DYNAMIX

Decoupling growth from resource use and environmental impacts

Qualitative assessment of the DYNAMIX policy mixes

DYNAMIX deliverable D5.5

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DYNAMIX PROJECT PARNTERS

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1 Executive summary

This report builds on the findings of the qualitative ex-ante assessments of the policy mixes developed under the DYNAMIX project[1]. In doing so, it identifies some of the challenges associated with the forward-looking evaluation of policy mixes generally, and with the specific policy mixes identified by the DYNAMIX project. It also notes key areas of consonance and divergence between the qualitative ex ante assessments under consideration, and the quantitative ex-ante assessments carried out in parallel, and identifies possible implications for policy.

The report first explains the methodology adopted for each aspect of the qualitative ex-ante assessment; it then discusses some of the challenges which were common to all or several of the assessments, or which arise from the process of bringing separate assessments together to form a single overview. Understanding these challenges, and thus the nature of the messages that emerge from the evaluations (both in terms of the valuable light they provide, and in terms of their limitations) is important to their effective use in policymaking. Moreover, some of the challenges of the evaluations themselves reflect the challenges faced by policymakers in developing responses at the scale required to deliver a significant shift towards improved resource efficiency in the European economy. This report then addresses the comparison with the quantitative assessment carried out in parallel under the DYNAMIX project, looking at both the economic modelling and the physical and environmental modelling, and respectively comparing them with the economic and the environmental qualitative assessments.

This report does not aim to recapitulate the detailed findings of the individual qualitative assessments, which are summarised in Annex 1. Rather, it attempts to identify some key messages which emerge from the process of bringing together separate qualitative assessments which address different facets of the impacts of policy mixes, using different methodological approaches; a process which was informed by the comparison with the results emerging from the quantitative assessment. These messages appear to be of broad relevance to the development of policy mixes for resource efficiency. In particular, we identify:

- **The importance of understanding public acceptability issues**, and the potential for policy sequencing to be used to help achieve the required changes in paradigms over time;
- **The challenges involved in developing appropriate, and effective, tax instruments**, which requires attention to the risk of overlaps between tax instruments, and is confronted with a broad challenge of public acceptability;
- **The need to address the impact of extra-EU material flows** in the form of imports and exports, both in terms of the potential impacts (often exaggerated in the public discourse) on EU economic interests, and in terms of the impact of EU policies on environmental and other outcomes in other economies;

[1] Nesbit et al, 2015; Bukowski et al, 2015; Bigano et al, 2015; Lucha and Roberts, 2015; Vanner et all, 2015. The assessments are available at http://dynamix-project.eu/results

- **The importance of addressing social impacts at an early stage** in policy design, in order to ensure that accompanying measures reinforce and facilitate the shift to resource efficiency among low-income households in particular.
- **The need for coherence and consistency** in the development of policy mixes, based on forward-looking roadmapping, effective sequencing, and an awareness of the challenges posed by uncertainty (both uncertainty in relation to the impact of individual policies, and uncertainty as to the broader context in which policies will be implemented).

2 Introduction - methodologies

The approach taken to our qualitative assessment involved, first, ensuring, as far as possible, a consistent understanding of the nature of the policy mixes and individual policy instruments developed in the earlier phase of the project. On that basis, we carried out separate assessments relating to the environmental impacts, the broader economic impacts, and the social impacts, complemented by an assessment which addressed governance issues (both in relation to legal feasibility, and in relation to public acceptability). These separate assessments were carried out by separate teams in the research institutions participating in the DYNAMIX project, although there was some overlap between team members, which helped to ensure a consistent, yet tailored approach to the different assessments.

The following section briefly describes the methodological approaches applied in the different assessments. We have focused here in particular detail on the public acceptability assessment (see section 2.5 below) since this is the most innovative, using techniques which are likely to be less familiar to most readers.

2.1 Environmental assessment methodology

All key policies identified in the policy mixes were evaluated against the following objectives and indicators:

DYNAMIX environmental objective	**Indicator**
Extraction of raw materials: Reducing use of virgin metals by 80 % (base 2010)	Change in the extraction of raw materials
Greenhouse gas emissions (GHG): 2 t CO2-eq per capita per year	Change in the GHG emissions
Land use: Zero net demand of non-EU arable land	Change in the global land requirement required for EU consumption and production
Freshwater use: No region should experience water stress	Change in the water use

In addition, the land use policies were assessed against their impacts on biodiversity. Some of the metals policies have been assessed against impacts on toxicity.

A simple scoring system was employed, described in the box below. The assessments were based primarily on a literature review, to provide an evidence-based qualitative assessment of likely environmental impacts, both positive and negative. The assessments also aimed to identify the conditions necessary to generate an environmental impact (e.g., public engagement/trust, other policies, funding/incentives etc.), and therefore consciously touched on elements which were of relevance to the economic, social, and governance assessments.

Identifying the baseline against which each policy was to be assessed proved challenging. While in principle our objective was to use the reference scenario described in Gustavsson et al, 2013 as a "business as usual" baseline, in practice the level of granularity required to understand the implications for the individual sectors affected by individual policies was absent.

Scoring system

Upwards arrows indicate a beneficial change with respect to the trend under a baseline scenario up to 2050, as described in the policy-mix descriptions, for each of the stated environmental objectives. Downward arrows indicate a detrimental change.

Estimated magnitude of change:

↗↗↗↗ or ↘↘↘↘ = High (above 100% deviation from the baseline)

↗↗↗ or ↘↘↘ = Medium high (ie between 50-100% deviation)

↗↗ or ↘↘ = Medium low (ie between 10-50% deviation)

↗ or ↘ = Low (ie less than 10% deviation)

The scope of impacts considered in the scoring of each policy instrument was the sector or product category that was the subject of the policy, although – as section 3.3. below notes – this approach was difficult to apply in a fully consistent way, due to the differences in nature, scope, and level of definition of scope, of the different policy instuments.

