POLICY BRIEF Nr. 2

November 2014

Current EU Climate Policy: Impacts, Implications and Challenges

This policy brief summarises the insights produced by research into the sectoral, economy-wide and cross-cutting impacts, implications and challenges of the current EU climate policy mix. These insights provide valuable lessons for the future development of the EU's climate policy mix, particularly in light of the on-going discussions surrounding the 2030 Framework for Climate and Energy Policies.

Key Conclusions

For the EU policy mix as a whole, **six broad conclusions** may be drawn, as listed and discussed below. Of course, numerous other sector and topic-specific insights also arose from this research, as discussed in the relevant publications underlying this policy brief.

- **Conclusion 1**: the EU climate policy mix is uneven, lightly co-ordinated and difficult to define…
- **Conclusion 2**: …however, it has been effective in producing CO_2 abatement
- **Conclusion 3**: economic instruments are key but not sole drivers of policy-induced CO_2 abatement
- **Conclusion 4**: There is no evidence that 'carbon leakage' from the EU has occurred
- **Conclusion 5**: From a broad perspective, key EU climate policy instruments were economically neutral at worst – and probably beneficial
- **Conclusion 6**: 'Optimality' is difficult but improvements are possible

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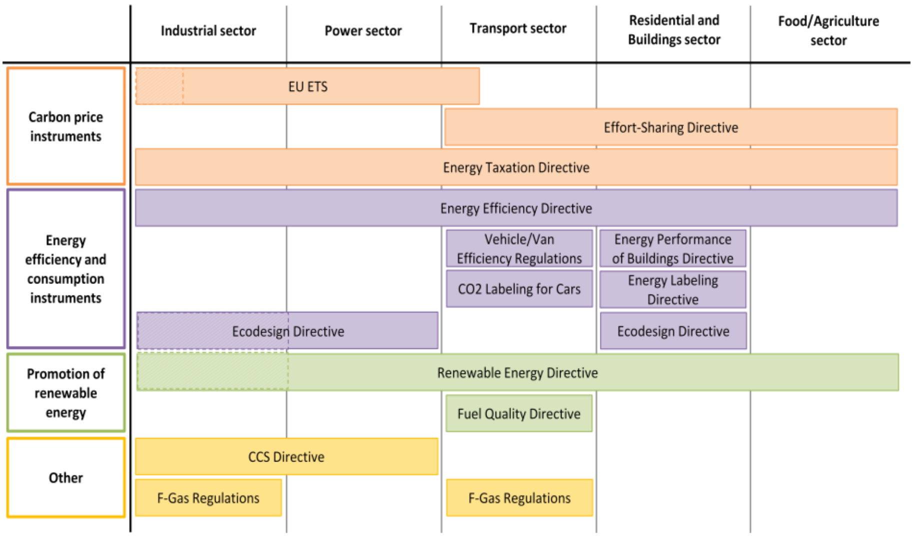
Funded by the European Union

Conclusion 1: The EU climate policy mix is uneven, lightly co-ordinated and difficult to define…

There are deep divides across sectors and between Member States concerning the number of instruments in place to tackle emissions, instrument design, scope, implementation and the level of ambition.

The landscape of policy instruments is most coherent in the power and industry sectors, with the EU ETS producing a single, EU-wide carbon price. However, the chronic oversupply of allowances since the onset of the financial crisis has resulted in a persistently low carbon price, rendering the ETS less effective than it could be. The power sector is also subject to instruments for the promotion of renewable electricity under the Renewable Energy Directive. Whilst feed-in tariffs (FiTs) are the most commonly used instrument (in 15 Member States—often in combination with other subsidies or loans), the specific design and scope of implementation is different in each. In combination with differing national circumstances (e.g., different national targets), this leads to great variation in the level and speed of renewable energy deployment and the associated cost.

