Assessment of Policy Impacts on Sustainability in Europe

D5.2 Proceedings of the Policy Workshop "Improving policy makers' knowledge basis for environmental policy making"

Organised by CEPS in Brussels on 23 May 2014

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1 MEETING NOTES

This Policy Workshop was organised by CEPS and took place in Brussels on 23 May 2014.

The objective of the workshop was to discuss how policy makers' knowledge of environmental policy preparation and implementation can be improved by combining insights on policy effectiveness from both model-based and empirical analysis. For example, while a model can help in estimating the impact of an environmental tax or subsidy within an entire sector, the APRAISE empirical analysis shows how different groups within that sector respond to the tax or subsidy and how that may affect the overall environmental policy effectiveness. A combined analysis, as applied in APRAISE, can thus provide better insights on possible co-effects of a policy and interactions between policy instruments. This will support policy makers in selecting more effective environmental policy instrument mixes.

Session 1: Introduction

In his introduction, Mr Arno Behrens of CEPS welcomed participants and said that the principle aim of APRAISE was to improve the efficiency of environmental policy formulation by providing policy makers with a holistic understanding of:

- The efficiency, effectiveness and efficacy of environmental policy instruments (3E approach),
- How these policy instruments could interact,
- What could be the impact of such policy interactions on achieving social, environmental and economic goals

The APRAISE approach is to assess the effectiveness and efficiency of a range of environmental policies by means of a combination of qualitative and quantitative approaches and how this information can be fed into policy makers' knowledge of the efficacy of policy instruments.

The qualitative part was based on the APRAISE 3E method, which compared the actually achieved effectiveness of the policy with the originally intended effect (based on efficacy knowledge) and related the differences to relevant impact factors such as the context, implementation and interaction of the assessed policy instruments.

For the quantitative assessment, different modelling approaches were applied that can be more micro or macro-economic depending on the respective focus.

Eventually, the combined assessment method had been applied to a number of key EU environmental policy areas, where - for comparative reasons - each assessment had been carried out in two EU countries.

Mr Behrens also briefly introduced participants to the three policy areas, for which the results of this analysis was presented at the workshop, namely renewable energy supporting policies (in Greece and Slovenia), recycling of plastic waste (in Germany and the Netherlands), and biofuels (in Austria and UK).

Following Mr Behrens' presentation, Mr Wytze van der Gaast, representing JIN, presented in more detail the aims and concepts behind APRAISE and described the approach and methodology used to stakeholders. In his presentation, entitled **"Improving policy makers' knowledge basis through complementary model-based and empirical analysis tools",** Mr Van der Gaast put particular emphasis on the unique selling position of APRAISE, which in its analysis recognised that environmental policy design and implementation of policy instruments do not take place in a vacuum, but in an existing (market) system. Therefore, the outcome of an environmental policy may deviate from the expectations held or targets formulated at the outset of such a policy. It was thus important to understand the system context factors which may have developed differently than anticipated and therefore contributed to the observed deviations, which included

- Developments in the economic, social, environmental, technological context
- Policy design and implementation cycle
- Interaction of policy instruments with with other policy instruments through the behaviour of market stakeholders.

APRAISE tries to give answers to these questions to provide for its principle aim, i.e. to improve environmental policy making.

Session 2: Analysis of effectiveness and efficiency of renewable energy supporting policies

Chair: Arno Behrens (CEPS)

Commentators: Kristine Kozlova, Renewables and CCS Policy Unit, DG Energy, European Commission; Pierre Tardieu, Senior Political Affairs Advisor, European Wind Energy Association; Rob Aalbers, Central Planning Bureau of the Netherlands; Simone Antonelli, ENEL

"Results of the qualitative, empirical assessment of Renewable Energy Policy case study for Greece and Slovenia"

Niki Artemis Spyridaki, Anastasia Ioannou (UPRC)

"Contribution of BSAM model application to the assessment of Renewable Energy Policy in Greece"

Sotiris Papadelis (National Technical University of Athens)

This session focussed on the results of one APRAISE case studies – RES-E support mechanisms in Greece and Slovenia – which have been analysed qualitatively using the APRAISE 3E method, whereas the case-study for Greece was also analysed quantitatively through the application of the BSAM model.

The BSAM model related demand for investments with the profitability index demonstrating that the residuals incorporate the effect and the time evolution of the unobservable factors. This is important because the unobservable factors are directly responsible for the effectiveness of the provided financial incentives by the FIT scheme.

The modelling results for the Greek power sector indicate that the RES-E support policy was not effective since it created additional friction and negative feedback effects. These negative feedback effects stemmed from saturation of the grid's ability to absorb increased amount of RES-E power and the inability of the regulatory bodies responsible for permitting to cope with increased workload due to the increased number of projects requesting permits. The same conclusions were drawn by the qualitative analysis where the difference between the scope of the FIT scheme and its eventual unilateral effectiveness and overall poor efficiency was analysed in more depth according to: technological and political contextual factors, (i.e. grid capacity, technology innovation effects, distortions and lack of maturity in the electricity market) as well as deviations between planning and practice in the design elements of the scheme (i.e. policy inconsistencies and lack of coherence, monitoring and adjustment system).

Response by commentators:

The discussion was focused on the Greek case study, key topics were highlighted and comments were made also in answer to the following questions raised:

1. Do you think that a premium-price FIT policy or a fixed Fit policy would create a more viable environment for further developing the RES-E sector in Greece?
2. In light of the current economic situation and reduced energy demand levels do you think that National targets for RES-E deployment should be revised in the near future?

The first commentator raised the following concerns as expressed by the EC:

- Are current EU provisions with regard to the RES Directive and support framework enabling or hindering MS to transpose and implement national measures and schemes? In light of the 2030 policy framework, the EU needs insights on barriers that policy makers face when formulating and implementing national policy schemes in response to overarching national targets and to what extent these barriers influence these national schemes. To what extent have the provisions of the RES directive launched national measures, and how concrete are they?
- Member states are moving okay towards 20-20-20 targets (apart from Malta, the Netherlands and UK) – need to look into specific technologies in the EU assessment.
- The second commentator emphasized the need to find the balance between flexibility and reliability in the RES support framework. The notion of having a flexible support mechanism that will avoid market bubbles (e.g. PVs) and one that will not drive investors from moving forward at the same time is under discussion. Moving beyond the 2020 targets and looking ahead to the 2030 Energy and climate framework, the EU will provide a strong signal to member states with regard to RES deployment targets until 2018 (potentially in the form of a common impact assessment methodology). Towards 2030, member states will not be obliged to achieve RES targets. Alternative mechanisms (e.g. EU bonus for ambitious and achieving countries) would encourage member states to do so.
- The Greek RES market has been governed by distortions in the functioning of the Greek electricity market and by inflexible support mechanisms.

- The administration system remains one of the main bottlenecks in RES deployment investment projects (e.g. in wind power plants, costs due to delays in the licensing and permitting process may amount to 9% of total project costs). Single window systems and non-stop shops are very much needed to tackle such issues.
- A lack of coordination among competent authorities has also been observed in France and is not necessarily a characteristic of how the national administration systems operate in the south of Europe. Significant reformations need to take place to enhance coherence in the administrative set-up regulating the RES support framework. Overall interconnection of targets in the energy and climate package, market infrastructure and the ETS are principal considerations towards a flexible mechanism design. The need for coordination regarding how investment sharing and burden sharing gets done between member States becomes critical.
- Maintaining flexibility (i.e. no technology specific targets) is important towards 2030 by giving the opportunity to Member States to choose where to invest.
- Detecting/Establishing causality is always difficult, especially in the case of energy efficiency where no data to establish causality exist in micro-studies and rebound effects are evident.
- Regarding the "easy" attainment of interim targets for reduced consumption levels, this may as well indicate whether it was a well-defined target or not.
- As far the RES support is concerned, the RES Directive does not say anything about technologies, therefore determining the RES technology mix is a choice made by member states.
    - Answer: Targets for the deployment of renewable energy systems are not deployed in specific technological pathways. Extensive flexibility, however, induces risk to companies who wish to invest in these technologies. This has been the case for offshore wind technologies, which were initially considered a less costly option, of considerable potential; however, in Germany and Estonia, due to a number of technical and administrative barriers, this technology proved to be costly and received less attention. A conclusion could be that for strong targets, more specific and concrete methodologies on how to attain them could be established, while looser targets could accordingly be less specific.
- The European Commission has introduced long decarbonisation targets towards 2030. Since there are non-binding targets on specific RE technologies, there needs to be an internal communication among EU member states for information exchange and most importantly, it is fundamental in the near future (e.g. until 2018) to have a signal of the direction of renewable technologies in each country, in order for investments to happen.
- National policies should contribute to the invasion/deployment of those technologies. In the case of the FiP (such as the Dutch ETS plus): technologies compete within the scheme thus fostering market competition.
- In order to support the ambition of RES deployment targets flexible support mechanisms are necessary. In fact, national targets for RES-E deployment should be

updated moving past to 2050 targets following a more flexible, adaptive pattern based on non-mandatory principles.

- Lack of transparency (it might be meaningful for consumers to know how much RES-E levy supports which source) and whether resources are allocated to different technologies should be related to the evaluation of the effectiveness of a policy.
    - Answer: The financing gap in the RES-E account is artificial. In Greece, practically all RES generation technologies are subsidized, including the natural gas technology. The problem is to find a way to explain who pays the costs of the RES-E generation. The costs paid on natural gas are not visible while you can see the effects in the deficient RES account. However the problem lies within the lack of finances in general and not within the lack of visibility on costs shares of the different RES technologies.
- Reliability of the support mechanism systems: a costly system for support may cause an increase in the perceived risk for investment, harming the reliability of the system, and resulting in a loss of investors' trust regarding what is going to happen.
- Would a FiP create a more viable investment environment in the Greek RES-E sector? The Fit simplifies access to support but should be used by small producers, whereas large-scale investors should be linked to the market via the FiP.
- Does it make sense to introduce more flexible targets? Flexibility should be present, but in a stable framework in the sense of allowing the possibility to decide which technology is ultimately more efficient. In other words, cost-relationships determine how to achieve overall targets. On the other hand, changing rules increases costs for countries (Flexibility is translated into more costs for utility-companies).
- Another issue that was raised is the necessity to monitor whether member states are on track for attaining the 2020 targets in relation to the changing member states' contexts. It is therefore important to establish more precise methods.
- One conclusion on the mechanism employed so far to this end, reveals that from an overall perspective, most member states are on track for achieving the targets set; however, a more detailed examination of the national action plans reveals that targets on certain technologies are not followed (e.g. offshore wind, geothermal technologies).
- As for 2030 targets, what is efficient for 2030? An efficient target becomes less useful the more long term the targets are!