2.2 Social assessment methodology

The following approach was taken in order to select the social impacts to be analysed.

1. A long list of possible social impacts was adopted from the impact assessment guidelines developed by the European Commission (European Commission 2009a). These guidelines were chosen as a starting point, as they cover a wide range of social impacts and provide consistency with the current framework of the European policymaking.
2. The long list of possible social impacts was combined with the full list of policy instruments prepared under WP4 to create a social impact matrix. The matrix provided a framework for the systematic screening of possible social impacts across all the policy mixes. Two researchers from WISE and FEEM qualitatively assessed the strengths of all the possible social impacts for all of the policies: the matrix was filled with the following scores: “0” (no impact), “1” (some impact), “2” (significant impact) or “3” (great impact). The final social impact matrix was computed by averaging the scores from the individual assessments, after a discussion on the differences between them.
3. The scores from the social impact matrix were used to identify a short list of three key social impacts to be assessed, taking into account the list of policy instruments selected for assessment in WP5, as well as possible overlaps with other tasks in Work Packages 5 and 6.

By establishing a long list of potential impacts and then selecting the several most important ones, this approach ensures a balance between comprehensiveness (i.e. it allows us to check whether an important type of impact has been omitted) and practicability (i.e. it allows us to focus the assessment and recommendations on the key social issues related to the policy mixes).

In order to ensure compatibility of results both within this assessment and with the other qualitative assessments in the DYNAMIX project, a qualitative scoring system was adopted. It assigns a qualitative score for each key social impact to each instrument assessed. The system takes into account not only differentiated scale of impacts, but also the associated level of uncertainty.

Table 1: Qualitative scoring system as used within the assessment

	Social impact assessment
+++	Likely very positive
++	Likely positive
+	Likely rather positive
0	Likely neutral
-	Likely rather negative
--	Likely negative
---	Likely very negative
(++)	Assessment uncertain
((--))	Assessment very uncertain

2.3 Economic assessment methodology

The economic assessment recognised, in the first place, that the policy approach of DYNAMIX is based on policy mixes rather than on individual policies. For this reason, a policy mix generally appears a more adequate instrument than a single policy instrument. This explains why multifaceted policy instruments tend to prevail in the real world and in the environmental and resource policy in particular (Bennear and Stavins, 2007).

The approach adopted for the economic assessment was to study first the individual policy instrument, and then the individual Policy Mix. This analysis was based on the investigation of four assessment parameters: **effectiveness, efficiency, equity and feasibility**, which are described in detail in the assessment report, and summarised in section 4.1 below. In a next step, the assessment team studied the relationship between the whole DYNAMIX policy package and the key targets of the Project. This involved, at an external level, assessment of how the whole policy package stands in relation to the five key targets of DYNAMIX; and at an internal level, how the individual policies in the three Policy Mixes interact with each other. Both levels of analysis used two assessment criteria: coherence and consistency.

Economic theory allows identification of certain common aspects among policies and on this basis it provides a classification into four well-defined categories:

1. Market-based instruments
2. Regulatory and command-and-control instruments
3. Information - based and educational instruments
4. Voluntary instruments and other instruments

This categorization is recognized also by policy makers as it emerges from several policy reports by major national and international bodies (e.g. OECD, 2006). Moreover, it is exhaustive in the sense that each and every policy can be ascribed to one of these four groups. The analysis performed in the economic assessment was based on this categorization, in order to allow for a more systematic and efficient assessment of the DYNAMIX policy mixes.

2.4 Governance assessment methodology: Legal

The legal assessment encompassed the following steps:

- Identification of the legal barriers;
- A legal assessment of these barriers with regard to the selected instruments of the policy mixes, that means:
    - Importance in legal hierarchy (which provision is of higher precedence?);
    - Applicability;
    - Compatibility check;
    - Exemptions from as well as justifications of breaches of provisions' content for example for environmental protection or human health reasons;
- A check of the consistency of the identified barriers with provisions that guarantee protection of the environment, human rights, etc. and thus can be interpreted as contributing to improved resource efficiency:
    - If such provisions do exist, a check is required on which of the provisions take a higher precedence: the provisions guaranteeing free trade etc., or those aiming directly or indirectly at resource efficiency.
- If necessary: Adaptation of the design of the instruments of the policy mixes on the basis of the assessment.

Especially in cases where the relevant provisions are ambiguous, the legislative history in the policy area, and the purpose of the relevant provisions have to be analysed (statutory interpretation).

2.4.1 Challenges and ways to overcome them

The ex-ante legal assessment constitutes a challenge per se as legal assessments in general are done ex-post, through the work of judges in court systems. This is because the level of detail required for legal assessment is high; even the check if an instrument is covered by legal provisions needs in-depth information about the objectives, character and design as well as the impacts of the instrument – information that is at least partly not available in the policy instruments being considered here due to the very nature of proposals for future instruments. The approach adopted was the following: where a clear statement of detail proved very difficult or even impossible, the assessment result was indicated as uncertain, and the nature of the missing information as well as ideas for a change in the design of the instrument were included as part of the chapter on conclusions and pointers for revision.

Another challenge was the need to summarise the results of the legal assessments of individual instruments in order to allow for an overall statement about the policy mix as a whole, especially where the results from compatibility checks with WTO and EU law differed. The approach adopted here was to classify the overall assessment result of the policy mix as uncertain by pointing to assessments of the single instruments, and adding ideas for changes in the design of the instruments in the pointers for revision chapter.

