well as the carbon tax model treated in more detail below, though unevenly applied across MS, can in fact be transferred to other EU MS and to the EU-level as whole. Strategies to link trading mechanisms across the different emission reduction systems would likewise permit greater flexibility in the strategies chosen by individual Member states and presumably raise the overall efficiency and effectiveness of emission reductions. Thus, to improve overall cost-efficiency, rapidity and relative burden-sharing in emission reductions, these three modifications of current EU strategy should be given greater consideration.

4.1. FIT systems

Considerable variation in both the strategies adopted at the national-level, as well as performance across the EU MS, speaks in favour of the promotion of revised tools for the rapid adoption of renewable energy technologies. Typically, feed-in tariff (FIT) systems that pay producers higher fixed tariffs for energy produced with RES technologies have most efficiently encouraged rapid adoption. Germany and now Spain and Portugal provide representative examples. In general, countries that have introduced "*differentiated*" FIT systems have been able to promote high rates of RES technology adoption at a relatively reduced cost (Altmann et al., 2010a). Moreover, such strategies appear to have knock-on effects on the rate of technological innovation. The rate of RES technology adoption has triggered considerable growth in the RES technology market, widespread competition across a large number of producers, lower prices and improved technological potential.

To-date, the EU has done little to intervene in national-level MS RES promotion strategies other than to set very broad targets on the adoption of renewable energy and to promote what is called the Green guarantee of origin system. The new Green guarantee of origin system was introduced at the EU level along with the second Renewable Energy Directive (2009/28/EC)[92] and is essentially intended to promote trade in renewable energy credits across Member states. However, it is not likely to have a significantly advantageous impact on RES technology adoption. The principal reason is its failure to provide a framework for the differentiated promotion of renewable energy sources. The Green guarantee of origin strategy (Art. 15) grants one green certificate for one MWh of RES energy produced, irrespective of technology type. This approach, closely modeled on the Renewable Obligation strategy employed in some Member states (e.g. the UK) has done little to promote the rapid adoption of renewable energy and has typically proven to be more expensive as a strategy. Moreover, like the Green guarantee of origin model, it is insensitive to differences in technology. FIT systems, on the other hand, can offer different tariff rates for different technologies, thus making it possible to adjust for the varied cost of different renewable energy technologies. Since the EU level strategy rewards one MWh of effort with one MWh of credit, it is likely to encourage the large-scale use of wind energy technologies and biomass at the expense of other renewable energy sources.

This has several disadvantages. Not all EU Member states enjoy large wind energy or biomass potential. And it remains exceedingly difficult to determine which renewable energy technologies will ultimately provide the best and cheapest future alternatives. Though some technologies remain expensive

[92]http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF.

(e.g. Solar PV), different renewable technologies have different advantages. Solar PV is perhaps one of the best potential strategies for reducing distances between points of production and consumption. On the other hand, it is not necessarily suitable in all locations (southern locations have better solar radiation than northern locations) and to-date it remains one of the more costly sources of renewable energy generation (though prices are falling fast). Wind power may thus represent a more favourable option for many locations, in particular where the amount of solar radiation is lower and where other renewable energy sources are not readily available. On the other hand, wind power typically requires large turbines that cannot easily be placed in densely populated residential areas. And the sheer number of wind turbines required to adequately meet all energy needs tends to make them unsightly.

An additional problem is related to the *intermittency* of many renewable energy sources (in particular the fluctuation of solar and wind power over time), the challenge of maintaining a continuous and secure supply of energy on the grid and the technological problems related to building adequate storage potential. Though more suitable storage technologies as well as more highly developed Smart Grid networks are now the cutting edge of technology development, non-differentiated strategies for the promotion of RES technologies fail to address this specific problem. In contrast to the intermittent character of wind and solar power, biomass combined heat and power, geothermal energy resources, ocean-based power sources and hydropower all provide *constant base load* power. Moreover, given favourable locational variables (adequate biomass resources or favourable geological resources), both geothermal and biomass-based energy resources are increasingly competitive (UCS, 2009, Ch.5). In the Scandinavian countries, biomass has become the energy source of choice for smaller scale combined heat and power generation. FIT systems can be more effectively tailored to suit varying needs and even to drive the introduction of new alternatives, such as storage technologies.

The current EU strategy is further unlikely to adequately adjust for the tremendously uneven character of support for renewable energy sources across the individual Member states. As suggested by the graphical representations presented above, a select set of individual Member states bear an unusually high share of the research and development costs associated with the promotion of renewable energy resources. Countries like Germany, Denmark, Spain, Portugal and even Bulgaria ultimately (though sometimes indirectly) fund R&D costs for Wind or Solar PV to the benefit of the remaining EU Member states. For the reasons discussed above, the non-differentiated character of the EU green guarantee of origin strategy will do little to resolve this problem. This general strategy of national-level promotion is not only inefficient. It is unlikely to bring the adequate critical mass to bear in order to bring about a successful and rapid shift in energy orientation across the EU as a whole.

An EU-wide FIT system, on the other hand, would go a long way to resolving these issues. It would enable a technology sensitive system for promoting both the development and the adoption of renewable energy resources across the EU as a whole. And in doing so, it would allow for the more rapid diffusion of renewable energy resources across a wider geographic space. Finally, such a system would be likely to promote more rapid technology innovation and thus successfully integrate the low carbon economy in European space.

Finally, much can be said about the benefits of FIT programs for reinforcing market mechanisms and driving technological innovation and development. FIT programs play a fundamental role in driving both the commercialization of new renewable technologies as well as their rate of adoption. Moreover, because of the way such programs are structured, they are likely to have a remarkably favorable impact on market forces. FIT tariffs are essentially paid to investor-generators, individuals all the way from small-scale households up to large-scale wind and solar farms who invest in these technologies for the purposes of power generation. Such investor-generators face strong market incentives to favor the most cost-efficient and potentially reliable renewable technologies available on the market, since these are likely to bring the best returns from FIT systems. Renewable technology producers, on the other hand, face strong market pressures to come up with the most cost-efficient technologies so that investor-generators will purchase them.

Though the pricing of FIT systems has occasionally caused headaches for individual countries (witness e.g. the recent case of Spain), their effective implementation provides powerful incentives for the rapid adoption of new technologies, as well as for rapid innovation, development and the commercialization of new technologies. Moreover, the hidden costs of auction-based strategies such as the UK model larger initial investments in order to file appropriate bids and waste significant resources when these fail. Such strategies not only artificially raise costs, they likewise inefficiently push most small-scale (e.g. household or even SME) producers out of the market.[93] Thus FIT systems, if appropriately structured, can encourage the development of highly competitive technology innovation markets. The withdrawal of support mechanisms, on the other hand, not only stymies adoption rates, it drastically slows rates of investment, innovation and market development.