General discussion:

- Does it make sense to have less specified targets for RES support? Ideas from case study on offshore wind: target specified by EU, with member states having to specify subtargets. Government: how to share the target between different sources. The temptation to change routes is much bigger without targets. The risks for companies will become bigger if the targets are too general - although it is better for flexibility.
- If we do not have binding national targets, there still will be coordination between member states as burden sharing will happen. There needs to be information sharing between member states. There needs to be as soon as possible (by 2015) clear info on where the RES policy is going.

- The analysis on how the sectors will evolve in the next years could be better done by researchers. The Commission should communicate on if we are sure that we are going to make it.
- Overall, we are on track to meet the 2020 target, but it is more complex when it comes to national and technology differences. More capital intensive technologies are behind. The question is how to be sure that this development continues?
- Can we have a design of policies that reaches the target and provides flexible support? Targets become less useful the further away the horizon is. Somewhere along the road you discover that the road is different than what you thought.
- Another issue to consider is the fact that Northern countries develop policies for Eastern countries through Directives resulting in difficulties during the implementation of policies largely due to quite different administration mechanisms.

Session 3: Analysis of effectiveness and efficiency of Plastic waste recycling and Biofuels policies

Chair: Christian Sartorius (Fraunhofer Institute)

Commentators: Helmut Maurer, Waste Management & Recycling Unit, DG Environment, European Commission; Ake Iverfeldt, Executive Director, Mistra The Swedish Foundation for Strategic Environmental Research; Raffaello Garofalo, Secretary General, European Biodiesel Board; Vanya Veras, Secretary General of Municipal Waste Europe; Guillaume Perron-Piché, European Supply of Waste to Energy Technology; Guadalupe Alvarez Tinoco, University of Sussex

This session focussed on the results of two APRAISE case studies – plastic waste recycling (Germany and the Netherlands) and biofuels support (UK and Austria) – which have been analysed quantitatively by means of the Global Trade Analysis Project (GTAP) model and qualitatively using the APRAISE 3E method.

With the GTAP model for each case study, a macro-economic perspective could be taken by, first, deriving a number of possible scenarios for an APRAISE partner country and then analysing the possible effects of selected policy instruments within the circumstances of these scenarios. The identified scenarios are:

- *Business-as-usual*, which assumes that recent and current economic, social, political and environmental conditions will continue to exist in the short to medium term.
- *Counterfactual high growth*, which analyses what economic growth and related socio-economic factor developments could have looked like in absence of the economic crisis since 2008.
- *Global climate agreement*, which assumes an ambitious, globally binding climate agreement.
- *Trade war*, which assumes that international trade agreements will cease to exist and which may lead to a 'fortress Europe' situation.

"Results of GTAP model application to the Plastic waste recycling and Biofuels case studies"

Juha Honkatukia (Finnish Government Institute for Economic Research)

For plastics recycling the GTAP model could reveal possible interactions of plastics recycling with, for example, bioethanol production as the latter uses the same inputs as both food and plastics industry. Within the scenarios GTAP could analyse the possible impacts of a packaging tax (or similar pricing mechanism) on the production and use of plastic packaging materials in both Germany and the Netherlands. Another feature of the GTAP model is that it can produce 'what if?' scenarios by assuming what would have happened in the past if, e.g., a policy instrument had not been implemented or differently or if other economic developments had taken place. With such scenarios, GTAP can support sensitivity analysis so that it can be checked how important the effect of a policy instrument has been within a changing context.

"Results of the empirical analysis of Plastic waste recycling case study for Germany and the Netherlands"

Carsten Gandenberger (Fraunhofer Institute) and Wytze van der Gaast (JIN)

The qualitative 3E approach has been applied to the plastics recycling case study in the Netherlands and Germany. It was shown that in both case study countries, plastic recycling targets have been met. However, stakeholder consultation has also shown that several context factors, policy implementation and policy interaction aspects have had a (slightly) negative impact on policy achievements. This has led to the conclusion that policy targets may not have been sufficiently ambitious. In other words, either policy makers have had insufficient knowledge of the potential achievements (i.e. insufficient knowledge of efficacy of policy instruments) or have deliberately formulated targets below what could theoretically be considered feasible (e.g. due to lobbying). Another aspect mentioned was that of possibly insufficient monitoring systems, which may imply that a stream of sorted plastics is monitored as recycled whereas in practice this stream is (co)incinerated for energy production.

Response of commentators:

During the discussion the following key topics related to plastics recycling were highlighted:

Monitoring of plastic waste streams: the researchers presenting the case studies concluded that current monitoring systems in the Netherlands and Germany may insufficiently provide insights on which plastic waste streams are actually recycled and which streams are co-incinerated for energy recovery. A key reason for the latter can be that some recycling processes are relatively expensive so that it becomes economically more attractive to send these plastics for co-incineration. As a result, actual recycling performance may be much lower than officially reported. This observation was emphasised by commentators who provided examples of deviations of actual waste streams from officially reported streams.

Among the possible consequences, it was argued that this could result in lower public willingness to continue with separating plastics from household waste. It led to the recommendation that instead of setting recycling targets, the focus should be more on what raw materials have been or should be replaced by recycled plastics, as this is the actual purpose of recycling.

Improve waste management streams for plastic waste within an EU circular economy context: it was explained that, with respect to plastic waste management, currently EU Member States can, broadly speaking, be divided into two groups:

- one group applies largely (co)incineration techniques in combination with (moderate) recycling and prohibits landfilling of plastic waste;
- the other group of Member States mainly sends plastic waste to landfills.

Therefore, it was argued during the discussion that the focus within the EU needs to be on three aspects:

1. Improve quality of recycling so that more plastics can be economically recycled;
2. Ensure high-quality energy recovery (with strict criteria, incl. for air quality); and
3. Prohibit landfilling of plastic waste.

This could, for instance, lead to a goal to recycle 50% of European plastics and have the other half used for energy recovery. The latter would also place plastic waste management in a larger context of energy production and consumptions in the context of a circular economy.

"Results of empirical analysis of the Biofuels case study in the UK and Austria"

Jenny Lieu (University of Sussex) and Andreas Türk (Joanneum)

The modelling results for the Biofuels case study complemented the results from the qualitative 3E analysis. The qualitative analysis reveals that Austrian polices generally have a positive impact when implemented within the policy mix; however there are mixed results with policy interactions. On the contrary biofuels policies in the UK highlight that implementation factors and interactions have a largely negative impact on the biofuels sector. In both cases contextual factors play a significant role in both countries the effectiveness and efficiency of biofuels policies are highly dependent on the land size/ availability, dependence on domestic feedstock/imports, technological uncertainties (2nd generation biofuels) and uncertainties surrounding sustainability issues for indirect land uses.

The modelling results confirmed that there was a high initial cost of introducing biofuels. For the UK case in particular, results indicated that biodiesel production would have grown more without policies. Additionally, based on the counterfactual scenario, the global recession positively impacted the target attainment in each country. If the global economy grew in the absence of a global crisis, both Austria and the UK would not be able to meet their respective targets due to increased transport fuel demand and the corresponding increases in biofuels targets. The qualitative and quantitative analysis indicated that contextual factors

outside of the control of policy makers had significant impacts on the biofuel sector. This is because the biofuels sector interacts with other sectors including agriculture and waste. Thus policy makers need to consider the impact of biofuels policies beyond transport sector and begin to consider how land use, sustainability, and resource use are interconnected.

Response of commentators:

The commentators raised several policy, industry, and methodology issues regarding the case studies.

Policy issues: Stakeholders in EU policy making domain discussed the rationale of target setting as a classical tool of measurement. It was necessary to question what are the targets trying to attain and what is the rationale behind targets. Commentators questioned whether or not it is effective to create a binding target in the EU or if there should be greater flexibility in creating targets as it is very difficult to set targets for 2030 or later. Additionally, there is a recognition that greater transparency and flexibility is required when implementing policies. Policies should be flexible enough to adapt to changes within a timely period.

Industry: Some questioned the need to further develop the biofuels sectors as there is a declining consumption of transport fuel in Europe. For instance, in Sweden ethanol pumps have closed down. Additionally questions were raised if Europe should be importing biodiesel while exporting gasoline.

The value of waste products such as used cooking oil was raised by industry stakeholders. Used cooking oil is now seen as a premium product rather than a waste product as it is valued as a sustainable feedstock for biofuels production. Double counting for used cooking oil has increased the value of the waste product and has driven up the price of used cooking oil. Thus the perception of a waste product is drastically changed when this product no longer becomes a waste but a resource.

Methodology: A stakeholder in academia questioned the biases of the researchers' interpretation of the results. Biases should be reduced with greater consultation with stakeholders throughout the 3e method and in the interaction analysis. However there is recognition that true objectivity is very difficult to achieve.

Overall there were several conclusions drawn in the biofuels case study:

- 1a. Biofuels is costly and therefore not an efficient; however the sustainability criteria for biofuels production more accurately reflect the true cost of fuel production and this may drive changes in consumer behaviour
- 1b. Policies are important drivers to reduce climate change but behaviour changes are also necessary and can be prompted by costs- i.e. higher fuel costs should lead to reduced fuel consumption
- 2 a. Biofuel policies should not be drafted and implemented in isolated without considering important sectors including the agriculture and waste sector
- 2b. Institutions in the energy sector and across different sector need to liaise and discuss interconnections between biofuels, food, resource use/waste

Discussion:

- The project does not require data to be tested
- Effectiveness: tools to measure achievement of targets. Effectiveness from one stakeholder is not effectiveness for another stakeholder.
- Transparency: what do we define as waste stream, as biofuels, as sustainable criteria?
- Understanding indicators: what are they actually measuring?
- Monitoring is a critical and vulnerable aspect of the system. It shows how important understanding the context is.
- Bias: interviews deliver opinions, not facts. It was made explicit in the reporting of the project, and balanced.
- Today we have the capacity to recyle 50% of plastics. The rest can go to waste-to-energy.