With respect to compatibility with EU law, it was critically important, owing to the division of powers between the EU and the Member States, to determine if the instrument was to be introduced by an act of the EU, or of a single Member State, or a group of Member States working together. However, clarity on this was not always possible, because it depends on the respective political situation, the majorities required in Council decision-making, etc., which in turn are linked to the issues considered under the separate assessment of political acceptability (see section 2.5 below). Indications on the least problematic ways to design the instrument with respect to the EU-Member States competencies are given in the assessment, however, pointing out that these competencies might change in the future.

2.4.2 Re-Classification of policy instruments under WTO- and EU- Law

In general, WTO and EU law differentiate between the following categories of measures:

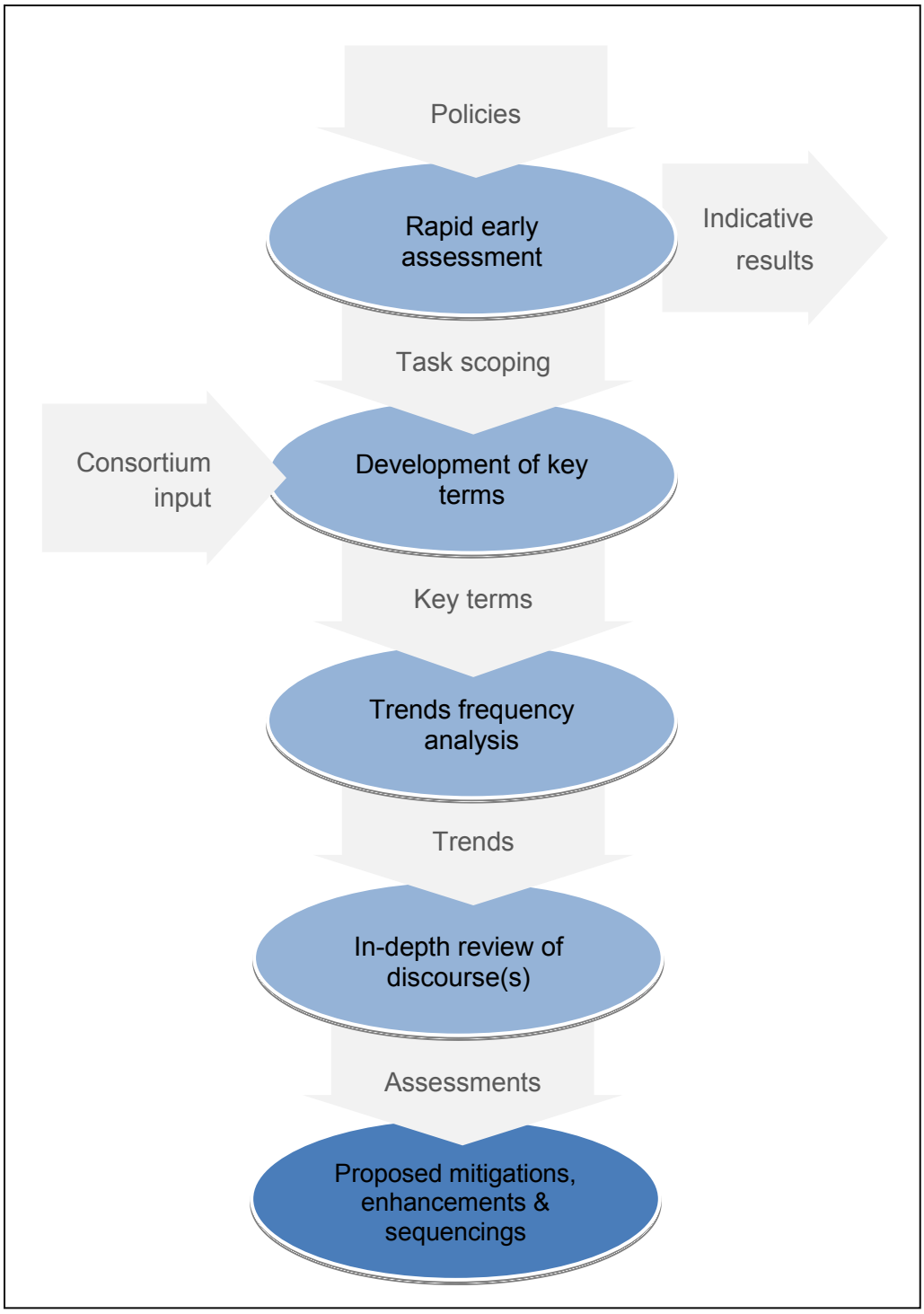
- Taxes;
- Subsidies;
- Technical regulation and product/production standards;
- Other (especially voluntary measures).

The legal assessment consequently uses these categories as a starting point under which the instruments were analysed on their compatibility with WTO- and EU-law. It should be noted that this categorisation differs from that adopted under the economic assessment (see section 2.3 above), although there is some overlap between some of the categories.

2.5 Governance assessment methodology: Public acceptability

The assessment of public acceptability of the proposed polices used relevant public discourses as a means of understanding how the public would likely respond if the policy were to be proposed in the real world. A staged methodological tool-kit was developed to maximise the value of the analysis to the DYNAMIX project as it progressed. This tool-kit is introduced in Figure 1 and described in detail throughout this section. Since the techniques used in this assessment are relatively novel, and will be less familiar to policymakers, the methodology is set out in more detail than for the other assessments.