4.2. Carbon taxes

The EU ETS system, with its focus on the power sector and high-emitting industry, almost entirely misses the potential contribution to emission reductions

[93] Though some argue such bidding systems will generate energy prices that are closer to real costs, it is generally not recognized that bidding systems have the impact of raising investment costs.

stemming from improvements in building-related energy use and/or reductions in natural gas use. At best curious in the current framework of energy security discussions (like oil, the adequate provisioning of natural gas is a highly sensitive energy security concern), strategies should be found to broaden the scope and application of the EU Energy and Climate Package to a much broader segment of emission sources and fuel types. A carbon tax is presumably the ideal tool with which to achieve this goal since it can easily be made to apply to a broad range of fossil fuels—including natural gas—and it can easily be applied to a far wider range of emission sources (not just the power sector and high-emitting firms).

Oddly, carbon taxes have been significantly less well researched than most of the other tools currently used in the EU toolkit. The reasons for this are a bit obscure. Many of the major organizations (mostly research institutes and NGO's) that track and collect data on country-level strategies for reducing emissions do not consistently keep or collect data on the use of carbon taxes. Thus, for example, the European Renewable Energy Council (EREC) lists a considerable amount of information on its website about the national policies pursued by individual EU Member states.[94] However, this information is for the most part less explicitly focused on the use of carbon taxes (or tax exemption strategies) than it is on the full range of other national-level strategies. However, EREC ultimately does a more consistent job of addressing carbon taxes than some of the other publicly available resources.[95] None of these resources, however, include an independent section comparing and discussing how carbon taxes are put to use across the EU 27 or provide tables with comparative data on carbon tax level or tax exemption amounts.

What is less clearly recognized in a broad range of studies is the relative advantage carbon taxes have offered to some countries. In particular, countries like Sweden and Finland have employed carbon taxes (or *tax exemptions* for the consumption of renewable fuels) to great effect, using them as a tool to progressively move individuals away from fuel oil and toward more carbon neutral energy sources such as heat from primarily small scale combined heat and power bio-energy plants and increasingly geothermal heat pumps as well. Though countries like Finland and Sweden, in particular, have made only limited progress in the adoption of renewable energy technologies like wind or solar power, in population-weighted terms they are at the top of the scale regarding the adoption of renewable energy technologies and the use of biomass resources in both energy production and consumption.

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[94] See: http://www.erec.org/policy/national-policies.html.

[95] Other agencies that closely track the adoption of renewable technologies and national level strategies are: the EurObserv'ER barometer, REN21 and also the German Ministry for the Environment, Nature Conservation and Nuclear Safety.

The introduction of a carbon tax could significantly help re-distribute the burden of reducing emissions across a much broader segment of industry and society. If we accept the analysis that most of the emphasis of the EU climate strategy is placed on the emission trading scheme (ETS), then it behooves us to find strategies for redistributing this burden more evenly, especially when many of the strategies for reducing energy use and thereby reducing emissions are also among the most cost-efficient. Building-related energy use contributes approximately 40% to global emissions. Further, natural gas use, despite the fact that it is approximately 60% as carbon-intensive as coal, is only marginally influenced by the EU ETS and its use gives rise to significant energy dependencies—especially in countries who are large importers of Russian natural gas. In this context, a strategy that has only a relatively weak impact on natural gas use makes little sense. Strategies could and presumably should be devised to promote both reduced natural gas use as well as reduced electricity use.

A carbon tax is meaningful in particular because of its potential broad application across a wider range and broader use of carbon-based fuels. Such a policy strategy could ultimately even the burden of pursuing carbon-reducing strategies by spreading them more broadly across the full range of carbon-based fuel uses and by targeting a much broader segment of industry and also building-related energy use (commercial, public, residential). Households in particular face few changing incentives to reduce overall energy use and, in particular, natural gas use under the current EU strategy.[96] Yet with a carbon tax imposed on all fossil fuels based on their carbon content, price signals could be more effectively used as an incentive to discourage fossil fuel use and thus favor carbon-reducing strategies on a broader scale.

Carbon taxes are deservedly controversial as a strategy. This is true for several reasons, not the least of which is the political problems associated with their introduction, nor the neo-liberal position that government already intervenes too frequently in the lives of individuals without promoting adequate added value. In the EU, the introduction of an EU-based taxation framework has likewise proven difficult due to MS resistance.

Perhaps the most important reason why carbon taxes are controversial, however, is perhaps the least frequently mentioned. The justification for carbon taxes is usually explained in terms of an overly simplistic behavioural paradigm: a simple change in price is assumed to => (*lead to*) behaviour modification. The conventional logic argues that *if prices are raised* via the means of a tax on

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[96] Since electricity producers face changing carbon prices, to the extent possible, price changes will be passed on to consumers. Thus price signals may drive changing behavior with respect to household electricity use. The same relationship, however, is not true for building-related natural gas use. In this regard, households (and other users of buildings) face no or fewer significant incentives to alter their energy consuming behavior where natural gas is concerned.

fossil fuels, *consumers will immediately alter their behaviour and stop consuming fossil fuels*. The real world however is never so simple. For one, most energy prices (electricity, engine fuels, natural gas and even coal) are more and more erratic. Other factors such as world demand, economic crises and relative supply (*OPEC* or *peak oil*) have equally or significantly larger price impacts. The ability of the average individual to sift through multiple factors and single out the relative impact of carbon taxes from among many potentially larger causes of price fluctuations is limited. And frequently carbon taxes, if present, exercise only a marginal influence on relative prices.

The second most neglected problem is inelastic demand. Thus even when prices rise as a result of carbon taxes, consumers may not change their behaviour due to the lack of reasonable alternatives. A classic example is the imposition of fuel taxes in an attempt to motivate consumers to drive cars less frequently, find alternative means of transportation or purchase more fuel-efficient vehicles. Unless alternatives are available, many or even most consumers will not alter their behaviour but will simply absorb the higher prices. Moreover, the rate of change in fuel efficiency over the years has been quite small. The average automobile consumer faces a complex set of variables (size, functionality, convenience, comfort, etc.). Fuel efficiency of course is only one of many variables driving consumer decisions. And many individuals likewise frequently have few alternatives to the daily commute.

The point is that unless meaningful alternatives or complementary carbon neutral alternatives (or products) are available, consumers are not likely to significantly alter their consumption habits and carbon taxes will not have any meaningful impact on behaviour. Energy price increases going into the 2008 economic recession and the economic crisis itself have done far more to change both consumer behaviour as well as to provide adequate incentives for car producers to change the range of vehicles and technologies they offer to consumers. Of course significant changes in price—whether driven by taxes or some other phenomenon such as increasing scarcity—are likely to have a significant impact on consumer behavior. But significant price increases initiated by carbon taxes are politically quite difficult to introduce and politicians face diminishing incentives to impose taxes the greater the required change in price.

On the other hand, there are at least two very meaningful justifications for carbon taxes. *First*, carbon taxes can easily be imposed on *a wide variety of fossil fuels* and thus potentially *impact a far broader range of consumption patterns* than, for example, the EU’s ETS. In this sense, carbon taxes can be both more evenly distributed across a *broad range of consumers*, thus sharing the burden more equally, and they can more effectively and meaningfully *target a wider range of fossil fuels*. This last point is particularly important with regard to the Achilles’ heel in the EU’s Energy and Climate Strategy, *natural gas*. Though building-related energy use (of which a significant part is natural gas use) represents some 40% of EU emissions, the EU policy structure only weakly targets this element, if at all.