Session 4: Evaluation and Conclusions

Short summary, recap and future steps of the APRAISE project

Wytze van der Gaast (JIN)

Three main messages from the workshop:

1. The APRAISE case study analysis has demonstrated that, when formulating policy targets and selecting policy instruments, it is important to acknowledge that policy instruments are not implemented in a vacuum and that for understanding their effectiveness a deep understanding is needed of their implementation context. Qualitative tools such as the APRAISE 3E method can help understand the policy context and support policy evaluation by comparing the achieved policy effect with the intended effect and explain the difference between the two by analysing: developments in the policy's economic, environmental and social context, the policy design and implementation cycle and possible interactions with other policies. Based on the APRAISE conclusions improved communication between ministries/governmental agencies is recommended to avoid negative policy interactions and improve policy effectiveness.
2. Quality of data when analysing policy effectiveness matters in policy evaluations, such as in APRAISE, in two respects: a. Reality of published data (e.g., does the monitoring reveal actually achieved policy effects), and b. Quality of data (e.g., micro studies may show results which do not appear in macro studies, which could imply that macro data even out positive and negative effects, thereby reducing the information value of macro data).
3. Are targets really necessary for environmental policy effects? Two views were expressed. On the one hand, targets trigger policy makers and stakeholder to consider measures and behavioural change. On the other hand, targets, when achieved, may not reflect reality and may not reveal progress with underlying factors. Alternatively, it was suggested that targets could be formulated for underlying factors (e.g. technology investments, research, education) for achieving

environmental goals. For these targets, both qualitative evaluation methods such as APRAISE 3E and quantitative methods can be applied.

2 WORKSHOP AGENDA

10:00 – 10:30 Registration

10:30 – 11:00 Session 1: Introduction

Welcome (Arno Behrens, Centre for European Policy Studies)

Improving policy makers' knowledge basis through complementary model-based and empirical analysis tools – overview of APRAISE tools (Wytze van der Gaast, Joint Implementation Network)

11:00 – 12:30 Session 2: Analysis of effectiveness and efficiency of renewable energy supporting policies

This session focuses on the assessment of the effectiveness and efficiency of Renewable Energy policies in Greece and Slovenia. It will present results provided by the Business Strategy Assessment Model (BSAM) regarding these policy instruments and compare them with the qualitative, empirical analysis using the APRAISE 3E method, which identifies context, implementation and interaction factors which have a significant impact on the outcome of the assessed policies.

11:00 – 11:05 Introduction by the Chair (Arno Behrens, CEPS)

11:05 – 11:15 Contribution of BSAM model application to the assessment of Renewable Energy Policy in Greece (Sotiris Papadelis, National Technical University of Athens)

11:15 – 11:30 Results of the qualitative, empirical assessment of Renewable Energy Policy case study for Greece and Slovenia (Niki Artemis Spyridaki and Anastasia Ioannou, University of Piraeus Research Centre)

11:30 – 12:00 Response by **Commentators** from the European Commission, international institutions, national policy advisory, business associations and industry

Kristine Kozlova, Renewables and CCS Policy Unit, DG Energy, European Commission

Pierre Tardieu, Senior Political Affairs Advisor, European Wind Energy Association

Rob Aalbers, Central Planning Bureau of the Netherlands

Simone Antonelli, ENEL

12:00 – 12:30 Open discussion

12:30 – 13:30 Lunch break

13:30 – 15:30 Session 3: Analysis of effectiveness and efficiency of Plastic waste recycling and Biofuels policies

This session will discuss the results of two APRAISE case studies – plastic waste recycling (Germany and the Netherlands) and biofuels support (UK and Austria) – which have been analysed quantitatively by means of the Global Trade Analysis Project (GTAP) model and qualitatively using the APRAISE 3E method, which identifies those context, implementation and interaction factors impacting significantly the outcome of the assessed policies. Like in session 2, a special focus will be on the comparison of both approaches to the assessment of the respective policies.

13:30 – 13:35 Introduction by the Chair (Christian Sartorius, Fraunhofer Institute)

13:35 – 13:50 Results of GTAP model application to the Plastic waste recycling and Biofuels case studies (Juha Honkatukia, Finnish Government Institute for Economic Research)

13:50 – 14:05 Results of the empirical analysis of Plastic waste recycling case study for Germany and the Netherlands (Carsten Gandenberger, Fraunhofer Institute, and Wytze van der Gaast, JIN)

14:05 – 14.20 Results of empirical analysis of the Biofuels case study in the UK and Austria (Jenny Lieu, University of Sussex, and Andreas Türk, Joanneum)

14:20 – 15.00 Response by **Commentators** from the European Commission, international institutions, business associations, industry and academia

Helmut Maurer, Waste Management & Recycling Unit, DG Environment, European Commission

Ake Iverfeldt, Executive Director, Mistra The Swedish Foundation for Strategic Environmental Research

Raffaello Garofalo, Secretary General, European Biodiesel Board

Vanya Veras, Secretary General of Municipal Waste Europe

Guillaume Perron-Piché, European Supply of Waste to Energy Technology

Guadalupe Alvarez Tinoco, University of Sussex

15:00 – 15:30 Open discussion

15:30 – 16:00 Session 4: Evaluation and Conclusions (at the latest)

Short summary, recap and future steps of the APRAISE project (Wytze van der Gaast, JIN)

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4 BACKGROUND PAPER

Content

Introduction

This background document presents the assessment of environmental and sustainability-related policies in different policy fields: climate protection, waste management, resource efficiency and conservation of nature. These policy fields are reflected in three case studies

- Climate protection through support of renewable energy sources
- Waste management with focus on plastic packaging waste
- Use of biomass for the production of bio-fuel

Starting point of each of these case studies is one (or a set of related) directive(s) enacted by the European Commission, which have to be transposed subsequently into national law. In most cases, the directives describe the environmental targets that are to be achieved, but do not prescribe exactly how the targets should be achieved. This leaves the countries plenty of room with regard to the choice of policy instruments and their respective designs. But not only the type and design of policy instruments is decisive for the effectiveness of the transposed policies; also many other factors can influence the policy output in favourable or unfavourable ways. These factors – specifically assessed in the APRAISE project – can result from

- The broader **context** including environmental, economic, social, and technological factors;
- Institutional settings that prevent the transposition and **implementation** of EU directives as well as policy specific context such as policy instrument design, operation and enforcement; and
- **Interactions** between policies and policy instruments, where one policy instrument can possibly reduce the effectiveness of another instrument or joint implementation of policy instruments could result in synergies.

Altogether, the specific policy instruments, their design, their interaction with one another and with other policy instruments, the context in which they work and the way they are implemented give rise to their specific output. For the assessment in APRAISE, this output is measured against the environmental targets stated in the policies – mainly in the directives, but also in the national laws – and the degree, to which the targets are achieved, is called the policy instrument's **effectiveness**. However, actual effectiveness sometimes differs from how a policy instrument could perform in theory. Therefore, not only the actual effectiveness of the assessed policy instruments is measured, but also the (maximum) level of achievement that could potentially be achieved. In many cases, this is also what the policy makers expected, when they planned and implemented the policy. In APRAISE, this potential achievement is called **efficacy**. Eventually, in order to assess the usefulness of policy instruments in achieving a certain target, their effectiveness (and efficacy) has to be related to the

cost of implementing and pursuing these targets. This determines the **efficiency** of the policy instruments.

The APRAISE approach is to assess the effectiveness and efficiency of specific environmental policies by means of a combination of **qualitative** and **quantitative** approaches. The qualitative part of the assessment uses the APRAISE 3E method, which compares the actually achieved effectiveness of the policy with the originally intended efficacy and relates the differences to relevant impact factors referring to the context, implementation and interaction of the assessed policy instruments (see above). For the quantitative assessment different modelling approaches are applied, which are more micro or macro-economic, depending on the respective focus. Eventually, the combined assessment method has been applied to a number of key EU environmental policy areas, three of which (listed above) are discussed in the following. For comparative reasons, each assessment has been carried out in two EU countries.

While it is the general focus of the APRAISE project to measure the effectiveness, efficacy and efficiency of a policy instrument and relating these results to the policy instrument's characteristics, their working context, specific implementation process and interaction with other policy instruments, the specific focus of this workshop is on the methods applied and their role in the assessment. In particular, qualitative (empirical) and quantitative (modelling) approaches are distinguished and it is assessed how both of them can contribute to answering the question as to why, possibly, a policy instrument does not perform as it was expected to and how the performance could be improved.

2 Policies supporting renewable energy sources – the cases of Greece and Slovenia

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Mitigating climate change and enhancing security of energy supply have triggered the implementation of a wide range of policies in Europe. The focus of the European Climate & Energy policy and also one of the main strategic energy targets is the commitment to reduce the emissions of GHGs at EU level by 20% until 2020 compared with 1990 levels. In this context, the European Energy Action Plan underlines the importance of enhancing instruments which support the development of RES and EE solutions at local and regional level outlining measures and policies to be adopted and implemented to achieve this main energy target by namely expanding RES and EE investment actions. This interrelation is translated into the achievement of 20% less greenhouse gas emissions (as compared to 2005), 20% higher EE and a 20% share of RES in power generation.