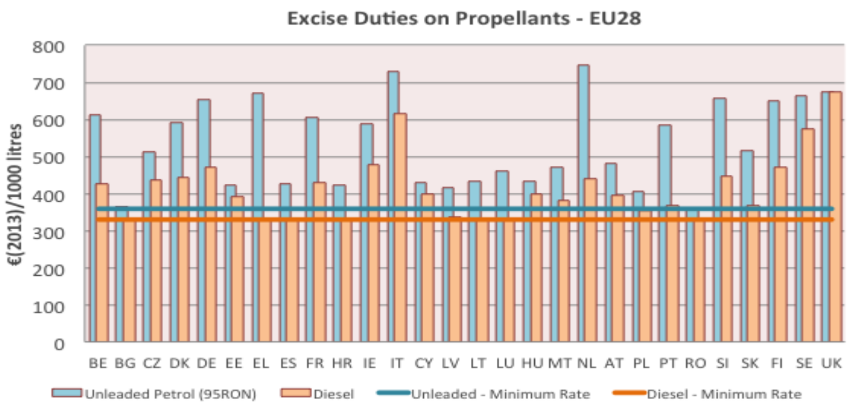
Figure 1: EU Climate Policy and Covered Sectors



It is not easy to determine where the boundary lies between 'climate' policy and other policies and instruments introduced for other purposes, but which also have an influence on GHG emissions. This, along with varied implementations of EU-level obligations between Member States, and the presence of unilateral policies, makes co-ordination between and the achievement of 'optimality' in the EU climate policy mix difficult.

The Energy Taxation Directive places uneven minimum taxation requirements on different energy carriers and sectors both in terms of energy and carbon content, with the highest minimum taxation placed on gasoline and diesel for road transport. However, as the Directive imposes only minimum rates, effective tax rates on gasoline and diesel are often much higher, producing substantial variation between Member States, as seen in Figure 2 below. Whilst other instruments, such as the 10% target for the use of renewables (mainly biofuels) by 2020 applies to all road transport, other key instruments such as CO_2 intensity and vehicle labeling regulations apply to passenger cars only. International aviation and shipping, both significant green house gas (GHG) sources, are effectively excluded from all instruments.

Figure 2: Excise Rates on Petrol and Diesel – EU28



Source: Máca et al, 2013

In all sectors, there are examples of policy instruments that have no explicit climate-related objectives, but nonetheless impact energy consumption and other GHG-emitting activities. This is particularly the case in the agriculture sector (see box below). Along with significant discretion afforded to Member States in terms of how to implement EU Directives and other EU regulations, most Member States pursue unilateral policies, targeting emission abatement across different sectors. Such policies, instruments and strategies may incorporate corresponding EU policies and targets, such as the *Energiewende* in Germany or the Carbon Price Floor in the UK, or tackle areas thus far outside of the scope of EU-level climate policy, such as Denmark's national carbon tax.

The mix of EU-level instruments at varied stages of implementation in the Member States, unilateral policies and a blurred boundary between climate and non-climate policies at all levels produces significant disparity in abatement incentives and costs between both sectors and Member States. This lack of co-ordination between instruments and spheres of governance, presents a real challenge in achieving an 'optimal' policy mix as defined by the CECILIA2050 project (see the final pages of this policy brief for a definition).

Agricultural Emissions and Policy in the EU – At present, no explicitly climate-related policy (focused on emissions abatement) exists for agriculture at the EU level. Instead, provisions in the Nitrates Directive and Common Agricultural Policy, both introduced for non-climate purposes, are likely to have had the most significant policy-related impacts on agricultural GHG emissions. Although unilateral instruments do exist at the Member State level, these are largely very recent, focus on information dissemination and R&D efforts (and therefore are without significant ambition in the short term) and are implemented on a voluntary basis.

Conclusion 2: …however, it has been effective in producing CO_2 abatement

According to the global economic-environmental model GINFORS (see box below) and the construction of a counterfactual scenario applied to it, the key policy measures introduced since 1995 (the EU ETS, instruments to promote renewable electricity and environmental tax reforms) **reduced CO_2 emissions in some Member States by up to 12-13%** below the counterfactual in 2008 (with significant variation across the Union). The abatement value is likely to increase in most Member States with the consideration of the impact of flanking instruments.