Figure 1: Staged methodological tool-kit



2.5.1 Identification of key discourse terms

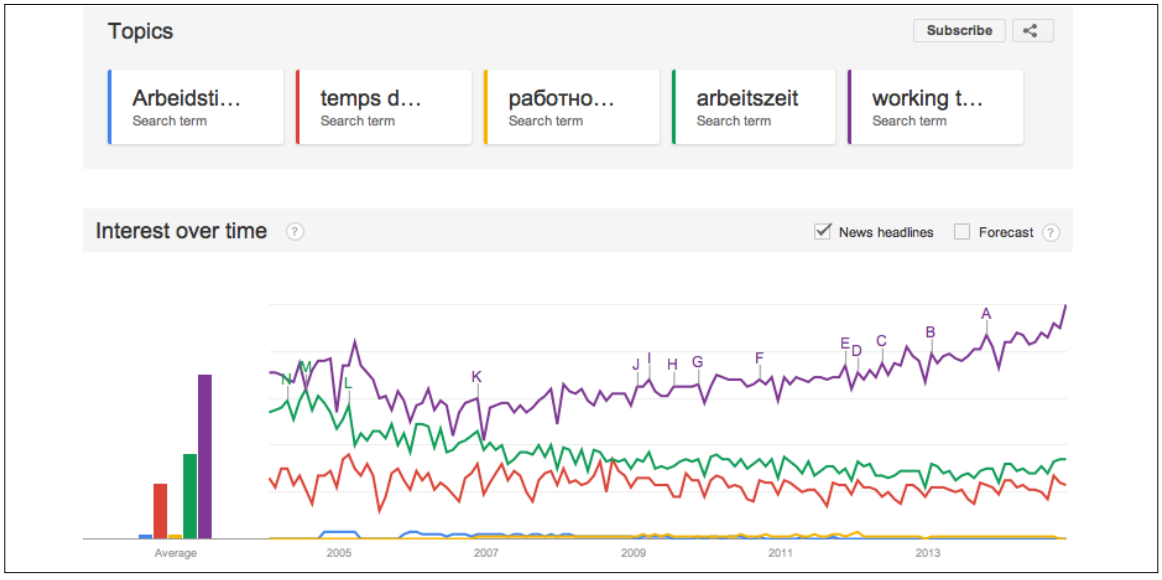
An important task for the in-depth investigations to follow was the development of key discourse terms. This is essential in defining the discourse which is relevant to the public acceptability of the particular proposed policy, as well as ensuring that the language, cultural and geographical variations are captured within the analysis. This was achieved using the following processes:

1. Identification of key terms used in the policy instrument.
2. A web-based search query of these terms to identify how these have been translated into public discourse. So for example, the discourse among professionals to develop a policy may use the term '*removal of the exemption on VAT on meat products*', whereas public discourse will additionally use the term '*meat tax*'.
3. It was identified within the rapid early pilot assessments that the media discourses frequently developed more precise terms, often emerging from within public discourse, which a direct linguistic translation would not pick up. Therefore, the terms were shared within the DYNAMIX consortium with the request to provide examples where their country of origin/residence has developed its own logistic and cultural derivative of the key term.
4. Finally, the selected key discourse terms underwent a direct linguistic translation into the various official languages of the EU.

2.5.2 Search frequency analysis

Search frequency analysis was then used as a supporting tool for the follow-up in-depth analysis. Building on its use in recent studies including Choi and Varian (2012), Wilde and Pope (2013), and Trevisan (2014), discussed in more detail below in Box 2, the assessment team used a search frequency analysis tool, Google Trends[2], to quantify the frequency of interest in key discourse terms in each of the different EU Member States. A sample snapshot result is shown in **Figure** 2 for 'working time'.

Figure 2: Google Trends sample snapshot – 'Working time'



[2] www.google.co.uk/trends/explore

Search frequency analysis facilitates the comparison of the relative popularity of search terms by geographical location and date. Google Trends results are normalised to place an emphasis on *relative* popularity of search terms, which reduces sample bias that might otherwise arise due to varying population sizes. The Google Trends tool also disregards duplicate searches. However, the assessment team emphasised the point that search frequency analysis results are only approximations of actual levels of public discourse.

Google Trends was used in this analysis as a supplementary tool to highlight possible events and other instances of relevant discourse which may otherwise have been overlooked. Although examples exist of correlations between search frequencies and related real effects (e.g. Wilde and Pope, 2013; Choi and Varian, 2012), a *lack* of data cannot be relied upon to infer public acceptability or low public interest in an issue. For example, strong regional or national views on an issue may remain undiscussed because they are widely held as common knowledge, or the issues may not yet have entered the public discourse, but nonetheless might rally strong opinion if they were to do so.

Further efforts, as described in Vanner et al 2015, were undertaken to address risks of cultural bias by those identifying the search terms; the potential lack of media representativeness; and the lack of comparability of results between different regions and different Member States.

2.5.3 In-depth review and assessment of discourse(s)

The search frequency analysis was used to direct more in-depth review of relevant media and government sources. This was intended to identify qualitative acceptability issues, prominent trends, framing of the issues within the discourse in relation to different specific groups participating in the discourse (e.g. industry coalitions; NGOs) and the thresholds of acceptability. These analyses drew upon:

- Published papers reflecting on the issues under investigation.
- Publically available lobbying positions and responses to consultations.
- Public media sources as returned by online searches.

Care was taken to explore those public discourses where the values implicit within the discourse are transferable across as much of the EU as possible. However, where a particularly focused and relevant discourse emerged within a particular Member State, this was pursued.

Public acceptability was assessed against the following question and criteria:

- **Can the policy measure be implemented within a democratic system?**
  1. **Unnoticed**: The policy measure could likely be proposed and implemented without any widespread public concern.
  2. **Uncontentious:** Proposal of the policy measure will likely cause some public concern on the issues, but it is unlikely that any formal coalition of disparate stakeholders will form to oppose it.
  3. **Contentious:** Proposal of the policy measure will likely cause considerable public concern on the issues raised, which will lead to the formation of coalitions of disparate stakeholders to oppose it. The policy measure in its current form can only be

implemented within democratic systems by the investment of political capital from the ruling government.