Moving beyond 2020, the EU policies and measures to achieve the energy 2020 goals are ambitious and will continue to deliver beyond 2020 helping to reduce emissions by about 40% by 2050, only less than half of the 2050 decarbonisation goal (EU Energy Roadmap 2050). Meeting the targets set within a sustainable roadmap until 2050 calls for the elaboration of policies and measures, which aim at the simultaneous fulfilment of the "20-20-20" obligations and a coordination of the targets being set in the electricity market becomes imperative. Whether climate targets are consistent with targets for the penetration of renewables or energy efficiency (EE) targets, when those are transposed in a national policy instrument mix, are research questions explored and analysed within the scope of this case study

Crucial domestic policy instruments (Greece/Slovenia)	
Greece (2006-current) • The guaranteed **Feed in Tariff (FiT I)** for all renewable electricity generation technologies: a market based instrument that provides fixed energy compensation rates for electrical energy produced by a Producer or Self-Producer through a station used for the production of electrical energy from RES or from CHP or through a Hybrid Station and is absorbed by the system or by the network. • Special program for the deployment of photovoltaics up to 10kW on buildings and especially rooftops that supports electricity generation by rooftop PV installations of up to 10 kWp through a guaranteed **Feed-in Tariff (FiT II)**. • **ENERGY EFFICIENCY programme:** financial incentives (70% subsidy scheme) to Municipalities to adopt practices targeted at the enhancement of energy efficiency interventions.	**Slovenia (2007-current)** • **Energy Act:** Introduced a better way of supporting the investments in renewable energy sources through increased feed-in tariffs that made investments in photovoltaic technology more profitable • **Regulation on supports for the electricity generated from renewable energy sources:** legally defines feed-in tariff and incorporates methods for calculation of feed-in tariffs for each year. It also includes specific guidelines to what devices/structures are eligible to feed-in tariffs • **Rules on energy efficiency in buildings:** defines technical requirement that must be fulfilled for efficient use of energy on subject of heat isolation, heating, cooling, air conditioning etc. Rules also contain a methodology for calculation of energy efficiency attributes. This rules applies both at construction of new buildings and reconstruction of old ones.

• **Energy Saving in households programme**: aims at improving the energy performance of residential buildings through the provision of soft loans and subsidies; • **Regulation on the Energy Performance of Buildings**	• **Regulation on the Provision of Energy Savings to End Consumers:** defines ways on improving energy efficiency in various fields. Also the list of energy efficient energy sources is given along with subsidized prices, for using such sources.

In the policy assessment, the focus was set on the RES support schemes while policy instruments promoting the uptake of EE interventions were grouped and analysed as "Energy efficiency policies'' for both countries looking into the effectiveness of the mix of EE policy instruments, as part of the policy package, on a more aggregate level in order to draw conclusions on the interaction effects between RES support and EE promotion.

Crucial context factors impacting effectiveness/efficiency of RES policy instruments			
Greece		**Slovenia**	
Unfavourable economic conditions resulted in liquidity problems and inability of sufficient funding restraining investments that would have been even greater than somehow other significant rates of increase reported (for PV and Wind). Domestic PV installations not being as capital intensive as in RES large-scale investments were not affected because of economic crisis.		**Unfavourable economic conditions** had negative effect on both policies. It was expected that effect would be greater as it was tougher to get finances. But due to falling price for photovoltaic technology and energy efficiency technology economic crisis didn't have as big of an effect as anticipated especially in photovoltaics.	
The situation and deployment planning of electricity transmission grids (**difficulty in access to the grid** also for non inter-connected islands) affected both the effective exploitation of national RES potential as well as the efficiency mostly of the FiT I scheme.		**Price of renewable technologies** substantially decreased and made possible for more households and investors to invest in energy efficiency technology and in photovoltaics.	
Lack of maturity and depth in the electricity market has reasonably affected the variance and the substantive content of the System Marginal Price (SMP). Distortions in the electricity market continue to cause severe problems in the Special account funding RES investments.		**Increase of retail electricity price** forced households to adapt and consume more energy in off-peak hours for example during the night.	
Instability in the legal framework for RES support, affected by the economic decline resulted in a number of re-adjustments in the FiT rates and additional financial levies imposed in RES producers retroactively to compensate for high FiTs inducing great risk for prospect investors.			

Crucial implementation factors impacting effectiveness/efficiency of policy instruments			
Greece		**Slovenia**	
The effectiveness of both Fit schemes (I and II) can be primarily attributed to those design characteristics (i.e. **high fixed rates and long term contracts**) that attracted investments in the RES power sector regardless of exogenous changes.		**Motivation to invest** was very high due to big feed-in tariffs for photovoltaics and because of actions by ECO fund that offered funds and favourable loans to improve energy efficiency in households.	
The adjustment system proved to be too slow leading to a tardy response to market changes. In effect, the mechanism's lack of adaptability deteriorated its efficiency.		**Low adaptability** of feed-in tariffs meant that at the start FiT didn't follow the decreasing prices of technology which consequently meant that more photovoltaic plants were build due to initially highly set FiT for photovoltaics.	
Subsequently overcompensation for PV producers limited growth in other RES technologies and overburdened consumers.		**Equity** had a strong negative impact on RES. Over compensations for PV meant a lot more PV were built than expected. Meanwhile FiT for other RES technologies weren't as big and weren't adapted enough consequently productions goals weren't met.	
Inconsistencies due to overregulation governing the licensing process and **policy incoherence issues** related to the lack of central coordination and uniform interpretation and application of the legislative framework.		**Poor coordination and management among institutions** meant that reactions to improve policies and adapt FiT was too slow.	
Greece presents one of the **most resource-hungry administrative (i.e. permitting and licensing) processe**s for industrial PV and Wind plants in Europe. Administrative hurdles were however anticipated and endured by the respective targets groups due to high returns on their investments offered by the favourable FiT scheme.			
Planning and operation of the Fit were guided by "rough assumptions" instead of target-setting and cost accounting estimations. The RES trajectory should have been **closely and continuously monitored**.			

Crucial interaction factors impacting effectiveness/efficiency of policy instruments			
Greece		**Slovenia**	
Discrepancies in the building code stipulating horizontal property rights in condominiums / requirement of 100% consensus of owners to approve a decision and make a financial contribution hindering the installation of PV rooftop systems.		**Same groups of people** are targeted by both policies (feed-in tariffs for photovoltaics and households energy efficiency policy). Households must in many cases decide which technology to use due to limited budget.	
The drop in energy consumption has relaxed energy needs and therefore **unwind the need for RES** (i.e. less RES power capacity is needed to meet the 2020 goals), this effect may not be attributed solely to the effectiveness of EE policy instruments. Within the reformulation framework of the Fit scheme, it was reported the rates would be set in accordance to the downward trend in energy demand.		**Lack of adaptation** of feed-in tariffs for other technologies severally hindered productions from other RES technologies. But due to initial big FiT for photovoltaic lack of adaptations meant big increase in production in photovoltaics and in year 2013 Slovenia already achieved its 2020 goals.	
From a consumers' perspective the FiT schemes combined with EE policies may act in synergy as the **RES-E levy used to finance the FiT increased the electricity price**, creating an additional incentive to invest in an EE interventions.			

Anticipated and observed effectiveness of domestic policy instruments	
Greece	**Slovenia**
• The **Fit I Scheme** presented unilateral effectiveness towards only a few RES technologies and overall limited efficiency. Indicatively effectiveness for 2013 (i.e. target achievement of total installed capacity levels) per technology is outlined below: Wind: 47,99% Solar: 259,25% Hydro: 129,76% Biomass/Biofuels: 56,95% • **FiT II for residential PV systems,** contributes to the overall share of installed solar capacity and was stated to have performed even more effective in the diffusion of PV rooftop systems, as reflected also in the growing amount of applications and installed PV systems, owning to also to the fact that the scheme overcomes grid-network deficiencies and PV rooftop installations are not as capital intensive. • The interim **final energy savings target for 2010** (5,1 TWh) is achieved mainly due to the impact of economic recession in the final energy consumption in the residential and industrial sector.	• For energy efficiency actions during the years 2008 and 2010 it was expected that 326 GWh in residential households would be save. Slovenia achieved 396 GWh of saved energy. • **Energy counselling network for citizens** was introduced and during the years from 2008 to 2010 37000 consultations were executed that on average saved 3.1 MWh. Slovenia is behind on expected goal for counselling due to shortage of money. • **Energy labelling of appliances** was very successful as 149 GWh out of expected 66 was saved during year 2008 and 2010. • **Financial incentive for energy efficient renovation and sustainable building** was able to save 76 GWh out of projected 84 GWh. • **Financial incentives for efficient heating systems** managed to save 68 GWh out of expected 17 GWh • The **FiT scheme** for photovoltaics was very effective. In year 2012 160 GWh was produced and with that Slovenia already achieved its set goals for 2020. It was projected that 139 GWh will be produced in year 2020.

Observed vs. Anticipated efficiency of domestic policy instruments	
Greece	**Slovenia**
• The greater the divergence between the application rate for permits curve and the installed capacity curve, the more generous and, at the same time, inefficient the incentives (here the feed-in tariffs) can be considered to be. The demand for PV and other RES-E permits lies far above their respective supplies thereby, indicating inefficient feed-in tariffs. • In the case of wind, by contrast, the demand exceeds the approved capacity only slightly, which deduces that the FiT was not too high. • In terms of dynamic efficiency effects, the feed-in tariffs for PV and wind did not fall between	• In 2010, 3.2 million € (12 % of total budget intended for support of RES) were given by the government for the support of SPP only. In 2011, however, this value has risen to staggering 15.5 million € (30 % of total budget intended for support of renewable energy sources), which is due to massive increase in SPP building. The government thus decided to lower reference price (which is basis for calculus of feed-in tariffs for SPP) every month for 2 % starting from December 2012 on.

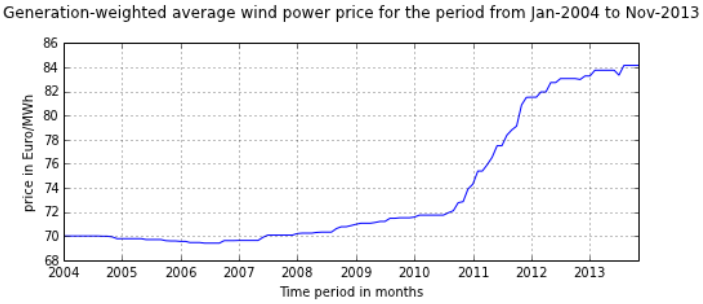
2007 and 2011 in Greece. If they changed at all, they even showed a slight increase. Accordingly, the gap between the FiT and the respective actual renewable electricity cost increased; and so does the inefficiency of this policy instrument.	