GINFORS – A global economic-environmental model that considers 38 country regions (and a 'rest of the world' region), 35 sectors, 59 product groups and 20 energy carriers. Agents make decisions in the model based on bounded rationality in imperfect markets, with international and inter-sectoral dependencies considered. The model contains a complete System of National Accounts (SNA) framework, allowing for the endogenous calculation of disposable income for individuals and government, which in turn determines demand for products and services, and thereby energy consumption. The share of energy production between energy carriers, and therefore CO_2 emissions, is determined by relative prices. Labour demand is determined based on sectoral demand and wage development.

Conclusion 3: Economic instruments are key but not sole drivers of policy-induced CO_2 abatement

Economic instruments have been essential in incentivising CO_2 abatement, but market failures and behavioural phenomena, along with flaws in economic instrument design and implementation, signify that regulatory and other corrective measures are also required. In some cases regulatory and non-economic instruments have produced significant abatement where economic instruments have underperformed.

While economic instruments are a crucial part of the climate policy mix, they are by themselves insufficient to effectively induce abatement where it may be required in all facets of the economy and society. Their effectiveness is limited by split incentives and other factors not considered in the standard economic interpretation of a 'rational actor' responding to price signals. In addition, the economic instruments currently in place in Europe suffer from design flaws, imperfect implementation and negative interaction with other climate and non-climate policy instruments, which limits their effectiveness and prevents governments from exploiting their full potential.

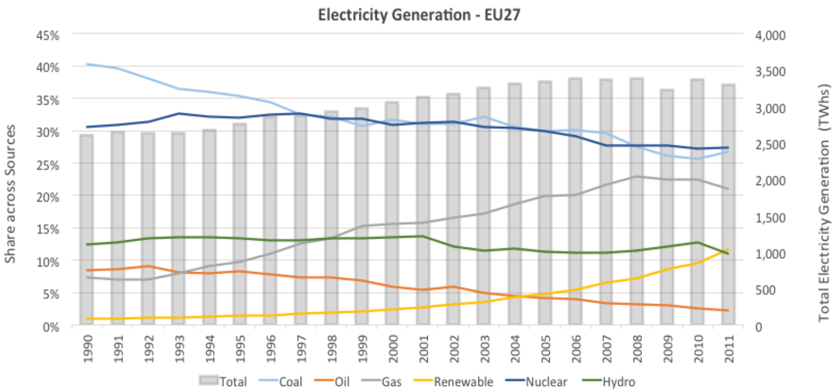
- **The EU ETS produced abatement of 1-3% in 2008** according to the GINFORS model. This was delivered principally through **fuel switching** from coal to gas in the power sector. However, the levels of induced abatement are likely to have varied substantially over time due to the instrument design preventing adaptation to unexpected developments and external shocks (e.g., initial oversupply of allowances in Phase 1 coupled with an inability to bank, and the financial crisis reducing demand for allowances in Phase 2 and beyond).

- **Instruments for the promotion of renewable electricity are likely to have induced a greater level of abatement, at an average rate between 3.2%**

and 3.9% across Member States in 2008** (depending on whether investment in renewables is considered in addition to or as a substitute for fossil fuels). Figure 3 below illustrates changes in electricity generation from 1990 to 2011 and depicts the rapid increase in renewable electricity generation in the EU (from 2.4% of total generation in 2000 to 11.6% in 2011). This rise is almost entirely due to dedicated support mechanisms, with the EU ETS having minimal if any effect. However, renewable electricity deployment and generation, and therefore attributable abatement, varies substantially between Member States with Germany achieving the highest estimated abatement of 7.88%.

- **The often-cited negative interaction between the EU ETS and the Renewable Energy Directive is unlikely to have occurred.** It is sometimes proposed that renewable electricity deployment depresses the ETS carbon price signal by reducing demand for emission allowances in the power sector. However, the level of renewable electricity deployment expected from the use of dedicated support mechanisms was considered when the EU ETS cap was set, meaning that only an overachievement of expectations would have produced this phenomenon. As fifteen Member States missed their indicative targets for renewable electricity deployment in 2010 (as set out by the 2001 Renewable Electricity Directive), a negative interaction between the two instruments is unlikely to have occurred.