4. **Highly contentious:** Proposal of the policy measure will very likely cause considerable public concern on the issues raised, which will lead to the formation of a coalition of disparate stakeholders to oppose it. The policy measure in its current form can only be implemented within democratic processes by the investment of considerable political capital from the ruling government during the right 'window of opportunity'.
5. **Unimplementable**: Proposal of the policy measure will very likely cause considerable and negative concern on the issues which will lead to the formation of coalitions of disparate stakeholders to oppose it. It is not conceivable that the policy measure in its current form can be implemented within democratic processes.

A necessary part of mitigating the highly contentious policies is the identification of thresholds of public acceptability. This reflects the 'paradigm edge' or 'point of paradigm change', which DYNAMIX seeks to focus on and highlight where more stringent policy is possible. These involve the issues, population segments and stakeholders that present a level of contention that threatens to undermine public acceptability within the democratic process.

2.5.4 Development of proposed mitigations, enhancements and policy sequencings

The policy packages as proposed under DYNAMIX represent a challenging context for the policy packages to be introduced. Many of the measures require EU-wide implementation and therefore agreement among all Member States (whether absolute or qualified). This would require convergence of EU opinion around these issues within a common timeframe. It has therefore been the intention of this assessment to ensure that any policy which is assessed to be **highly contentious** is subject to mitigations and/or sequencing**.** The rationale for this being that, within the assessment criteria, a highly contentious policy requires not only political capital, but additionally the right '**window of opportunity'** for public acceptance.

It is not the intention of DYNAMIX to avoid acceptability thresholds altogether, but rather sequence policies in a way that permits these thresholds to move over time (i.e. paradigm change). This inter-policy sequencing (i.e. ordering of policy implementations) differs somewhat from the intra-policy sequencing (i.e. *within* policy instruments), in that the inter-policy sequencings are more significant and reflect how early policies can lay the ground for more ambitious policies. In some cases these will be extensions to a proposed policy, such as preparing a mandatory scheme with an introductory voluntary scheme. Other examples include policies which have been initially assessed as highly contentious but which become implementable once other related policies have laid the ground.

All of the information as explored in this methodological section was applied to make the assessments, and where there were significant public acceptability concerns, we have made proposed mitigations to the policy instruments were offered by the public acceptability assessment team; these were considered by the policy mix authors alongside the results of the quantitative assessment.

2.6 Using the results from the qualitative assessments in combination

As can be expected in the light of the descriptions above of their differing methodologies, the nature of the analysis in the individual evaluations was significantly different. The evaluations were used within the Dynamix project, alongside the findings of the quantitative evaluation (Ekval et 2016, Bigano et al 2016) to refine and develop the policy mixes in Ekval et al 2015; the adjustments considered are set out below in Annex 2. This report does not attempt to recapitulate the findings of each (although the summaries of the findings are set out in Annex 1, for reference); and the project has not, in practice, attempted to create a single, synthesised evaluation. Indeed, developing a single synthesis would be to misunderstand the nature and value of qualitative assessments of this kind, which should not be seen as leading to a cumulative or averaged "score" or quantified result for each policy instrument or policy mix, but as providing policymakers with pointers to issues which need to be addressed in the development of policy responses.

This report focuses instead on lessons learned from the process of considering the separate evaluations. It does so by identifying some of the challenges common to two or more of the evaluations (in section 3 below), which to some extent reflect the parallel challenges faced by policymakers themselves; by putting the outcomes of the relevant qualitative assessments alongside the results from the parallel quantitative assessments (in section 4 below); and then (in section 5) identifying some broad policy messages which emerge from the assessments, and which in our view are of particular relevance to the process of developing broad policy mixes to deliver a shift in resource efficiency.

3 Particular challenges in qualitative evaluation of the policy mixes

Some problems were common to all of the qualitative assessments and, to a large extent, reflect the real world challenges experience by policymakers in developing instruments and combining them in policy mixes to achieve resource efficiency and other broad environmental goals. This section identifies the most salient challenges.

3.1 Assessing combinations of policies

This challenge was foreseen at an early stage in the project and in order to mitigate as much as possible the policy mixes themselves were designed to be self-reinforcing, i.e. trying to design the instruments so that synergistic effects between (some of) the instruments in the mixes seem plausible. This implies a level of interdependence of the instruments, with the effectiveness of one contributing to that of others (or a lack of effectiveness of one handicapping the impact of others). Addressing this level of interdependence was not feasible within the ex ante assessment; but it remains very relevant to the potential success of a policy mix.

As a simplifying approach, assessors worked on the implicit assumption that all policy mixes would be implemented as planned, and would have broadly the impacts envisaged; in practice, of course, this is unlikely to occur. A more fruitful approach in future similarly complex assessments might be to focus on whether the policy mix is designed so as to be sufficiently robust to the failure of some elements, and capable of adjustment; or, conversely, designed so as to be capable of capitalising opportunistically on any unexpected positive impacts, or on an unexpected degree of success of individual policy instruments (for example by bringing forward more ambitious approaches to the range of products covered by producer responsibility obligations in response to a significant shift in public acceptability).

The use of paradigm analysis, as used within the public acceptability analysis, lends itself well to assessing the overall impact of policy mixes. The approach sets out to understand what attitudes and worldviews stand in the way of some of the more far-reaching policy instruments, and to propose how sequenced introduction of mutually supportive policy instruments might be able to tackle these. In practice though, this remains a complex process with uncertain outcomes in the real world. One clear message for policymakers identified by the project, therefore, is that improving the wider public attitude towards policies aimed at resource efficiency has benefits in relation both to the behavioural impacts of individual policy instruments, and to a progressive fostering of the public acceptability of more ambitious policies. This process can be seen as helping to bridge the gap between publicly expressed support for those objectives, and the lack of public support for the means to achieve them.