Outcome of modelling with BSAM (Greece)

The demand for investments during any given period can be regarded as a function of their perceived value. The perceived value is, in its turn, a function of a profitability index, as well as of the unobservable risk, soft cost (e.g. attaining financing or copying with permit procedures) and opinion dynamics factors. A model that relates the demand for investments with the profitability index would have the following useful characteristic: the residuals incorporate the effect – and the time evolution – of the unobservable factors. This is important because the unobservable factors are directly responsible for the effectiveness of the provided financial incentives.

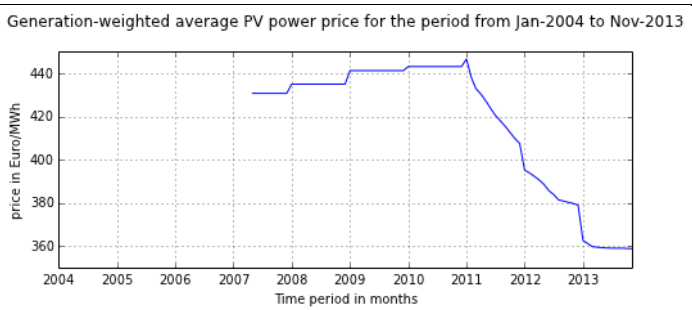
The results indicate that the RES-E support policy in Greece was not effective since it created additional friction and negative feedback effects. These negative feedback effects stemmed from saturation of the grid's ability to absorb increased amount of RES-E power and the inability of the regulatory bodies responsible for permitting to cope with increased workload due to the increased number of projects requesting permits.

The monthly evolution of the generation-weighted (in €/MWh) monthly average wind power price for the same period is presented below.



The figure suggests that increased financial incentives were utilised to counterbalance institutional deficiencies in permitting and interconnecting wind RES-E projects. The efficient equivalent of the evolution curve of the weighted monthly average power price of wind RES-E is a condition where financial incentives become progressively stronger so that less efficient sites are explored.

The monthly evolution of the generation-weighted (in €/MWh) monthly average PV power price for the same period is presented next.



The figure represents a case of overshooting, where very attractive support was provided for the diffusion of PV leading to the actual installed capacity being far higher than the planned and locking the electricity system with photovoltaic technological options that turned out to be (cost-wise) inferior ex-post.

Conclusions – Country Comparisons	
Greece • Reduced levels of national energy consumption are largely attributed to changes in the energy conservation behaviour of households usually at the expense of personal comfort or satisfaction. While the increased efficacy of subsidies and soft loans was offset mainly due to the recessionary environment (i.e. difficulties in access to finance, lack of liquidity) that often made investments non feasible. • The targets set by the NREAP, were considered as viable and efficient. However the RES trajectory eventually abided by a Ministerial Decree that set higher interim targets for RES generation namely for PV technology generation, was an indicative example of the difficulty in the effective translation of political support into practice that decreased the mechanism's cost-effectiveness. • The FITs for PV on rooftops is considered of strategic importance and should be reviewed to improve its financial viablity, and be continued as it enhances the dispersed generation and raises public awareness. • The cost of the RES-E support should take into account both the induced decrease in the wholesale power price and the increase in capacity payments for the less utilized but still needed thermal (especially natural gas-fuelled) generators. • By keeping stable the backbone of the RES licensing process it is proposed: to strengthen staffing of legal services in order to eliminate conflicting, incompatible regulations and to directly supervise the implementation of RES projects and therefore timely detect bottlenecks. • The need for a long term more visionary and adaptive policy design inclusive of reformulated targets and a more coherent strategy are primary issues to be addressed in order to enhance the effectiveness and efficiency of the Greek RES support Fit scheme alike.	**Slovenia** • Energy efficiency midterm goals were realized mostly due to reduced energy consumption during the financial crisis. • Although Slovenia is currently on right track to achieve its set goal of 9% saved energy by year 2016 a lot will depend on the amount of money Slovenia would be able to invest in different actions regarding energy efficiency in the future. Especially if we consider that only the easiest and most achievable measures were done until this day. • FiT for solar power plants were very effective as the goals for year 2020 were already reached by year 2012. • Due to lack of adaptation of FiT other RES technology wasn't as successful as photovoltaics. This has to improve in coming years if Slovenia wishes to achieve its set goals. • 42,6 % of all supports through FiT for RES technology went to solar power plants in year 2012 but generated only 18,6 % of all energy from RES technology that year.

Conclusions – Method integration

- Contributions of the qualitative (empirical) method to the assessment results:
  - Explaining the difference between the scope of the Fit scheme and its eventual unilateral effectiveness and overall poor efficiency according to: technological and political contextual factors, (i.e. difficulty in access to the grid, technology innovation effects, distortions and lack of maturity in the electrcity market) as well as deviations between planning and practice in the design elements of the scheme (i.e. adaptability, monitoring and adjustment system).
  - Identification of inconsistencies relating primarily to overregulation governing the licensing process and coordination issues across governmental levels, playing a determinant role to the scheme's cost effectiveness and highlighting future adjustments to be made within the reformulation of the Fit mechanism.
  - Integration of interactions between key stakeholders in RES-E promotion sector in the analysis to interpret the actual outcomes of the FiT.
- Contribution of the quantitative (modelling) approach to the assessment results:
  - Assessing the effectiveness of the FIT scheme through comparing the profitability index of RES-E investments with the demand for new operation permits. A model that relates the demand for investments with the profitability index would have the following useful characteristic: the residuals incorporate the effect – and the time evolution – of the unobservable factors. This is important because the unobservable factors are directly responsible for the effectiveness of the provided financial incentives. An alternative way to view the unobservable factors is that they represent the cost of the policy-induced uncertainty and the delays caused by permitting and grid-connection procedures.
  - Assessing the efficiency of the Greek FIT scheme by comparing the evolution of the generation-weighted (in €/MWh) average wind power price with the evolution of the capacity additions. The efficiency of a RES-E support policy can be judged by its ability to capitalize on cost reductions through a step-wise and adaptive process of tariff size and installed capacity target setting. Based on this, the time evolution of the financial support to RES-E projects can provide insight regarding the efficiency of the support.
  - Calculation of the support measures' efficiency through the calculation of the major costs and benefits can feed the debate regarding the competition between fossil-fuelled and RES-E generators.

How do qualitative and quantitative approaches relate to each other (complementary, yielding same results)? Profitability of the Fit scheme is a precondition for the effectiveness of the Fit scheme, as reflected not in the target-achievement levels of the policy but in RES projects' application rate. However in cases where the trend of applications did not go hand in hand with the profitability trend offered by the Fit, through the qualitative analysis other sufficient preconditions were identified, such as technology related ones (i.e. grid capacity additions' rate) as well as policy specific factors related to the successive reforms of the scheme.

Questions to stakeholders

1. Do you think that a premium-price FIT policy or a fixed Fit policy would create a more viable environment for further developing the RES-E sector in Greece?

2. In light of the current economic situation and reduced energy demand levels do you think that National targets for RES-E deployment should be revised in the near future?

3 Recycling of plastic packaging waste – the cases of the Netherlands and Germany

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To substantially reduce the use of natural resources is a priority of the EU. One of the EU's most important political strategies addressing this issue is the thematic strategy on waste. Due to the environmental challenges associated with the strong growth of plastic waste worldwide, the two case studies focus on the management of plastic packaging waste in the Netherlands and Germany. There are several options available for the management of plastic waste, including recycling, thermal recovery, incineration with or without energy recovery, and disposal. Although the waste hierarchy specified by the EU's waste directive gives a preference to recycling, the interference with other policy instruments (e.g. promotion of secondary plastic material as refuse derived fuel) can impede possible progress with regard to recycling quota.

As a starting point for this assessment, the following table lists the policy instruments used to transpose the EU Directive on Waste (2008/98/EC) in the Netherlands and Germany.

Crucial domestic policy instruments (Netherlands/Germany)	
The Netherlands **(2006-2012)**	**Germany** **(1990s-current)**
• **Packaging decision:** for plastic packaging material it set a recycling target of 42%. • **Packaging tax:** paid by producers/suppliers of products packed in plastics (levied by weight). The tax revenues were partly earmarked for waste separation and prevention of litter. • **Producer responsibility**: producers/suppliers are responsible for the collection of the plastic packaging material after consumption of the product. • **The responsibility of municipalities to collect household waste and optimise waste prevention and separation processes**: municipalities have a crucial role in the collection and separation of plastics from regular household waste and transfer of the separated plastics to recycling installations. Municipalities were compensated for that from packaging tax revenues.	• **Closed Substance Cycle and Waste Management Act:** stipulates the so-called 5-step 'waste hierarchy': (1) prevention, (2) preparing for reuse, (3) recycling, (4) other recovery (in particular energy recovery), (5) disposal. • **Packaging Ordinance**: formulates recovery and recycling quotas for specific packaging wastes streams. Starting from 1999 at least 60% of plastic packaging materials has to be recovered, thereof 60 % has to be recycled. • **Technical Ordinance on Waste from Human Settlements:** requires thermal treatment of waste and inertisation prior to final disposal in landfills • **German Greenhouse gas Emission Allowance Trading Act**: The overall objective of this act is to reduce greenhouse gas emissions from the energy sector and energy intensive industries.

It is evident from the list that both countries call on the responsibility of the waste producers. Additionally, the Netherlands have used tax incentives to reduce the use of plastic packaging material and make use of secondary plastics more attractive, whereas specific minimum quota are set in both countries. In the Netherlands, producer responsibility was implemented through a covenant with municipalities.

In Germany, from the year 2005 onwards, the recycling rate has constantly increased. However, it is not clear to what extent this increase can be attributed to waste policies. Based on the views expressed in the expert survey, the effectiveness of the VerpackV on the recycling of plastic packaging is only slightly positive. One of the reasons for this assessment is that the minimum recycling quota of 36% specified by the 4th revision of the VerpackV in 2005 is considered to be under ambitious and, due to the fact that in the following years the recycling performance was much higher than the minimum quota, did not offer actors high enough incentives.

In the Netherlands, under the Packaging Decision of 200, 45% of plastic packaging material had to be applied usefully, of which at least 38% has to be recycled. In 2010, the recycling target for plastics was increased to 42%. In 2012, 48% of the plastic packaging material (both industrial and household) was collected and sorted for recycling. However, the recycling target as applied in the Dutch Packaging Decision is a target for 'collection and preparation of plastic waste for recycling'. After collection, the recycling companies (mainly German) have a scope of freedom to decide on whether to recycle the plastics or to choose another option for recovery (e. g. thermal recovery or incineration). Therefore, despite the trend of increased recycling, it is unclear whether the reported 48% of reported plastics for recycling have actually been recycled. Current monitoring tools cannot fully reveal that.