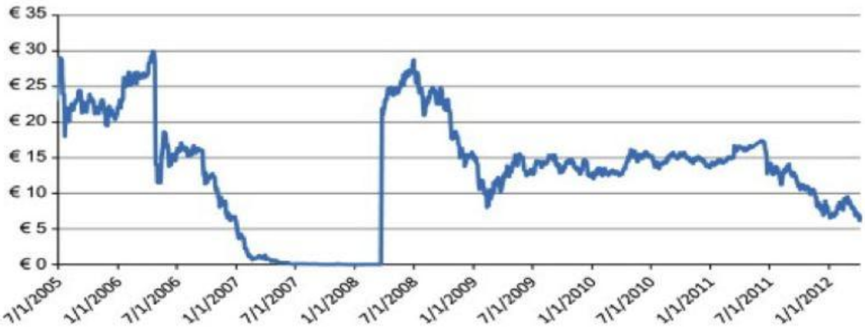
Figure 3: Gross Electricity Generation, in Total and by Source – EU27



Source: Agnolucci & Drummond, 2014

- **The EU ETS is likely to have triggered only minor technological innovation** in the power or industry sectors, due to low and volatile prices and relative unpredictability (see Figure 4 below)—although 'organisational' innovation, particularly surrounding the introduction of emissions monitoring and management systems, has likely been more substantial. **However, by contrast, there is evidence that renewable electricity support mechanisms have led to significant incremental product innovations**, particularly improved generating efficiency of existing technologies.

Figure 4: Trend in EUA Spot Price



Source: Drummond, 2014

- **The use of fuel taxes appears to be effective in influencing road travel demand but not significant in driving demand for more efficient vehicles.** However, incentives for both reduced demand and for more efficient vehicles by any road transport pricing instruments (including registration and circulation taxes, and often other road pricing mechanisms) are heavily distorted by company car taxation arrangements in most Member States (see box below). However, Regulation 443/2009, which sets binding CO_2 performance standards for new passenger cars, has been effective in improving the CO_2 efficiency of new cars, with the 2015 target of 130gCO_2/km achieved ahead of time. The effectiveness of such a broad-scope regulation is not (or at least, much less) affected by market distortions such as company car arrangements.

Company Car Taxation Arrangements – Whilst all Member States require employees to declare company car use as an in-kind benefit, the calculation to determine the proportion of the vehicle's catalogue price to be levied as taxable income varies (calculations may consider distribution of private and business use, age of the car, CO_2 intensity, etc.), although the rate usually falls between 10% and 30%. It is also common practice for the employer to absorb the cost of the fuel (via fuel cards, for example), rendering the use of a company car in place of private vehicle ownership financially attractive to employees. The employer also benefits, primarily through the deductibility of the VAT paid for vehicle and fuel purchase, as well as maintenance and repair costs. A company car as an in-kind benefit is also not liable for social security contributions (from either employer or employee). As such, the employee has little incentive to reduce fuel consumption, nullifying the effect of fuel taxation, whilst the employer is incentivised to purchase expensive, often CO_2-intensive cars.

Conclusion 4: There is no evidence that 'carbon leakage' from the EU has occurred

Whilst much of the *ex-ante* analysis predicted significant rates of carbon leakage, the *ex-post* evidence provided by econometric analyses detailed in two of this brief's underlying reports suggests that **no loss of competitiveness leading to carbon leakage has occurred amongst the Energy Intensive Trade Exposed (EITE) sectors**. Such sectors, which must be both energy intensive and exposed to international trade to be at risk of carbon leakage, include cement, ceramics, coke, glass, refineries, iron, steel and aluminium, and together account for around a third of EU ETS emissions (two thirds in non-electricity sector emissions). The difference between the *ex-ante* studies and *ex-post* results may be due to several reasons, including:

- Free allocation of EU ETS allowances in Phases 1 and 2, effectively removing the cost burden of the EU ETS on the industry sector, and potentially actively incentivising against abatement to maintain higher allocations in subsequent years and Phases.