3.2 Uncertainties associated with assessing the impact(s) of individual policies, and with future scenarios

The question of uncertainty around outcomes applies both (i) at the level of individual policy instruments (what assumptions should be made about their success, particularly where they depend on behavioural responses among individuals or organisations?); (ii) and at the level of the policy mixes collectively, and the economy as a whole (in what future scenario for the economy as a whole will they apply, and what effect will that have on the impact?). While the first (i) is, in principle capable of

being resolved with appropriate assumptions and estimates, the latter (ii) is much more challenging due to the complexity of processes, actors and decision levels involved. A notable uncertainty in assessing impacts of policy mixes relates to the degree to which some of the early sequenced polices will impact at the social-paradigm level; thereby facilitating a greater or lesser behavioural response to later sequenced policies. However, there is also a broad range of external factors, both in terms of wider development of the EU economy, but also in terms of the wider global economic conditions, which are external to our policy mixes. These questions were addressed in work package 4 of the DYNAMIX project, through the development of background scenarios (Gustavsson et al. 2013); but basing our assessments on a comparison with a "business as usual" trajectory, in practice proved difficult.

3.3 Evaluating the scale of the impact

A further challenge in our assessments relates to the scale of impact of different types of policy instruments. Individual policy instruments in the DYNAMIX policy mixes are designed to apply at different levels of economic scope: some (particularly taxation measures) are designed to apply across the economy; others have a much more targeted impact; or are designed to apply initially to a range of sectors and products, with expansion to more targets planned in the event of initial success, or demonstrated practicability. As noted in Nesbit et al. (2015), it was therefore problematic to choose between assessing the impacts of policies on the economy as a whole (which would have undervalued policies which are relatively narrow in scope but potentially very effective within that narrow scope) or, alternatively, against a narrow sectoral definition (which would have undervalued economy-wide environmental impacts). The environmental assessment was carried out on the basis of a narrow sectoral definition, with caveats as to the reading of the results of the assessment; the challenge was less prominent for the other assessments, and they took a range of different approaches.

3.4 Integrating the results of the separate qualitative assessments

Finally, a key challenge in the development of a coherent overall picture of the qualitative analysis for each policy mix, and for the policy mixes working in combination, was the need to combine the results of the separate assessments, carried out using distinct methodologies. While this combination is facilitated by the initial work aimed at ensuring that the assessments had a common understanding of the detail of each individual policy, it was not possible to assume consistency of assumptions around dynamic responses to the policies. In practice, the impact of a policy is the result of a complex interplay of governance (including public acceptability issues), social, economic, and environmental impacts. For example, successful implementation of a policy is likely to be influenced by its economic impacts, and the extent to which those economic impacts are distributed, both of which will cause social impacts and hence influence public acceptability, which in turn will affect the credibility and salience of requested legal implementation processes (such as unanimity at EU level) – and hence will counteract early delivery of positive environmental results. Addressing that interplay through a qualitative (or quantitative) assessment is unlikely to be readily feasible. The approach set out at section 2.6. was therefore adopted, aiming at a detailed reading of the individual assessments in order to adjust the policy mixes, and an identification in this report of of broad policy messages relevant to the development of policy mixes.

However, it could be argued that the public discourses as referenced by the public acceptability analysis (for example, on environmental tax reform, or on food waste) are real world examples of integration, albeit subjective and sometimes biased examples. Public discourses tend to respond selectively to results from across the range of available (scientific and non-scientific) analyses, and debate them through a range of perspectives and worldviews. Given the finding that a shift in public acceptability is important to secure the longer-term conditions for implementation of policies at the required level of ambition, we suggest that using analyses of pathways of public acceptability over

time as a framework for integration of the different assessments is a potentially fruitful avenue for further exploration – it seems promising to embed potential environmental impacts into wider socio-economic impact and legal challenges, which influence public acceptability and thus, in turn, determine whether and in what form the initial policy can be implemented and hence very likely also change the nature or magnitude of the policies' environmental impacts.

4 Comparison with the results of the quantitative assessment

The project's qualitative assessment of the impacts of the policy mixes has been carried out in parallel to a quantitative assessment (see Ekvall et al 2016). This approach was expected to provide differing but valuable perspectives on the impact of the policy mixes; but also creates some challenges in combining the lessons of the two types of assessment. The issue is relevant principally in relation to the economic assessment (the lessons from the qualitative assessment can be compared to the outcomes of the quantitative economic analysis); and the environmental assessment (the lessons of which can be compared to the outcomes of the physical and environmental assessment prepared as part of the quantitative assessment). As with the findings of the different qualitative assessments, this process is best understood not as an attempt to reach a mediated, compromise "score" for each instrument or mix, but rather as an opportunity to check our understanding of the potential impacts of the policies, and as a means of ensuring that the findings of the evaluations re used with an appropriate appreciation of their methodological context, value, and limitations. Doing so should enable a better understanding of the issues which need to be addressed in the further development of the policy instruments and mixes.

4.1 Comparison of the qualitative economic analysis with the quantitative modelling

In the case of the economic analysis, the comparison between the results of the qualitative and the quantitative assessment is viable only for those policies, which are evaluated from both perspectives. Since the qualitative analysis tackles all DYNAMIX policies, it suffices to consider the ones which were also simulated with the three quantitative economic models. These are indicated in the table below.

Table 2: Policy instruments simulated by each model

Policy mix	Policy instrument	ICES	MEMO II	MEWA
PM-O	1. Circular economy tax trio	X	X	X
	2. Enabling shift from consumption to leisure			X
PM-LU	3. Revised emissions levels in the […] nitrogen cycle on farmland			X
	4. Strengthened pesticide reduction targets under the Pesticides Directive, and provision of […]	X		X
	5. Targeted information campaign to influence food behaviour towards changing diets	X		
	6. VAT on meat	X	X	X
PM-MOM	7. Green fiscal reform: materials tax	X	X	X

Policy mix	Policy instrument	ICES	MEMO II	MEWA
	8. Green fiscal reform: internalisation of external environmental costs	X	X	X
	9. Increased spending on research and development			X

Bigano et al. (2015) point out that the qualitative analysis and the quantitative analysis are mutually complementary. Although each type of analysis focuses on different aspects of a policy, there are broad overlaps between the two types of assessment. The comparison between the results obtained by the two approaches obviously refers to these overlapping areas. In order to identify them, the four standard assessment criteria , i.e. effectiveness, efficiency, equity and feasibility were used (Bigano et al. 2015).