Second, carbon taxes can be used in the same way the current EU ETS system is used. Carbon taxes can essentially impose a carbon price on fossil fuel consumption and thus affect relative price differentials between goods that are dependent on fossil fuels for their production and those that are carbon neutral. The advantage of this model, however, is its ability to target consumer behavior over targeting and directly penalizing individual firms. And in important ways, a carbon tax is a much simpler and far more bureaucratically streamlined tool for achieving the same goal across a much broader range of sectors and fossil fuels.

However, as suggested above, two additional features seem to be important with regard to the potential success of carbon tax strategies. The *first* of these is the presence of complementary alternatives. Without significant changes in fuel efficiency and thus the availability of real alternatives, individuals are likely to make their consumption choices based on other variables. *Second*, given the occasionally high cost of initial investments (e.g. re-insulating a building or installing a new geothermal heat pump), and/or the low impact of increased efficiency on consumer budgets (savings of $10-20/month on energy bills may not be persuasive enough to drive significant changes in consumer behaviour), the imposition of a carbon tax alone may not be adequate to motivate significant behavioural changes. In this regard, additional complementary government-driven strategies (rebates, additional tax exemptions, one-time offers, etc.) are presumably a requirement.

4.3. Linking mechanisms

The trading of carbon credits is for the most part restricted to the power sector and high-emitting firms, i.e. to the EU ETS system. As such, powerful incentives to encourage emission-reducing activities are unevenly applied across different emission sources. Moreover, the cost of making emission reductions in individual compartments or sectors of national economies varies considerably both from sector to sector and from country to country. Though reductions in building-related energy use are thought to be the most cost-effective, the EU strategy for the non-ETS sector only promotes a small amount of effort, and that primarily in countries that presumably have the least to gain (i.e. have already made the greatest progress in energy efficiency relative to other EU Member states).

Many have attempted to place an increased emphasis on energy efficiency goals. The 3C initiative in particular points to the high potential return (economic reward) from heavily investing in energy efficiency and building-related energy use.[97] Tindale from the Centre for European Reform argues that energy efficiency represents "the most pain-free way for European governments to fight climate change".[98] The *European Environment Agency* likewise suggests that energy efficiency efforts should be strengthened. Only a very small share of current emission reductions can be attributed to sectors outside the EU ETS and thus to energy efficiency (EEA, 2010, p.9). And the European Climate Foundation (2010) recently published a report detailing the need for more concerted energy efficiency efforts, noting that the EU MS would need to triple their efforts in order to reach 2020 climate goals for reducing energy use by 20%.

Despite the great potential for efforts related to increasing energy efficiency, policy efforts have to-date typically not succeeded in achieving their goal. Certainly one reason for this is the fact that no binding targets have so far been set on energy efficiency (Altmann et al., 2010b). The EU strategy so far only provides guidelines for relevant energy efficiency efforts. Thus, to-date, at least three separate tools for promoting significant advances in energy efficiency have not been adequately explored. The *first* of these—binding targets—could potentially go a long way to encouraging MS to get serious about energy savings. Though several attempts have already been made to make gains in energy efficiency binding on MS, these have so far failed. As suggested above, the *second*, a carbon tax, could likewise have a significant impact on a broad segment of energy users and could be applied to a broad range of fuel types (not only those that are electricity generation related, but also to natural gas and/or fuels). Attempts to pass a carbon tax at the EU level have likewise failed.

The *third* and potentially the most effective tool, however, for raising energy efficiency—making it possible to trade improvements in energy efficiency in carbon trading schemes—has been less widely explored. The reasons for this are at best obscure. Some certainly fear that including too many options into an emission-trading scheme is likely to reduce carbon prices and thus weaken the effectiveness of the system and strategy. Such argumentation, for example, is frequently used to restrict the augmentation of the EU ETS system to other sectors such as the non-ETS sector or to land use, land use change and forestry, LULUCF. In this regard, insistence on maintaining high carbon prices in the EU ETS may represent one of the principal barriers to creating more flexibility in the EU climate strategy.

Such concerns however seem misplaced. To-date, carbon prices have played perhaps the weakest role in moving emission reductions forward. As suggested by the data presented above, national level strategies for reducing emissions—and in particular for encouraging the rapid adoption of renewable

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[97] The work of the 3C Initiative is based on 3C (2009) and the previous work of affiliated organizations McKinsey (2008) and Vattenfall (2006).

[98] See "The EU Should be Much Bolder on Energy Efficiency" (CER, Oct. 12th, 2010).

energy technologies—have ultimately been far more successful. These, what one might call "*positivist*", approaches may ultimately provide a more solid groundwork for rapid progress than the EU ETS system and its imposition of carbon prices.

At the same time, creating more linkages across the multiple Kyoto (KP) and in particular EU trading mechanisms would appear to represent an invaluable strategy for propelling movement forward based on the principles of cost-efficiency and the ease of achieving emission reduction goals. Much of the potential field for achieving emission reductions is currently poorly mobilized in the EU framework. This could, presumably, be dramatically improved.

In important respects, the degree of *inflexibility* in the EU carbon trading and emission reduction scheme(s) is frequently underestimated. This inflexibility however is evident at many levels. For one, emission reductions and/or avoided emissions promoted across the different elements of the EU climate policy structure are not tradable across the same space. Thus, for example, even if individual countries manage to meet their Kyoto targets specified in the EU burden-sharing agreement, they can still remain behind on targets related to the introduction of renewable energy or emission reductions in the non-ETS sector. Without flexibility across the system, EU Member states remain subject to multiple targets, not all of which can easily be met.

In a similar fashion, some Member states will be forced to pursue costly emission reductions in the EU ETS sector, while neglecting emission reductions that can frequently lead to positive returns in the non-ETS sector (in particular with regard to building-related energy use). This particular problem is perhaps most pronounced in countries with more limited resources to invest in new production technologies. While the NMS have great potential to reduce GHG emissions from building-related energy use—in particular due to years of subsidized energy prices and far more limited use of energy efficiency technologies—the EU policy package, and in particular the EU ETS system, forces them to invest the larger share of their resources in one place.

Likewise, the EU climate policy framework continues to restrict countries from taking advantage of the opportunities afforded by increased efforts at supporting European forest growth. This last restriction on individual Member states efforts is particularly difficult to understand, in particular in the context of the advantages forests can provide on both the climate change mitigation and adaptation fronts (see e.g. Ellison et al., 2011). Despite these potential advantages, EU climate policy still prohibits trade in emission reductions produced in the LULUCF sector.

A more flexible EU climate policy framework should permit the complete fungibility of avoided and reduced emission credits across all potential segments or sectors of the climate change mitigation framework. Only in this way can emission reductions be achieved at the lowest possible cost and with the highest rate of return. Moreover, absolute flexibility in the pursuit of both targets and emission reductions would significantly help to encourage rapid emission reductions and the rapid promotion of renewable energy technologies.