- Lower, more volatile and less predictable carbon price evolution than projected in *ex-ante* studies. Also, many EITE firms hold long-term electricity supply contracts at agreed prices, insulating them from carbon price fluctuations and pass-through from electricity generators.

- Many EITE industries are also protected from levies designed to recoup the cost of subsidies for renewable (e.g., under the German FiT system).

- The non-consideration, or inadequate representation of other quantifiable and non-quantifiable factors such as capital abundance, labour force qualification, proximity to customers and infrastructure quality that may act to prevent carbon leakage due to the imposition of a carbon price.

Similarly, another factor may be the lack of consideration of other potential benefits of environmental regulation, such as first-mover advantages, climate 'spillovers' and the 'Porter Hypothesis.' Although, the evidence for these factors having occurred as a result of the European climate policy mix in European industry is mixed.

Conclusion 5: From a broad perspective, key EU climate policy instruments were economically neutral at worst – and probably beneficial

The results of our research show that the presence of the EU ETS, renewable electricity support mechanisms and environmental tax reforms overall did not reduce GDP in the EU, and likely had a positive impact. Employment is also likely to be higher in most Member States, with the exception of some of the smaller transition economies.

However, **the EU ETS, taken individually, is likely to have reduced GDP by an average of 0.5% across Member States in 2008, and reduced employment by an average of 0.34%,** according to GINFORS, due to EU ETS industries pricing-in the opportunity cost of freely allocated allowances. Conversely, under the assumption that investments in renewable electricity have been in addition to fossil fuel investment, rather than displacing it, **investment in renewable electricity is estimated to have increased GDP by an average of around 0.32% in 2008, and increased employment by an average of around 0.09%**, across Member States. This is a consequence of increased net demand for equipment produced by

> The EU ETS and Renewable Energy Directive, in combination, have likely had a broadly positive effect on GDP and employment. However, negative distributional impacts have been a problem, such as windfall profits for electricity generators and measures to protect vulnerable industries from a loss of competitiveness, which increase the cost burden on households.

domestic industries more than compensating for the net increase in electricity retail prices as energy suppliers and governments attempt to recover the cost from support mechanisms. Assuming that investment in renewable electricity fully displaced the equivalent investment in fossil fuels, both GDP and employment in 2008 would have been 0.17% and 0.14% higher in 2008 respectively without these instruments. Whilst the true situation is somewhere between these two binary assumptions, it is likely that it rests more towards the assumption that investment in renewable electricity has been additional to investment in conventional power.

Despite overall positive macroeconomic effects, distributional concerns remain. For example:

- The carbon cost pass-through of the EU ETS price from electricity generators to the wholesale price of electricity varies substantially over time and between Member States (from negative to more than 100% of the price). However, any positive value across Phases 1 and 2 (2005-2012) represents the pass-through of opportunity costs, as more than 95% of all allowances were allocated for free during these initial phases. **This has generated substantial windfall profits for the European power sector – essentially a transfer of wealth from consumers to generators.**

- **The increase in renewable electricity generation**, which generally has zero marginal costs of generation (as fuel costs—wind and sunshine—are free), **acts to reduce average wholesale electricity prices**—a reduction consistently over 10% in Germany and Spain. However, support mechanism costs have more than counteracted this phenomenon, producing a net increase in retail prices.

- **The net increase in consumer electricity prices falls disproportionately to the European residential sector**, as Member States exempt industrial power consumption for fear of damaging the international competitiveness of domestic industries.

Conclusion 6: 'Optimality' is difficult, but improvements are possible

It is clear that the existing climate policy mix cannot claim to be optimal: both in terms of the efficiency and the effectiveness of the policies in place. There is much room for improvement. However, while better solutions can be identified in theory, policies as applied in real-world situations face trade-offs and compromises within and between the three components of 'effectiveness,' 'cost efficiency' (static and dynamic) and 'feasibility.' Based on the research produced by the CECILIA2050 project, several 'lessons learned' can be used to enable improvements to the existing policy mix to be investigated and pursued.