In terms of **effectiveness**, the comparison of the two types of analyses is particularly fruitful, while it is less helpful in the case of **efficiency**, and even less so in the case of **equity**. **Feasibility**, which "has to do with the chances the policies have to be implemented without being stopped by any technical, legal, social, economic or political obstacle" (Bigano et al. 2015: 8), is clearly difficult to capture in a quantitative model.

In the case of **equity**, Bigano et al. (2015) argue that this may be looked at from three different perspectives: equity among countries, among sectors and among private actors [and their groupings]. The ICES model allows us to study the issue from the former two points of view, but the assumption of agent homogeneity (i.e. that all agents in each broad category will respond in the same ways) prevents any analysis of the third aspect.

Effectiveness is the capability of a policy to reach a given objective, and, in principle, it can be measured. This is however a general appraisal, which needs to be circumstantiated. A basic feature of DYNAMIX is that every objective (i.e. key target) is pursued by a set of policies. This is appropriate, as illustrated in Bigano et al. (2015). However, neither the qualitative nor the quantitative assessments assess the entire set of policies aiming at reaching a given objective. Quite differently, the assessments focus on every individual policy and on each policy mix. For this reason, it is quite difficult to argue about the overall effectiveness of a set of policies (in contrast to a single policy aimed at achieving a single target), because the assessment of the cumulative effect of those policies that it would require has not been feasible. Neither is it an easy task to assess the effectiveness of a single policy in detail, as the corresponding policy description (see Ekvall et al. 2015) would have to be very detailed in order to enable in-depth assessment. The quantitative assessment of the effectiveness of a policy may be performed in ICES using the results regarding the emission levels (ICES allows to calculate the emissions of several air pollutants) as well as the material intensity (which we define as tonnes of materials per unit of GDP).

In terms of **efficiency**, the DYNAMIX project does not focus on the comparison of different policy options from the perspective of the costs, which they bring about when achieving a given objective. As indicated in Bigano et al. (2015), these costs include but do not equate to the welfare losses. In theory, the welfare loss associated with an efficient policy should be (more than) compensated by the gains due to the falling externality. Since models with perfectly competitive markets (like ICES) are usually unable to depict this type of gain, the model allows a quantification of the costs of the policy but not the gains. These would need to be calculated on the basis of model results and with additional external data. If model results were to report a welfare gain, this would be simply due to the interaction of the introduced policy and the already existing policy framework in a typical second-best situation (Lipsey and Lancaster 1956). Moreover, since the model does not allow for the depiction of the externality, the externality level, which corresponds to the social optimum, cannot be determined

within the model. For this reason, it is basically impossible to determine the level of the measure necessary to optimally cope with the existing externality. There is thus a risk that the adopted measure would either be insufficient or would exceed the optimal level, and from the observation of model results one cannot rule out, for example, an overshooting of the objective. Appraisal of these aspects is necessarily confined to the area of qualitative assessment: quantitative assessment on its own would provide insufficient breadth of analysis. In particular, quantitative approaches are, in practice, based on incremental changes from a simplified construction of the present, and thus struggle to address issues such as an environmental systemic risk (tipping points, etc) or issues which are not reflected in the model (for example, health, or broader measures of well-being).

Five out of the six policies, which are quantitatively simulated in ICES, are of a market-based type. The non-market based policy foresees a "targeted information campaign to influence food behaviour towards: reducing food waste and changing diets". This policy has the objective of changing consumers' preferences regarding meat consumption. The five market-based policies foresee the introduction of a tax, but do not pursue any precise target. This is understandable considering that the scale of the targeted externality is often unknown. This is in particular the case of the externalities which arise from materials' extraction and disposal activities. Moreover, as illustrated in Ekvall et al. (2015) the quantification of an externality is in any case a very complex task which leads to different results under different assumptions.

A general consideration regarding the two types of analysis is that their results are substantially coherent. We focus here on four policies. The first refers to the policy aiming at increasing the VAT on meat. Both the qualitative and the quantitative assessment highlight a basic feature of meat demand, i.e. its low elasticity. The qualitative analysis expects the effect of an increased VAT on meat to be quite low, and this is indeed confirmed by the quantitative simulation. Based on this, the qualitative analysis suggests distinguishing among different meat types, which are also associated with different impacts both on the environment and on human health. The distinction between, say bovine and non-bovine meat would represent quite a challenge for the quantitative analysis, which needs data and an appropriate model structure, in order to allow for such distinction.

The two types of analysis also deliver similar results with regard to the relationship between the policy instruments advocating a higher VAT on meat and the policy consisting in a targeted information campaign to foster a change in diets. Both assessments in fact find that this policy has a certain degree of effectiveness as it directly intervenes on consumer tastes while bypassing the issue of the low demand elasticity. Following to a successful information campaign pushing for a change in diet, the consumers' demand shifts and this clearly causes a change in demand, which may be higher than the change in demand which occurs in response to higher prices. The simulation in the quantitative analysis builds on a quite prudent approach as it assumes that diets in all EU countries become of a Mediterranean type. In technical terms, the simulation assumes that preferences in all EU countries start conforming to those of countries like Spain, Italy or Greece, and it quantifies the effects of these changes on emission levels and on the economy as a whole.