5. Discussion

These findings cast doubt on the effectiveness of EU tools for achieving grand scale emission reductions over long periods of time. The EU commitment strategy and the EU ETS do not appear to be the most effective strategies for promoting emission reductions and technological change. At least one NGO predicts the EU ETS will deliver only a 0.3% reduction in emissions (Sandbag, 2010) compared to the total 8% reduction to which the EU has committed for 2012. This is a very small contribution for an institutional and administrative structure that requires a considerable measurement, monitoring and certificate trading bureaucracy. Moreover, the quite massive financial sums redistributed through the ETS trading mechanism – annually approx. 30-35 billion € (Zachmann, 2011: p.2) – suggest the "*expense*" may far outweigh the usefulness of the strategy. To be fair, the EU ETS system is not likely to begin to have a real impact on emissions until the beginning of Phase 3 in 2013. Only after this date will the transition from grandfathering to the required auctioning of emission credits begin to give the EU ETS real teeth.

In contrast, the adoption of renewable energy technologies in the individual EU Member states has already played a decisive role in the avoidance of GHG emissions. Depending on how "avoided" emissions are calculated (the baseline can be considered against coal-based energy production, any of the other fossil fuels (brown coal, oil, natural gas), or an average across all of these. Thus avoided emissions vary significantly depending on which of these fossil fuels is chosen as the baseline. Thus, for the EU 27 and depending on the baseline fossil fuel type, avoided emissions represent anywhere from 8-14% of total 2008 GHG emissions (natural gas use and coal provide the lowest and the highest estimates, respectively). An average across all of the fossil fuel types listed above yields an estimate of approximately 11% avoided emissions in the EU 27. Moreover, it is important to note that the relative share of renewable resources in EU27 energy generation has been growing steadily between 1990 and the present.

Conventional predictions have repeatedly suggested the adoption of RES technologies would be slow and painful. Most of the large organizations conventionally engaged in predicting future energy generation needs and technologies (the IEA, Capgemini and the European Commission) have argued the predominant share of energy will be fossil fuel-based for many years to come. Capgemini (2007), the European Commission (2007) and the International Energy Agency (IEA, 2007b, Ch.1) have all suggested the role of fossil fuels will make up some 80% of new capacity through 2020 or 2030. Early in fall 2010, however, the European Commission was compelled to recognize that actual progress in the adoption of RES technologies is rapidly outpacing predicted progress. With the reportedly quiet publication of its *Energy Trends* update for 2009, the Commission finally acknowledged a significant shift toward renewable energy sources was underway.[99] This recognition is especially important, since it may open a pathway for the adoption of an improved strategy.

6. Conclusions

Without the introduction of reformed strategies at the more centralized EU level, current EU policy is likely to lead to important imbalances and distortions across the EU Member state economies. Though the EU as a whole has good chances of meeting and keeping its KP commitments, this is not necessarily the result of the good performance of the older EU15 Member states that initially signed the Kyoto Protocol in 1997, but is instead primarily the result of the performance of the Central and East European New Member states. Moreover, not only have these countries radically reduced emissions, they have also made significant progress—in particular based on their relative EU income—in the adoption of renewable energy technologies. The NMS are not alone in this regard, a select number of Western EU Member states have also made significant progress, both with emission reductions as well as with the rapid adoption of renewable energy technologies. However, this performance is at best uneven and could (some might say “*must*”) be significantly improved.

Reform of the EU climate strategy is important for several reasons. First, much could be done to spread the positive performance of the NMS’s and the select group of Western states more evenly across the wider range of EU Member states. Failure to transfer more successful policy tools to the EU level means that a select group of more successful countries are over-subsidizing both the adoption of and innovation in RES technologies in the EU. Such market distorting outcomes are neither in the EU’s interest, nor in that of the subsidizing countries.

A EU-wide strategy could achieve several important goals at once. It could: accelerate the rate of emission reductions and RES technology adoption, accelerate the rate of innovation and create a more level playing field across EU Member states in terms of the adoption and spread of RES technologies. Finally, the adoption of an EU-wide carbon tax would help re-distribute the emission reduction burden across a far broader segment of the economy as well as across different fossil fuel types, thereby reducing the potential economic distortions likely to arise from uneven performance. This would further have the benefit of including and incorporating a significantly broader range of Western MS states into the Kyoto mission.

Second, significant reform could help spread the adoption of a wide variety of renewable energy technologies across a broader set of countries.

[99] See in particular; “64% of new power to be renewable over next decade”, (EurActiv.com, Sept. 16th, 2010).

Currently there is a relatively clear trend toward supporting the adoption of the cheaper RES technologies in the NMS. This trend cannot be easily explained on the basis of national comparative advantage in specific technologies and appears to be the direct outcome of a mix of both national level strategies and relative income. This trend could be reversed with a RES technology promotion strategy such as an EU-wide FIT that is firmly supported at the EU rather than only at the national level.

Third, significant reform of the EU climate strategy could help lock in the successful performance demonstrated by a broad range of countries. Renewed economic growth, though slow to materialize, will pose a significant threat to the quite significant emission reductions that have already been achieved across the EU as a whole.

The structure and shape of national level policy instruments in particular go a long way to explaining the successful comparative performance of a number of individual EU countries. These successful strategies—and EU-wide FIT system and broadly based Carbon Taxes—along with the introduction of a more broadly based trading mechanism that allows for the complete flexibility and fungibility of carbon reduction efforts are likely to significantly propel the further reduction of EU emissions along a desirable path.

The current author does not wish to downplay the role of international commitments and target-setting, nor the quite significant role the EU has played in these negotiations. In the context of the rapidly increasing threats posed by global warming and climate change, these efforts are increasingly important. At the same time however, the commitment strategy is not able to explain the relative success in emission reductions across the individual EU Member states. Rather, the success of individual Member state policy packages and perhaps individual Member state commitment to emission reductions appear to do a much better job of explaining relative progress on the Kyoto goals.

Finally, it may be meaningful to consider that efforts to negotiate a Kyoto-II style agreement in future Conference of the Party meetings will fail. In this context, the fact that the policy framework proposed herein does not really depend on a commitment style framework may be an advantage. The policy framework proposed herein suggests that countries can make considerable progress toward emission reductions without a Kyoto style commitment framework. This does not mean the loss of the Kyoto framework would not have significant negative consequences for the global project of reducing emissions. Nor does it mean the climate policy framework proposed herein could be seamlessly integrated into the EU policy framework. Difficult negotiations across EU Member states would still be required. But progress is in some senses less dependent on a commitment style framework than is frequently believed.

The EU can clearly learn from this success and improve upon the overall climate policy package. Elevating the successful elements of individual Member state policy to the EU level and increasing the degree of flexibility across the different components of the EU climate strategy could help to achieve the goal of reducing GHG emissions and mitigating the climate challenge.