The tables below describe the factors which have had an impact on the effects of the policy instruments applied in Germany and the Netherlands for spurring recycling of plastics. For that analysis, three types of influential factors referring to the context and implementation of the relevant policy instruments and their interaction with other policy instruments have been assessed.

Economic, technical, social and governance context factors:

Impact of relevant context factors on the effectiveness of the policy supporting recycling of plastic packaging waste in the Netherlands and Germany

The Netherlands		**Germany**	
Economic context factors			
Oil price		Oil price	
Demand for plastic waste as energy source		Demand for plastic waste as energy source	
Export of plastic waste		Export of plastic waste	
Technical context factors			
Techological progress		Techological progress	
Quality standards for recycled plastic		Quality standards for recycled plastic	
Socio-political context factors			

Public awareness and acceptance plastic recycling		Public awareness and acceptance plastic recycling	
Use of composite packaging materials		Use of composite packaging materials	
Governance context factors			
Governance structures for waste management		Governance structures for waste management	
Monitoring systems for sorting and recycling plastic waste		Monitoring systems for sorting and recycling plastic waste	

Policy implementation factors:

Impact of policy implementation factors on **effectiveness** of policies to promote recycling in the Netherlands and Germany

The Netherlands		**Germany**	
Political acceptance of recycling as a policy objective		Political acceptance of recycling as a policy objective	
Policy flexibiltiy of wast hierarcy		Policy flexibiltiy of wast hierarcy	
Political support for thermal recovery of plastic waste emanating from climate regulation (ETS)		Political support for thermal recovery of plastic waste emanating from climate regulation (ETS)	
Collaboration between local and national governments and producers/suppliers on implementing the producer responsibility, and the flexibility to use different collection and separation systems		Collaboration between local and national governments and producers/suppliers on implementing the producer responsibility, and the flexibility to use different collection and separation systems	
Monitoring of results		Monitoring of results	

Policy Interaction factors:

Impact of interactions on *effectiveness* of policies to increase recycling of plastic packaging waste (Germany and the Netherlands)

Policy interactions	Impact	Impact on effectiveness/ efficiency of key PIs
Germany		
Interaction between KrWG/VerpackV and TaSi	(-) Neg. impacts on recycling because of low costs for incineration as a competing option for waste treatment (-) Neg. impacts on the objective to reduce plastic packaging	
Interaction between KrWG/VerpackV and TEHG	(-) Neg. impacts on recycling because of increasing demand for plastic waste from RDF power plants and economic incentives for thermal recovery (-) Neg. impacts on the objective to reduce plastic packaging	
The Netherlands		
Packaging tax, producer responsibility, covenant with municipalities	(+) through the combined implementation of these three policy instruments, producer responsibility could be operationalised, funding required for waste collection and separation could be generated from producers and existing municipality waste infrastructure could be utilised	
Packaging tax, producer responsibility, covenant with municipalities in combination with Diftar	(+) in municipalities where plastics are separated at the household level and where households obtained tax reductions as a reward, a stronger plastic waste separation performance could be seen.	
Packaging tax, producer responsibility, covenant with municipalities in combination with public campaigns	(+) through public awareness campaigns willingness to support recycling increased among households	
Interaction of Packaging tax, producer responsibility, covenant with municipalities with (German) climate policy and stimulus to incineration capacity	(-) this interaction has been negative as Dutch plastics transported to (mainly) German recycling companies are in practice not always recycled do to relatively high costs of recycling in comparison with (co-) incineration.	

The different sets of policy instruments used in both countries to transpose the Waste Directive render it little surprising that also the impacting factors are quite different. In the end, however, the effectiveness and the efficiency of the assessed policy instrument turn out to be rather similar in both countries. With respect to the better performance of Germany at the time of policy implementation, more advance targets could have been achieved, which may explain the more pessimistic assessment of the impact factors.

Observed vs. Anticipated effectiveness of domestic policy instruments			
The Netherlands		**Germany**	
• Packaging tax has had limited effect in terms of prevention, due to short time frame (with longer timeframe prevention could be stronger). In terms of recycling, the tax made secondary (recycled) plastics		• Reduction of plastic packaging waste generation	
• Producer responsibility on its own had no effect on prevention and recycling rates as producers were not directly involved in and did not directly pay for waste collection and separation		• Increase of packaging plastic recycling	
• The agreement between producers, municipalities and governments to producer responsibility-packaging tax to combine the packaging tax, producer responsibility and municipalities' role in waste value chain had a positive impact on increasing plastic recycling		• Increase of plastic recovery	

Observed vs. Anticipated efficiency of domestic policy instruments	
The Netherlands	**Germany**
• Using a tax scheme for implementing the producer responsibility was considered efficient as it would utilize existing (tax) schemes. However, in practice the tax size was considered too small for operationalisation through the taxation office. The packaging tax has therefore been cancelled on 1 January 2013. • Use of existing municipality waste collection and separation schemes has improved efficiency of the policy. • In terms of dynamic efficiency effects, there are indications that the process of collection and separation have become more efficient (e.g. reduction in compensation for municipalities from € 475/ton plastic in 2009 to € 430 in 2013.	• Packaging Ordinance: increasing efficiency of the 'green dot' scheme due to technological progress and increasing competition. The total costs of the 'green dot' scheme have decreased from approximately two billion Euro per year in the period between 1995 to 2000 to approximately one billion Euro per year since 2008.

Outcome of modelling with GTAP

The GTAP modelling was only done for the Netherlands part of the case study with a particular focus on the impact of the packaging tax on the quantities of supplied goods packed in plastics on the Dutch market, including domestic supply and imported products.

The Netherlands

The main findings are:

1. The modelling results confirm the hypothesis that the packaging tax is almost entirely absorbed in the consumer prices, in line with the observation of stakeholders who argued that, instead of modifying their packaging strategies, producers' immediate response to the packaging tax has been to level the tax off to consumers through product prices. In the Netherlands, this leads to lower level of total consumption of products packed in plastics.

2. The effect of lower Dutch consumption due to packaging tax results in a relatively greater reduction of **imported** products (in comparison with demand for domestically produced goods). This finding follows from the assumption that foreign producers which export to Dutch markets generally do not respond to a Dutch tax. For instance, a multinational with a global packaging strategy has less incentive to respond to a national tax than for a national producer with the Netherlands as core market. In other words, the packaging tax makes Netherlands less interesting as an export destination. This model result is in line with the observation by consulted stakeholders that multinational producers/suppliers will not change their packaging strategy due to a national tax (especially when this market is small). Instead, stakeholders argued that packaging strategies are mainly based on longer term decision making and seem to respond more closely to longer term society and political trends and waste management policies, especially at the EU level.

3. The effect of the packaging tax on Dutch production of the affected commodities is smaller than the effect on consumption. The model assumes that national producers modify their packaging strategy so that less tax needs to be paid by reducing plastics use, in accordance to the actually observed statistics. Thus, the final prices increase less than the prices for imported goods, which leads to a shift in consumption towards domestic products.

4. Dutch producers also have an incentive to **export** more of their goods which are packed in plastics. This result can be explained by the fact that only goods supplied to the Dutch markets were subject to the packaging tax. As the packaging tax only affects supplier price at domestic market, exports become relatively more profitable and consequently a larger share of Dutch production is exported. This finding complements the stakeholder consultations which did not clearly identify possible implications of a packaging tax for exports of goods and mainly focused on national volume impacts.

5. The modelling results show the significance of the role that the Netherlands plays in food industry globally (and especially in Europe): multilateral policies and changes in global environment that affect food prices (growth, trade war) or competing uses of agricultural products (climate policies, biofuel mandates) affect the efficiency of Dutch national policies. For example multilateral policies promoting production and use of biofuels **increase** food production in the Netherlands, and this increased production goes to **exports**. This would further reduce the impact of domestic policy instruments such as the packaging tax.

6. While the model results confirm that the higher price on CO_2 emissions in the European Emissions

Trading Scheme (ETS) would imply higher prices for plastic products, it is also found that such prices would likely result from conditions where economic growth is high, and demand for food products considerably above present levels. In this context, the additional demand for packaging material for the increased food production exceeds the impact of more expensive plastics, and may require additional policy measures to achieve waste reduction targets.

After assessing the observed and expected effectiveness and efficiency of the investigated policy instruments and relating these findings with with the relevant impact factors, the following conclusions can be drawn for the management of plastic waste in the Netherlands and Germany.

Conclusions and country comparison	
The Netherlands	**Germany**
• The agreement between producers/suppliers, government and municipalities, which enabled implementation of producer responsibility in collaboration with municipality waste collection and separation infrastructure • Willingness of households to separate plastics from waste at home • Possibility to apply different collection and separation systems depending on the context (larger cities, apartment blocks, etc.) • Economic conditions (recession, etc.) have reduced waste material supply, but plastic waste quantities have remained relatively stable as people changed their consumption patterns in terms of consuming in different price categories but not in terms of type of consumption goods • An increase in plastic separation activities leads to lower supply of waste to incinerators which operate below capacity levels for efficient through-put of waste incineration. The supply deficit is compensated through waste imports. • The European Emissions Trading Scheme (ETS) could have a positive impact on recycling of plastic waste as a high price on CO2 emission would make primary plastics relatively expensive compared to secondary (recycled) plastics. This effect could, however, not be observed during the 2006-2012 period for this case study as ETS prices were generally too low for that.	• Waste avoidance and recycling seem to be influenced negatively by interactions with other policy instruments. Both, the interaction between different waste management policies as well as the external interaction between waste management policy and climate policy have had a slightly negative impact on recycling. • In particular with regard to the recovery of low grade plastic waste, economic incentives for thermal recovery and incineration are much stronger than for recycling. The flexibility of the waste hierarchy has made the recycling objective susceptible to the potentially negative effects of policy interactions. • Due to the lack of dynamic incentives, the Packaging Ordinance by itself was not successful in increasing the recycling performance beyond the 36 % threshold level. Rather it seems to be the case that the observed increase of recycling between 2005 and 2010 was induced by a positive development of the system context, • However, it must be stated that this development could only take place with the basic recycling infrastructure being in place, which can be clearly ascribed to the provisions of the Packaging Ordinance.