One key lesson highlights the importance of political feasibility in regards to policy coherence. The political economy in each of the 28 Member States is different; each country has varied positions and preferences surrounding climate policy and its components, in turn generating considerable difficulty in reaching a common EU-wide agreement. The preferences, politics and interactions of the European institutions add another layer of complexity, which may drive or hinder the development of climate policy. Such factors may change, however, and sometimes very rapidly so. This was seen, for example, with the introduction of the EU ETS, which the EU initially opposed in favour of a carbon tax. Several factors converged to produce an abrupt reversal, including the failure to agree on a carbon tax, but also more mundane factors such as personnel changes at the EU Commission, and the active involvement of foreign experts in fostering better conceptual understanding of emissions trading.

For academics analysing EU climate policy, experiences such as this one point to a fundamental dilemma. On the one hand, it is their role to derive recommendations based on the fundamental principles of their respective disciplines, be they economics, political or legal sciences. And such recommendations will be geared towards some notion of an optimal policy mix, reflecting these same principles, even though the recommendations are made in full awareness that this optimal solution will probably remain unattainable in practice. On the other hand, there is a real risk in providing recommendations that are entirely consistent with underlying theories, empirically well-founded and based on state-of-the-art analysis as they may be at the same time utterly useless in practice because they ignore key constraints related to political feasibility. Looking forward, this tension is likely to remain a challenge—given the high level of ambition of Europe's 2050 climate goals, and the radical transformation they imply for its economy and society, in contrast to the considerable political, institutional and legal constraints under which EU climate policy operates.

Further Reading

Agnolucci, Paolo; Drummond, Paul. 2014. *The Effect of Key EU Climate Policies on the EU Power Sector. An Analysis of the EU ETS, Renewable Electricity and Renewable Energy Directives.* WP2 Deliverable 2.1. London: UCL Institute for Sustainable Resources.

Branger, Frédéric; Quirion, Philippe. 2013. *Understanding the impacts and limitations of the current instrument mix in detail: industrial sector.* WP2 Deliverable 2.1. Paris: Centre International de Recherche sur l'Environnement et le Développement.

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Kuik, Onno; Kalfagianni, Agni. 2013. *Food and Agriculture. The Current Policy Mix.* WP2 Deliverable 2.1. Amsterdam: Institute for Environmental Studies.

Máca, Vojtěch; Eberle, Andrew; Pearson, Adam; Ridgway, Monica; Braun Kohlová, Markéta; Görlach, Benjamin, Novák, Jan; Ščasný, Milan. 2013. *Climate Policies and the Transport Sector. Analysis of Policy Instruments, their Interactions, Barriers and Constraints, and resulting Effects on Consumer Behaviour.* WP2 Deliverable 2.1. Berlin: Ecologic Institute.

Marie-Laure, Nauleau; Branger, Frédéric; Quirion, Philippe. 2014. *Abating CO2 Emissions in the Building Sector: The Role of Carbon Pricing and Regulations.* Paris: Institute for Environmental Studies, Centre International de Recherche sur l'Environnement et le Développement.

Mazzanti, Massimiliano; Antonioli, Mazzanti, Davide. 2013. *Inducing Greenhouse Gas Abating Innovations through Policy Packages. Ex Post Assessments from EU Sectors.* WP2 Deliverable 2.2. Ferrara: University of Ferrara.

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Meyer, Bernd; Meyer, Mark, 2013. *Impact of the current economic instruments on economic activity. Understanding the Existing Climate Policy Mix.* WP2 Deliverable 2.2. Osnabrück: Gesellschaft für Wirtschaftliche Strukturforschung.