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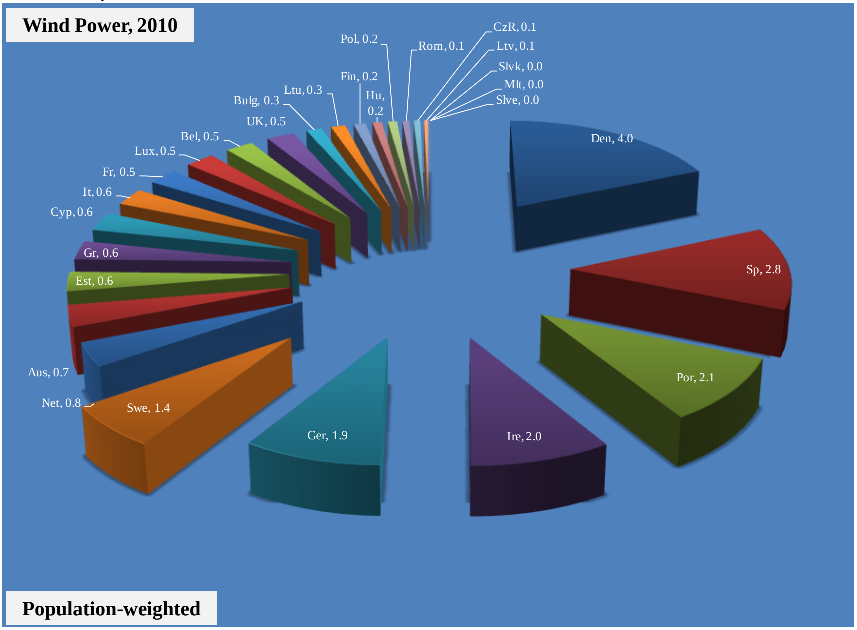
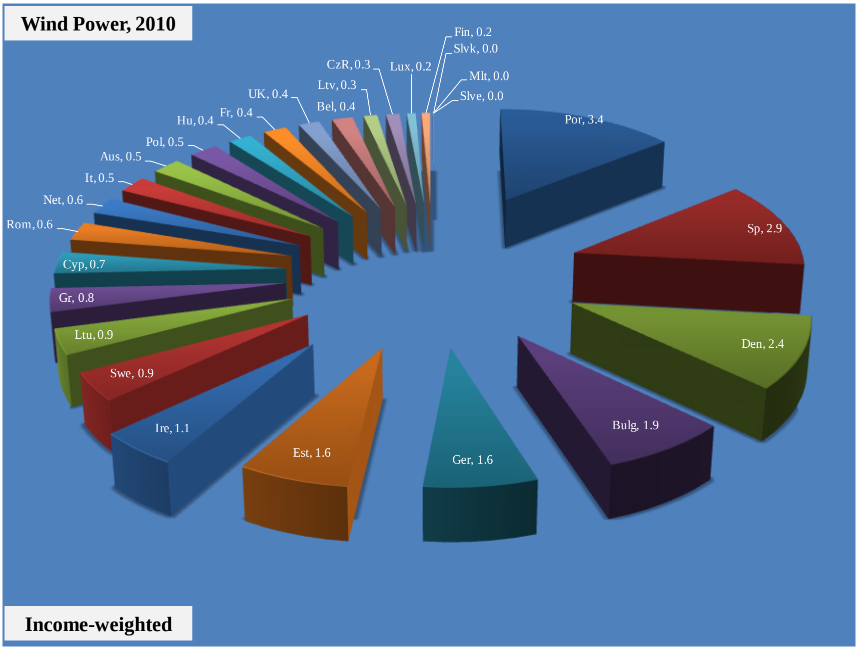
ANNEX

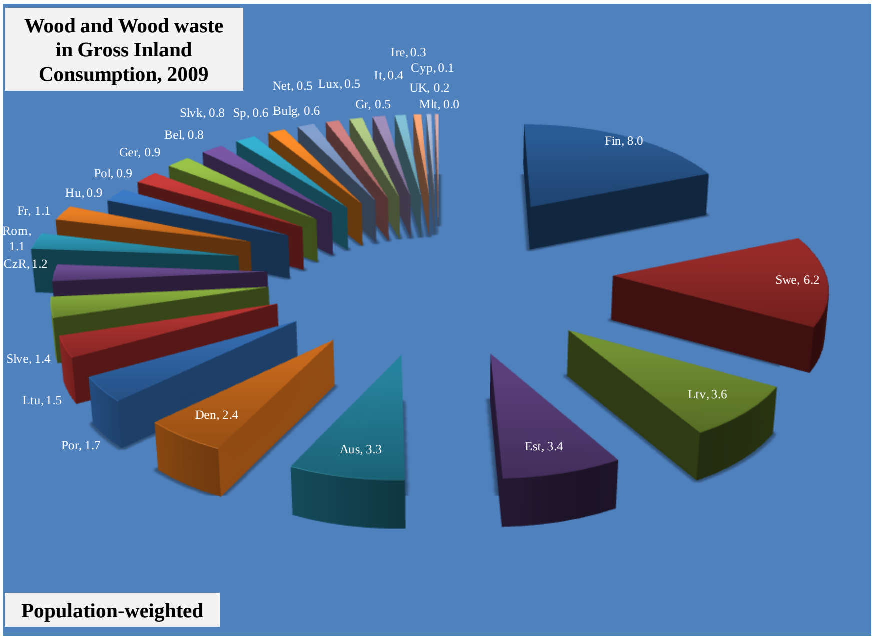
Figures 3 - 8. Share of renewable energy resource adoption by technology and country (weighted by population and income)