Conclusions – Method integration

- ***Contributions of the qualitative (empirical) method to the assessment results:***
  - Considers the complexities of policy interactions and stakeholder interactions and identifies the synergies and conflicts of policy and stakeholder interactions. This allows policy makers to identify the areas in the policy implementation stage that require attention.
  - Identifies the key contextual factors both within and outside the biofuel systems that influences the policy implementation process; however these contextual factors cannot be controlled which can limit preventative action as the impacts of contextual factors are unknown.
  - It clearly demonstrates that policies do not exist in a vacuum and that it is important to consider the system into which they are implemented.
- ***Contribution of the quantitative (modeling) approach (here: GTAP) to the assessment results:***
  - The GTAP model enables taking a broader view on the policy context, including import/export changes due to a policy instrument.
  - GTAP helps to better understand the consequences for price elasticity for different market actors, such as how strongly do suppliers respond to a packaging tax in terms of reduced use of plastic packaging material or increased exports/supply to countries without a tax.
  - GTAP can support predictions of possible effects of policy instruments under different macroeconomic context factors.
- ***How do qualitative and quantitative approaches relate to each other?***
  - Quantitative models provided a possible scenario of certain contextual factors, but the model provided limited insight as it did not consider how policies interacted within the plastics waste management systems (i.e. conflicting policy targets) and how stakeholders responded to policies. Additionally, the contextual factors were broad global factors such as trade wars. The model is best suited for exploring the impact of policy instruments with unambiguous price tag; in this case, the modelling was limited to the packaging tax while the implementation of producer responsibility was broader than that.
  - Qualitative analysis was able to identify more specifically how policy implementation aspects (such as the impact of a voluntary agreement on plastic waste collection) have had an impact on recycling performance. Qualitative analysis was also able to distinguish between actors within a sector, which is usually more difficult for quantitative analysis where a sector could be treated as one actor group.
  - Qualitative and quantitative analysis in the plastics case study turned out to be complementary: GTAP was able to explore trade effects that the qualitative analysis could not explore; qualitative analysis produced insights on context, implementation and interaction aspects that are not covered in that much detail in the GTAP model.
  - Qualitative analysis must complement quantitative analysis in the plastics case study as it not only provides an explanatory factor for the movement in trends but also provides a wider system perspective that helps to identify unintended impact of policies on stakeholders within a specific context, which is a crucial tool for making necessary policy revisions/amendments.
  - Qualitative analysis insights could be considered for inclusion in the model, so that models' information about efficacy of policy instruments can be improved.
  - As the model data is at sector level, it does not reveal firm level behavioural responses, such as the observation by some Dutch stakeholders that the packaging tax may have been 'distributed' by producers across products (so that a product with a price of €1,98 would stay below €2; the tax was then partly added to the price of another product: €1,94 becomes 1,96).

Questions to stakeholders

1. In both the Dutch and German case study it could be observed that at a certain point it becomes economically more attractive to use plastic waste for co-incineration (with energy recovery) instead of recycling. This can be due to relatively low costs of co-incineration in comparison with more expensive recycling actions (e.g. when plastics have a heterogeneous composition).
   - ***How does, in your view, the interaction between plastic waste recycling and co-incineration activities (for energy) affect the waste hierarchy where recycling is place above (co-)incineration?***
2. Some of the Dutch stakeholders have expressed concerns that monitoring of the waste-to-recycling chain can be weak as it may not always be clear which part of the waste prepared for recycling will actually be recycled and which part will be used for (co-)incineration. This may lead to a situation in which plastics are prepared for recycling (and appear in statistics as recycled waste), whereas in reality they may be (co-) incinerated.
   - ***How could in your view these monitoring processes be improved to obtain a better picture of which plastic waste stream are actually recycled and which stream (co-)incinerated?***
3. The GTAP model exercise for this case study has demonstrated that a packaging tax (similar to other governmental pricing policy on use of plastic packaging material imposed on suppliers) could lead to changing trade patterns whereby suppliers have an incentive to more their supply to markets where no such pricing policies exist.
   - ***Would such insights be a reason for stronger international agreements and coordination (incl. at EU level) on what policy instruments to use for achieving an environmental target, such as, in this case, increase recycling of plastics?***

Transposition of the EU Renewable Energy Directive and its interactions with other environmental objectives (focussing on biofuels for transport) – the cases of Austria and United Kingdom

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For making the mobility sector more sustainable and climate friendly biofuels as bioethanol, biodiesel and biomethane are intended to contribute to this aim (8.45 % biofuel target in Austria and 4.7% in the UK). This aim is achieved in EU- member states by different ways, because country-specific characteristics and conditions have to be taken into consideration for achieving this aim.

The promotion of biofuels is differently successful in different EU-MS and leads potentially to interrelations with aspects regarding biodiversity, water bodies' protection and waste reduction. Furthermore agriculture and climate protection issues are of interest in this respect. Thus, the case study explores how the aims of the EU renewable energy Directive (with special focus on biofuels for transport) are achieved in Austria and UK, which policy instruments have been used and how did they perform, and what are the (positive and negative) interactions with other (mentioned) policy themes (biodiversity, water, etc.). The bases of this analysis are the EU Renewable Energy Directive (2009/28/EC) as well as the repealed Biofuels Directive (2003/30/EC).

The table below shows that both countries have set policy instruments (PIs) setting targets for biofuels, whereas Austria preferred a command & control measure and UK a market based system for key biofuels policy instruments. Both countries introduced different tax rates for biofuels and fossil fuels at certain points in time.

Crucial domestic policy instruments	
Austria	**UK**
• **Fuel Decree:** Defines an Austrian biofuel target for 2020; minimum substitution shares for transport fuel suppliers; options for double counting of biofuels from waste; minimum GHG reductions of biofuels compared to the corresponding fossil fuels (includes instructions for set-up of national system for certifying sustainability); • **Decree regarding agricultural outputs for biofuels**: Defines land areas which must not used for cultivation of biofuels' feedstock (includes instructions for set-up of national system for certifying sustainability); • **Mineral oil tax law:** Defines different tax rates for 100% fossil fuels and transport fuels blended with biofuels; positive tax discrimination of fuels blended with biofuels; • **Decree for bioethanol mix:** Defines partial tax refunds for E75/E85.	• **The Renewable Transport Fuels Obligation (RTFO)**, a transposition of the Renewable Energy Directive and the former Biofuels Directives, establishes a mandatory biofuels target and tracks the obligation through a certificate trading system. • The **Excise Duty** overseen by HM Revenue and Customs sets taxation rate for all fossil fuels including biofuels based on the Energy Taxation Directive. • The **Motor Fuel and Merchant Shipping Regulations** (MFMS) address the goals of the Fuel Quality Directive to reduce emissions in the transport sector by allowing the sale of biofuel content between 7-30 % for transport fuel. • **Environmental Permitting Regulation** (EPR), is a board environmental programme that sets controls for the transport, storage, use and the treatment of biodiesel from tallow such as melted animal fat and waste oils.

The upcoming discussion about ILUC (connected with availability of land for cultivating biofuels' feedstocks) and subsequent limitations for 1st generation biofuels impact effectiveness and efficiency negatively in both countries. Other aspects (technical limitations for B10, taxes on imported biofuels) are country specific. Continued increases in global GHG emissions would intensify pressure to invest in low carbon and renewable energy technologies. Additionally, uncertainties surrounding indirect land use changes have also temporarily placed a cap on biofuels in the UK and targets are unlikely to change until major sustainability issues are addressed. Energy security concern is a positive driving force for the UK biofuel sector, which promotes domestic fuel production (to a certain degree).

Crucial context factors impacting effectiveness/efficiency of policy instruments					
Austria			**UK**		
Impact factor	**Effectiveness**	**Efficiency**	**Impact factor**	**Effectiveness**	**Efficiency**
Change in final energy consumption in transport sector			Increases in total GHG emissions increased need for action		
Scientific knowledge on impacts of biofuels on climate protection and biodiversity (ILUC)			Indirect land use change (ILUC) uncertainties		
Technical usability of biofuels in current car engine technologies (limitation for B10)			Energy dependence concerns		
Providing guidance for market actors to achieve obligations (certification procedure)			Availability of land in the UK		
Providing long-term investor certainty			View of general public towards biofuels		
			Biofuel/feedstock subsidies in key biofuels export countries		
			Regulation regarding taxes on imported biofuels		

It turns out that considerably different aspects in the national implementation process had impacts on effectiveness and efficiency of PIs. In Austria the failure of introducing E10 had negative impacts whereas the national administrative framework and coordination among institutions have been beneficial. In UK fluctuating conditions (prices for RETC, tax incentive) have negative impacts on success of biofuels in UK.

Crucial policy implementation factors impacting effectiveness/efficiency of policy instruments					
Austria			**UK**		
Impact factor	**Effectiveness**	**Efficiency**	**Impact factor**	**Effectiveness**	**Efficiency**
Non-introduction of biofuel E10			Fluctuating prices for the Renewable Energy Transport Certificates		
National administrative set up of certification system			Cancellation of the differential duty for biofuels		
Coordination and management among institutions			Coordination and management among institutions		

Upcoming knowledge about ILUC and thereby assumed potentially lower GHG abatements by 1st generation biofuels have led to a limitation of these biofuels. This provision to ensure climate mitigation due to biofuels has highly negative impacts on achieving national biofuel targets, also in an efficient way.

Crucial policy implementation factors impacting effectiveness/efficiency of policy instruments					
Austria			**UK**		
Impact factor	**Effectiveness**	**Efficiency**	**Impact factor**	**Effectiveness**	**Efficiency**
Interactions within the stakeholder system			Interaction within the stakeholder system		
Interactions with biodiversity policies			Interaction between UK policies		
Interactions with climate protection targets			Interactions with climate protection targets		
Interaction with waste legislation			Interaction with the Clean Air Act & Landfill Tax		

Due to different biofuel targets in Austria (8.45%) and UK (4.7%) problems associated with national biofuel target achievement are different. The high Austrian interim targets on biofuels could always be overachieved; however, the limitation of 1st generation biofuels and technical limitations for introducing B10 highly jeopardize Austrian 2020-biofuel target. The market-based system in the UK has not sufficiently contributed to meeting the biofuels target. The B10 cap threatens the biodiesel market as it eliminates the differentiation between the bioethanol and biodiesel market in the UK. As a result, the biodiesel market is likely to shrink in the UK, as bioethanol is more economical compared to biodiesel.