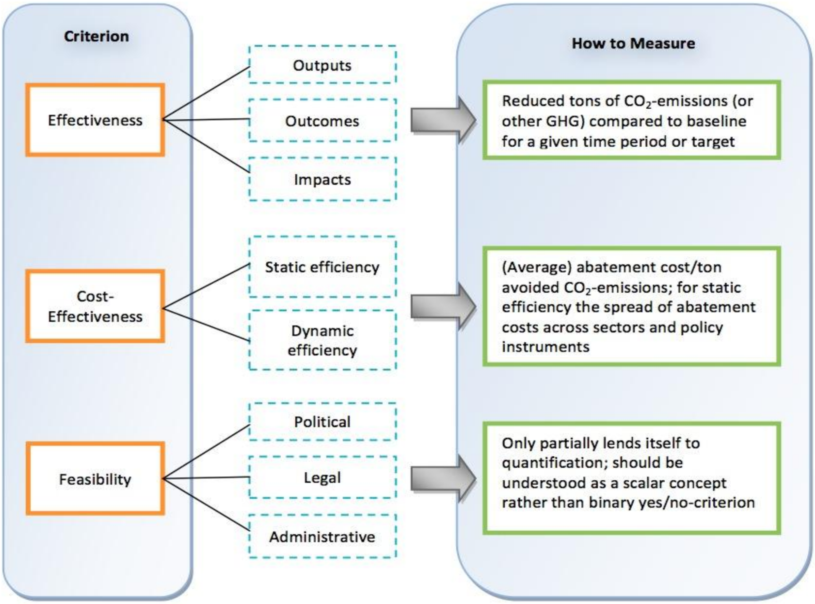
Research Background

This policy brief draws lessons from nine research papers, plus a synthesis report, produced by the CECILIA2050 research team and the institutions that comprise it. Five papers focus on the impact of the European climate policy mix on key individual sectors of the energy system and economy (power sector, industrial sector, transport sector, food and agriculture sector and the buildings sector), whilst four reports focus on cross-sectoral impacts including total policy-attributable CO_2 abatement and macroeconomic consequences, the role of innovation, international competiveness and the influence of and on law and institutions. These papers may all be accessed on the CECILIA2050 website (www.cecilia2050.eu).

The CECILIA2050 concept of Optimality

In economics ‘optimality’ is generally understood to be the most favourable relationship between an outcome and the resources necessary to achieve it and the outcome itself. If the outcome itself is not predefined, an assessment of optimality would determine the level of both the outcome and resource input, as would occur in a cost-benefit analysis. In determining the optimality of EU climate policy, however, the output is already given in the form of the EU’s short and long-term GHG emission reduction targets. Optimality therefore becomes a discussion of achieving these targets with the least cost to society. Such a task is not straightforward. Finding the ‘least-cost’ pathway to meeting these targets involves inherent uncertainty and a long-term view; many technological, organisational, social or other changes required to decarbonise are still yet to be identified and developed. The capacity to absorb any changes must also be considered; public acceptance, economic and social impacts and the legal and procedural requirements of existing, expanded or new policy instruments must be considered. As such, the CECILIA2050 project has developed a broad definition of ‘optimality’ that extends beyond the purely economic concept and considers real-world constraints.

Figure: Broad Definition of 'Optimality' – Key Criteria



A comprehensive literature review determined that no universally agreed upon set of criteria exists for judging the optimality of a policy instrument or mix of instruments, however there is broad overlap between different approaches. Criteria may be broadly arranged into three categories and subcategories, as in the figure above.

The CECILIA2050 project has been set up as a three-year research project, funded by the European Union's 7th Framework Programme for Research. Running until August 2015, it brings together ten leading research institutions from eight EU countries to assess the performance of the existing climate policy mix, and to map pathways towards future climate policy instrumentation for the European Union, with a prime focus on economic instruments.

Combining Policy Instruments to Achieve Europe's 2050 Climate Targets

CEILIA2050 Policy Briefs – this policy brief is part of a series that discusses the results of the CECILIA2050 project. Here, we focus on the results of the second Work Package, in which the impacts, implications and challenges of the existing European climate policy mix are examined on a sectoral, cross-sectoral and economy-wide basis.

All underlying reports can be accessed at: www.cecilia2050.eu.

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no. 308680 for the research project CECILIA2050.