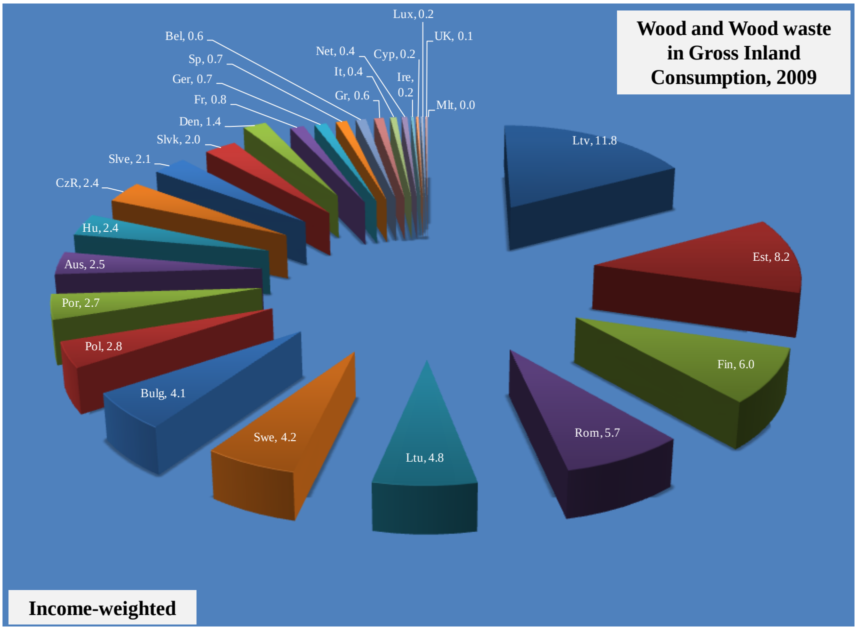
Figures 3 a, b



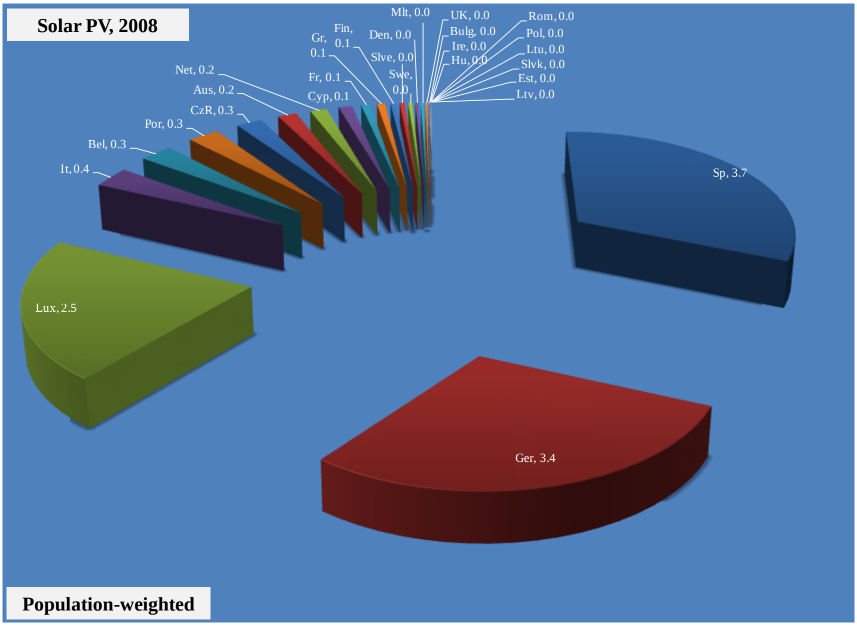


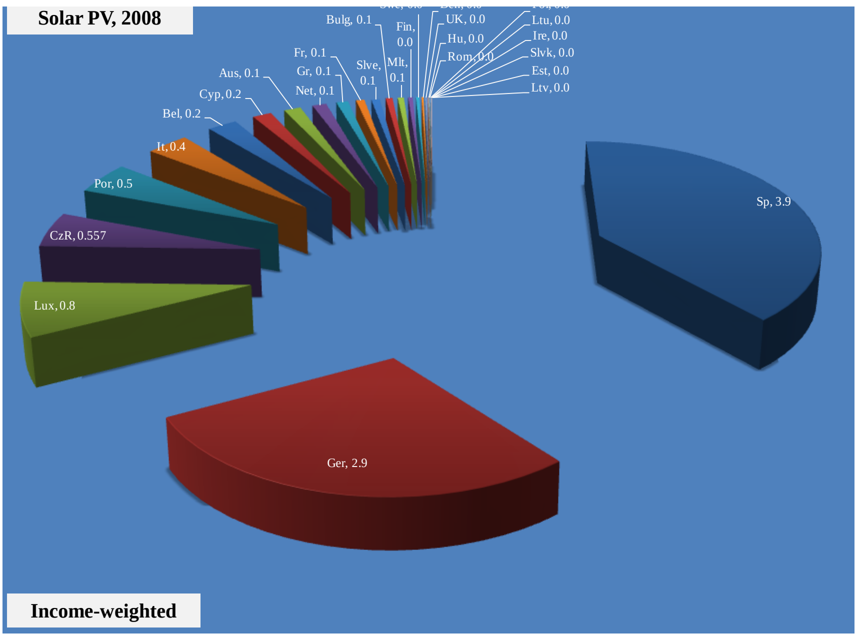
Figures 4 a, b


Wood and Wood waste in Gross Inland Consumption, 2009
Ire, 0.3
Cyp, 0.1
It, 0.4
UK, 0.2
Net, 0.5
Lux, 0.5
Mlt, 0.0
Gr, 0.5
Slvk, 0.8
Sp, 0.6
Bulg, 0.6
Bel, 0.8
Ger, 0.9
Pol, 0.9
Hu, 0.9
Fr, 1.1
Rom, 1.1
CzR, 1.2
Slve, 1.4
Ltu, 1.5
Por, 1.7
Den, 2.4
Aus, 3.3
Est, 3.4
Ltv, 3.6
Swe, 6.2
Fin, 8.0
Population-weighted

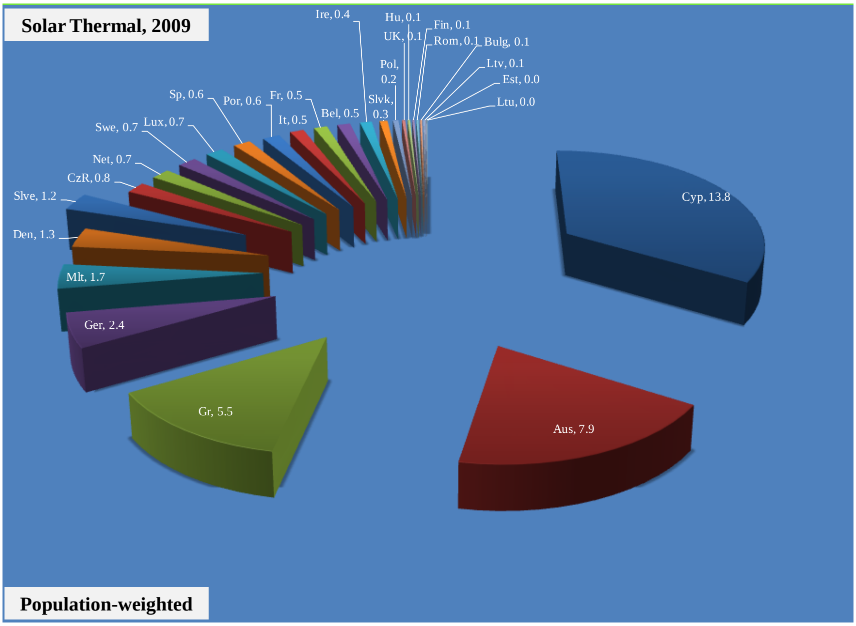

Wood and Wood waste in Gross Inland Consumption, 2009
Lux, 0.2
Bel, 0.6
UK, 0.1
Sp, 0.7
Net, 0.4
Cyp, 0.2
Ger, 0.7
It, 0.4
Ire, 0.2
Fr, 0.8
Gr, 0.6
Mlt, 0.0
Den, 1.4
Slvk, 2.0
Slve, 2.1
CzR, 2.4
Hu, 2.4
Aus, 2.5
Por, 2.7
Pol, 2.8
Bulg, 4.1
Swe, 4.2
Ltu, 4.8
Rom, 5.7
Fin, 6.0
Est, 8.2
Ltv, 11.8
Income-weighted