Expected and observed effectiveness of domestic policy instrument	
Austria	**UK**
• Expected by policy makers: achieving 8.45 % biofuel target (energetically) by biofuels E10/B10 subject to sustainability criteria of EU Dir. 2009/28/EC; • Observed: overachievement of interim targets of biofuel shares; • Tax exemptions/refunds makes it profitable for market agents to use blended fuels rather than 100% fossil fuels; • Current 6% limit on 1st generation biofuels jeopardizes biofuel-target achievement considerably, as non –biofuel options are technically highly limited; • Also the current technical constraints to apply B10 hinders target achievement • Sustainability and minimum GHG reduction of biofuels is guaranteed by legislation	• Expected: biofuels target has orginially set to 5 % for 2010 (by blending 5 % bioethanol and 7 % biodiesel); • The biofuel target was reduced to 5 % from 2012 onwards, latest revision sets target on 4.7 % from 2013 onwards (continuous revision of targets) • Since the RTFO was implemented in 2008, biofuel targets have not been met (with the exception of 2008) • The RTFO addresses sustainability and GHG emissions savings through the sustainability criteria, which are tracked and verified through the issuance of RTF certificates (RTCF) • The duty differential was the primary driver for developing the biofuels in the UK and the industry has lagged since its cancellation in 2009

For Austria options other than biofuels are considered as more efficient in achieving the 10% RES-target for the transport sector (e.g. modal shift). However, in Austria these other options are considered not to be viable for achieving the 2020-target. In the UK, biofuels contribute less to the 10% RES target than other renewable energy options. Confusion in certification procedure might be a problem especially in Austria, which produces much more of its biofuel demand domestically (in %) than UK.

Observed efficiency of domestic policy instrument	
Austria	**UK**
• Achieving the RES-target mostly by biofuels is not the most efficient strategy (in the long term); • However, it is the only option in the short term with essential leverage • EU-wide confusion in certification procedure reduces efficiency	• The RTFO and its corresponding RTFC has not been successful in meeting biofuel targets thus questions the efficiency of the market based mechanism • It may take some time for the RTFC prices to stabilise but this is also dependent on other factors such as setting sufficient biofuel targets to drive demand and supply • Uncertain biofuel policy strategies at the EU level impacts UK biofuel policies

The fixed biofuel targets and external contextual factors in both Austria and the UK limit the expansion of first generation biofuels and second-generation biofuels are not likely to make a sizable contribution to meeting 2020 targets, although in the UK there is growing investment and research and development in the area. Overall Austria and the UK have interpreted EU directives and implemented national policies differently. The command and control mechanism in Austria appear to be more effective and efficient in meeting national biofuel targets compared to the market based instruments in the UK.

Conclusions and country comparisons

Austria

- Command and control measures have been effective in combination with fiscal incentives to achieve Austrian biofuel target;
- However, 6% limit for 1st generation biofuels jeopardize both biofuel and RES-target achievement;
- Another barrier: Applying B10 is technically not viable yet;
- Thus, putting strong focus on just one option (i.e. biofuels) makes target achievement vulnerable if conditions change (rare diversification of options);
- Future generation biofuels are not likely to be provided to a sufficient extent until 2020;
- Increasing R&D in future generation biofuels would reduce (at least short-and medium term) efficiency of strategy for RES-target achievement;
- Changing conditions have decreased investment certainty;
- Confusion with certification obligations/procedures considerably reduce efficiency of using biofuels;
- No biodiversity damages domestically, but potentially abroad because of displacement of food cultivation potentially also to areas with high ecological value;
- **Austria has chosen a command & control instrument with fiscal incentives → high efficacy (high expected effectiveness);**
- **Changing external conditions (1st generation biofuels) and technical limitation (B10) jeopardize target achievement, low diversification of measures to achieve RES-target → low expected effectiveness → need to adjust policy instruments domestically;**
- **Confusion about certification (e.g. mutual compatibility) reduced efficiency → need to adjust policy on EU level.**

UK

- A market mechanism along with quota setting (RTFO certificate trading) has been questionable in terms of its effectiveness in meeting biofuel targets;
- Policy interactions: other policies include command and control measures that either increase the cost of biofuels production or indirectly encourage biofuels production;
- The 4.7% cap on biofuels limits further development of first generation biofuels. The 4.7% target is unlikely to increase until the major issues on indirect land use changes are sufficiently addressed;
- The cancellation of the duty differential increased uncertainty in the biofuels market and have made biofuels more expensive than fossil transport fuel;
- Second generation biofuels and biofuels from waste are expected to play a more important role in biofuels production within the mid-term;
- The majority of biofuel feedstock are imported from abroad due to lower/more competitive prices from subsidised; biofuels in other countries as well as limited land in the UK
- **The overarching biofuel policies do not consider the wide variety of feedstocks for biofuels and different environmental impacts → differentiated policy targets may necessary for different types of biofuels based on their environmental impact;**
- **The implementation of the RTFO has not been as effective and efficient in meeting biofuel targets or developing a UK biofuels sector → need to re-examine the implementation process and targets as well as the impacts on different biofuel producers (small vs. large scale production, biodiesel vs. bioethanol).**

Modelling Scenario

The modelling scenario highlights some of the key contextual factors identified in the qualitative analysis:

- Climate agreement scenario: emission permit prices are about three times as high as in the BAU for EU ETS region
- Trade war scenario: introduces high import tariffs and export tariffs for some critical raw materials; and
- Counterfactual growth scenario: reveals the impact of the economic crises on the policy efficiencies (growth without the global economic crisis)

Table 1 illustrates the impact of a climate agree, trade ware and counterfactual growth on meeting RES and the corresponding biofuel targets.

- The Climate agreement increases the prices of fossil fuels relative to biofuels due to higher costs of carbon emissions. Thus RES becomes more competitive and both countries have a higher likelihood of meeting the RES target.
- The Trade war has a positive effect on the overall RES target on Austria, a country that relies on domestic biofuel production or EU imports. Since fossil fuels are primarily imported from third countries and face higher tariffs, they become relatively more expensive. UK is a large importer of biofuels from third countries, thus trade war makes meeting the target more expensive as biofuels also face higher tariffs.
- The Counterfactual growth has a large impact on the biofuels sector and results in a higher demand for all fuels including biofuels. This increase in demand will require a higher volume of biofuels to be produced in order to meet the target; thus it will be more costly and difficult to reach the RES target

Table 1: **Difference to the target in other contextual scenarios (+ target exceed with x%, - x% below target)**

Contextual factors	Austria	UK
Climate agreement	2.0 %	0.5 %
Trade war	1.6 %	-2.6 %
Counterfactual growth	-9.3 %	-5.6 %

Table 2 illustrates the economic impact of biofuels on land in 3 contextual scenarios.

The large impact in the counterfactual growth scenario can be attributed to the global food demand that is much higher than in the business as usual (BAU) scenario. Land prices would be higher but less land would be used for biofuel crops in areas where conditions are optimal for food production. The UK has land constraints and does not have a comparative advantage in global crops markets.

Table 2: Real factor income from land, effect of biofuel policies

Contextual factors	Millon USD		% changes	
	Austria	UK	Austria	UK
BAU	63.4	331.1	1.30%	1.08%
Counterfactual growth	15430.2	6548.7	83.50%	6.00%
Climate agreement	65.0	300.8	1.34%	0.99%
Trade war	63.8	281.4	1.34%	0.99%

Conclusions – Method integration

- Contributions of the qualitative (empirical) method to the assessment results:
  - Considers the complexities of policy interactions and stakeholder interactions and identifies the synergies and conflicts of policy and stakeholder interactions. This allows policy makers to identify the areas in the policy implementation stage that require attention.
  - Identifies the key contextual factors both within and outside the biofuel systems that influences the policy implementation process; however these contextual factors cannot be controlled which can limit preventative action as the impacts of contextual factors are unknown.
- Contribution of the quantitative (modelling) approach (here: BSAM) to the assessment results:
  - Able to model the potential future impacts of contextual factors and compare the results to the business and usual case: the 3 key contextual factors were identified and scenarios were created for trade wars, counterfactual growth and climate agreements.
  - The modelling results usually provides a value are familiar with these indicators (i.e. prices).
- How qualitative and quantitative approaches relate to each other:
  - Quantitative models provided a possible scenario of certain contextual factors, but the model provided limited insight as it did not consider how policies interacted within the biofuels systems (i.e. conflicting policy targets) and how stakeholders responded to policies. Additionally, the contextual factors were broad global factors such as trade wars. Qualitative analysis was able to identify more specific gaps in trade policies pertaining to the blending of biofuels for specific stakeholder groups, which had a significant negative impact on the UK bioethanol producers.
  - Qualitative analysis must complement quantitative analysis in the biofuels case study as it not only provides an explanatory factor for the movement in trends but also provides a wider system perspective that helps to identify unintended impact of policies on stakeholders within a specific context, which is a crucial tool for making necessary policy revisions/amendments.

Questions to stakeholders	
Austria	**UK**
• Why was no unique European sustainability certification system established? • What are potential solutions for the problem of dislocating food cultivation to potentially areas with high ecological value? • Is there a "plan B" of EC if future generation biofuels cannot be provided until 2020 to a sufficient extent? • Which factors have considerably impacted achievements of national biofuel targets? • Which factors have considerably impacted efficiency of national biofuel targets?	• Do you think that a quota and certificate policy such as the RTFO or a command and control policy (i.e. taxation) creates a more viable environment for developing the biofuels sector? • Does there need to be separate targets set for biodiesel and bioethanol due to the diverse feedstocks used and also different environmental impact for each fuel type? • Are separate targets required for biodiesel and bioethanol? And why? • What role do you think second generation biofuels will play in the UK biofuels sector in the medium-long term?