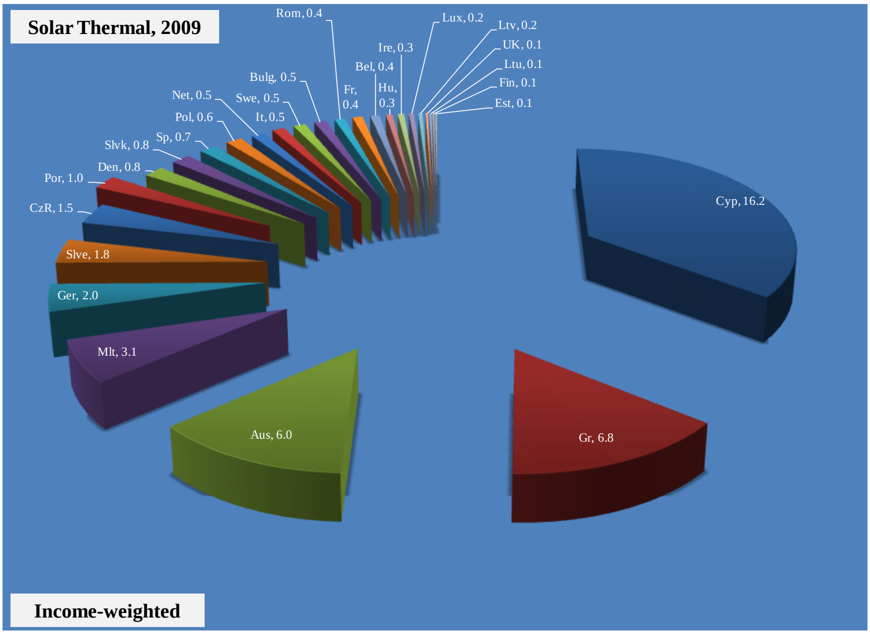
Figures 5 a, b


Solar PV, 2008
Sp, 3.7
Ger, 3.4
Lux, 2.5
It, 0.4
Bel, 0.3
Por, 0.3
CzR, 0.3
Aus, 0.2
Net, 0.2
Cyp, 0.1
Fr, 0.1
Gr, 0.1
Fin, 0.1
Den, 0.0
Slve, 0.0
Swe, 0.0
Mlt, 0.0
UK, 0.0
Bulg, 0.0
Ire, 0.0
Hu, 0.0
Rom, 0.0
Pol, 0.0
Ltu, 0.0
Slvk, 0.0
Est, 0.0
Ltv, 0.0
Population-weighted

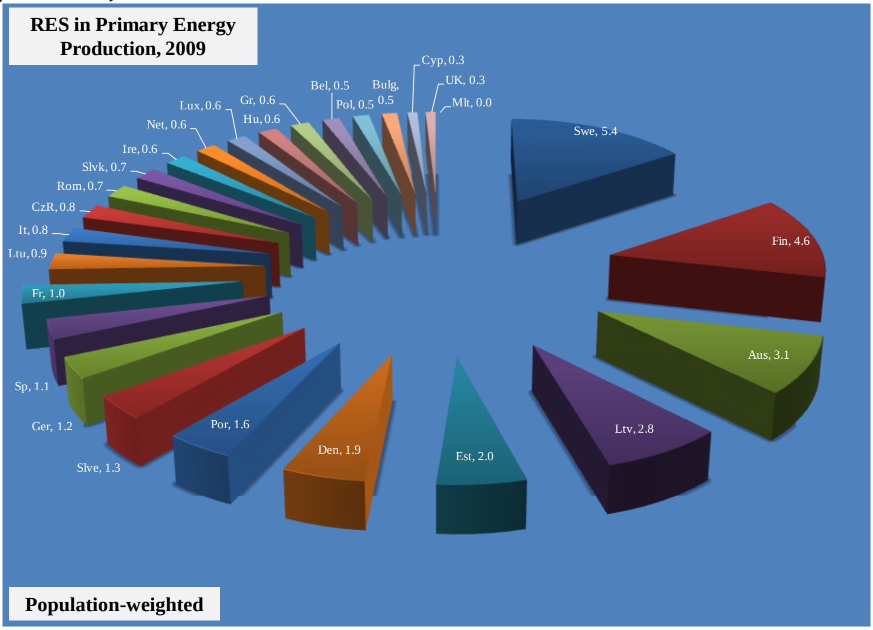

Solar PV, 2008
Sp, 3.9
Ger, 2.9
Lux, 0.8
CzR, 0.557
Por, 0.5
It, 0.4
Bel, 0.2
Cyp, 0.2
Aus, 0.1
Net, 0.1
Gr, 0.1
Fr, 0.1
Slve, 0.1
Mlt, 0.1
Bulg, 0.1
Fin, 0.0
UK, 0.0
Hu, 0.0
Rom, 0.0
Ltu, 0.0
Ire, 0.0
Slvk, 0.0
Est, 0.0
Ltv, 0.0
Income-weighted

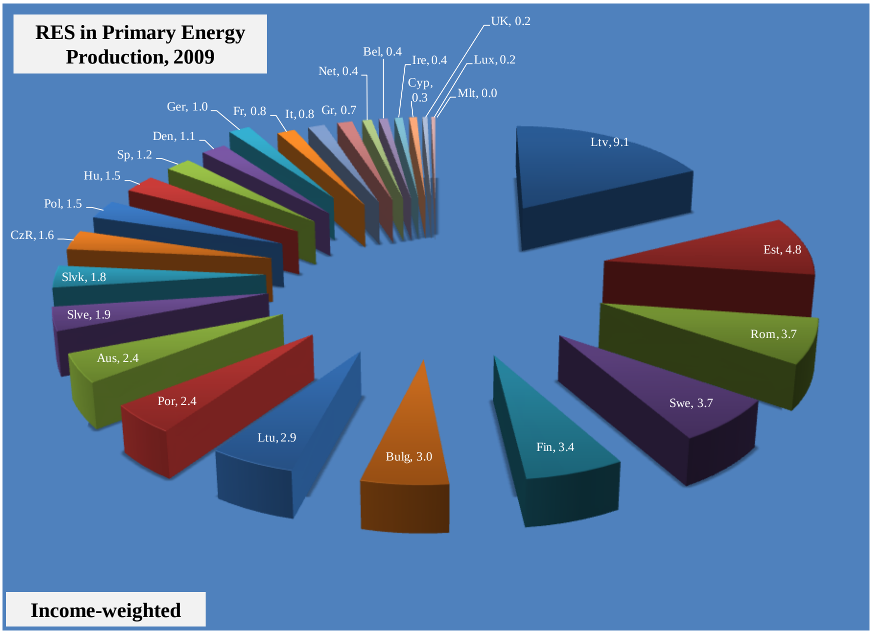
Figures 6 a, b


Solar Thermal, 2009
Cyp, 13.8
Aus, 7.9
Gr, 5.5
Ger, 2.4
Mlt, 1.7
Den, 1.3
Slve, 1.2
CzR, 0.8
Net, 0.7
Swe, 0.7
Lux, 0.7
Sp, 0.6
Por, 0.6
Fr, 0.5
It, 0.5
Bel, 0.5
Ire, 0.4
Slvk, 0.3
Pol, 0.2
Hu, 0.1
UK, 0.1
Fin, 0.1
Rom, 0.1
Bulg, 0.1
Ltv, 0.1
Est, 0.0
Ltu, 0.0
Population-weighted

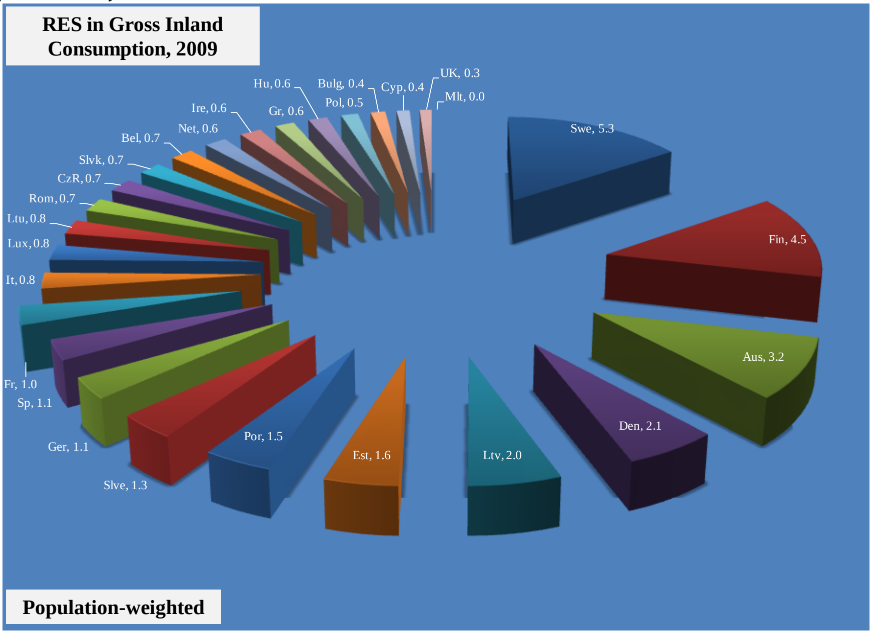

Solar Thermal, 2009
Cyp, 16.2
Gr, 6.8
Aus, 6.0
Mlt, 3.1
Ger, 2.0
Slve, 1.8
CzR, 1.5
Por, 1.0
Den, 0.8
Slvk, 0.8
Sp, 0.7
Pol, 0.6
Net, 0.5
Swe, 0.5
It, 0.5
Bulg, 0.5
Rom, 0.4
Fr, 0.4
Bel, 0.4
Ire, 0.3
Hu, 0.3
Lux, 0.2
Ltv, 0.2
UK, 0.1
Ltu, 0.1
Fin, 0.1
Est, 0.1
Income-weighted

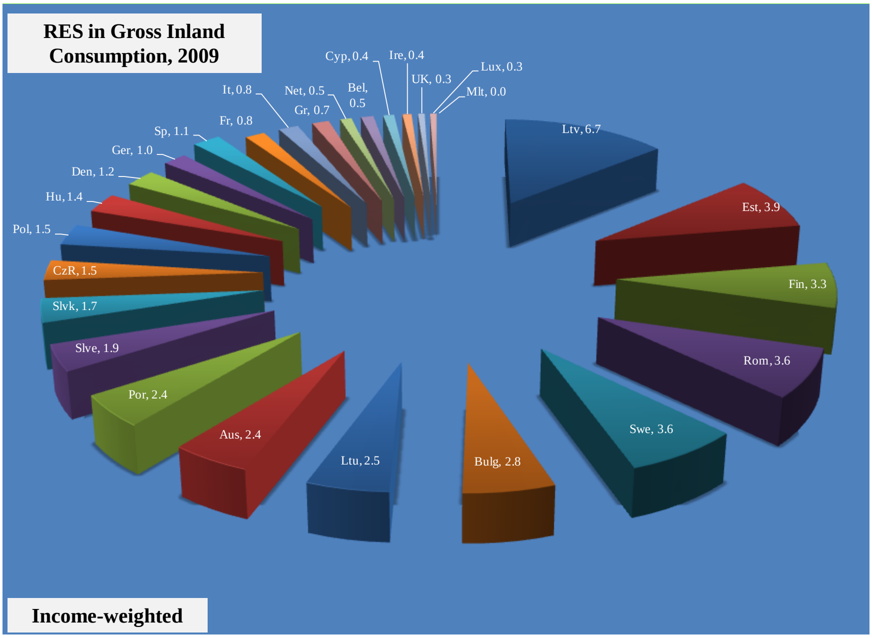
Figures 7 a, b


RES in Primary Energy Production, 2009
Cyp, 0.3
UK, 0.3
Mlt, 0.0
Bel, 0.5
Bulg, 0.5
Pol, 0.5
Lux, 0.6
Gr, 0.6
Hu, 0.6
Net, 0.6
Ire, 0.6
Slvk, 0.7
Rom, 0.7
CzR, 0.8
It, 0.8
Ltu, 0.9
Fr, 1.0
Sp, 1.1
Ger, 1.2
Slve, 1.3
Por, 1.6
Den, 1.9
Est, 2.0
Ltv, 2.8
Aus, 3.1
Fin, 4.6
Swe, 5.4
Population-weighted


RES in Primary Energy Production, 2009
UK, 0.2
Bel, 0.4
Ire, 0.4
Lux, 0.2
Net, 0.4
Cyp, 0.3
Mlt, 0.0
Ger, 1.0
Fr, 0.8
It, 0.8
Gr, 0.7
Den, 1.1
Sp, 1.2
Hu, 1.5
Pol, 1.5
CzR, 1.6
Slvk, 1.8
Slve, 1.9
Aus, 2.4
Por, 2.4
Ltu, 2.9
Bulg, 3.0
Fin, 3.4
Swe, 3.7
Rom, 3.7
Est, 4.8
Ltv, 9.1
Income-weighted

Figures 8 a, b


RES in Gross Inland Consumption, 2009
Hu, 0.6
Bulg, 0.4
Cyp, 0.4
UK, 0.3
Mlt, 0.0
Ire, 0.6
Gr, 0.6
Pol, 0.5
Net, 0.6
Bel, 0.7
Slvk, 0.7
CzR, 0.7
Rom, 0.7
Ltu, 0.8
Lux, 0.8
It, 0.8
Fr, 1.0
Sp, 1.1
Ger, 1.1
Slve, 1.3
Por, 1.5
Est, 1.6
Ltv, 2.0
Den, 2.1
Aus, 3.2
Fin, 4.5
Swe, 5.3
Population-weighted


RES in Gross Inland Consumption, 2009
Cyp, 0.4
Ire, 0.4
Lux, 0.3
UK, 0.3
Mlt, 0.0
It, 0.8
Net, 0.5
Bel, 0.5
Gr, 0.7
Fr, 0.8
Sp, 1.1
Ger, 1.0
Den, 1.2
Hu, 1.4
Pol, 1.5
CzR, 1.5
Slvk, 1.7
Slve, 1.9
Por, 2.4
Aus, 2.4
Ltu, 2.5
Bulg, 2.8
Swe, 3.6
Rom, 3.6
Fin, 3.3
Est, 3.9
Ltv, 6.7
Income-weighted