Another area of agreement between the two types of analysis regards the two green fiscal reforms. The quantitative simulation results show that a policy fostering a full internalisation of external environmental costs can have economy significant negative impact on economic activity. Coherently with the qualitative analysis, the quantitative results show that excessively high taxes, unilaterally adopted in the EU risk significant economic consequences in some countries which would be unlikely to be publicly or politically acceptable. A more flexible model with a more detailed sector specification (following a so-called bottom-up approach) might perhaps better capture innovation and substitutability dynamics, leading to a less negative assessment of the economic impacts.

Analysis of the materials tax exhibits similar problems. Based on Ekvall et al. (2015), the qualitative analysis argues that the "resource demand [has] low price elasticity, in particular with stable technologies (short run) or limited substitution possibilities in the industrial process. For this reason,

even a larger increase in final prices (following from taxation) could have only a small quantity effect". This is also the outcome of the quantitative simulation, which does not allow computing the effects of the policy until 2050, as it becomes unfeasible some years before that one.

4.2 Comparison of the quantitative physical and environmental assessment with the qualitative environmental assessment

The physical and environmental assessment carried out as part of the quantitative assessment (Ekvall et al. 2016) considered a narrower range of policy instruments, selected on the grounds of their suitability for modelling. The physical and environmental assessment notes in particular that the policy mixes are assessed through models of their physical flows only, and that, for most policies, assumptions on the effectiveness of the policy mixes are needed as an input to that modelling. For example, a key divergence with the qualitative assessment can be seen in the results relating to an information campaign on food consumption (waste and dietary preferences), where the physical model assumes full effectiveness of the provision of information in driving behaviour change. In such cases, the physical and environmental modelling is best considered as an estimate of the potential resource efficiency benefits available, rather than an assessment of the ability of the policy mixes to meet the DYNAMIX targets for 2050.

The policies considered by the physical and environmental assessment were:

- Policy mix on metals:
    - Research and development (R&D) to improve copper removal in car dismantling
    - Product standards that specify material choice in water piping
- Policy mix on land-use:
    - Information campaigns to change diets and food-waste management
    - Redistribution and donation of food to reduce food waste
- Overarching policy mix:
    - A feebate system on cars, where the environmentally best products are subsidised while a fee is levied on the purchase of the worst products.

Key insights which the physical and environmental assessment adds to the qualitative assessment are an understanding of the potential impact of successful technological development on resource use and environmental impacts (for example, more rapid electrification of EU transport), and the significant contribution to the effectiveness of our policy mixes of rapid decarbonisation of the energy sector.

The assessment of the **Policy mix on metals** is broadly consistent between the two approaches, although in the case of product standards the qualitative environmental assessment took an overview of potential impacts across a range of products, while the quantitative assessment focused on the specific example of water piping. The latter approach provides a less optimistic view of impacts, suggesting on the one hand that there may be an element of optimism bias and availability bias in the qualitative assessment, as a result of focusing on examples of cases where product standards have been successfully introduced (which are likely to be the cases where potential gains were available). A clear focus on physical quantities and detailed analysis of individual product categories yields a better understanding of the potential impact of the measure. On the other hand, Ekval et al 2016 makes the important point (albeit essentially a qualitative observation) that consensus-based standards are unlikely to be strong drivers of change; in part this reflects the likelihood that incumbents with interests to defend are more present in standards discussions, and that the interests of actors which

might emerge to develop innovative responses to challenging standards are, by their nature, difficult to identify – a different, and countervailing, effect of the availability heuristic.

The assessment of the **Land use policy mix** shows a divergence in results on consumption policies, as noted above, although this is more properly considered as a divergence in the question asked by the assessments; in the case of the quantitative assessment, insight was provided into the potential impacts in the event that measures were fully successful in changing behaviour, whereas the qualitative mix also considered the likelihood of success. This difference in methodology needs to be understood before policymakers draw conclusions. The quantitative approach, however, provides a clearer understanding of the potential *scope* of policy impacts; and, for example, makes it clear that policies which successfully change diets could have a much greater beneficial impact on resource efficiency than those which are focused on avoiding waste (although the potential contribution of the latter is by no means negligible).

The assessment of the feebate measure proposed in the **overarching policy mix** was similar in both the qualitative and quantitative exercise, noting significantly greater scope for an impact on emissions, than for impacts on resource use in manufacture. The quantitative assessment adds significant depth to the qualitative assessment, however, through its analysis of the differing levels of impact in the cases of different scenarios for the decarbonisation of electricity generation; although these energy impacts are outside the scope of our policy mixes, they are clearly a vitally important element in the context for resource efficiency policies; this finding has implications for policymaking, in particular the synergistic potential of, on the one hand, the resource efficiency policies we have identified, and, on the other hand, ambitious energy sector decarbonisation policies.

5 Key messages for policymakers

The assessments carried out involve examination of the potential impacts of the policy mixes, and their individual policy instruments, from a range of different, and to some extent overlapping, perspectives. Their recommendations in respect of individual policy instruments and policy mixes merit careful attention, but are not recapitulated in this overview. In this section, we draw out some over-arching messages for policymakers, focusing on issues of general application, rather than on the detail of the individual instruments.

5.1 Implementing policies in the real world: Working with paradigms

The assessment of public acceptability identified notable gaps between the behaviour changes implied within the proposed policy packages and the changes in behaviour the public would presently be willing to accept. An important element within DYNAMIX has been the use of paradigm[3] analysis in the design and reconfiguration of the policy packages to alter the basis of public acceptability over time. The unit of analysis within the public acceptability assessments has been public media discourses.

Within a given discourse, individuals and groups interact and debate the issues and form both formal and informal alliances. The discourse surrounding a policy or combination of policies reflects the broader public and stakeholder understanding of economic, social, and environmental impacts. However, this process was found to be not always predicable and rarely objective, with discourses typically being steered by those who have influence and who hold the public's trust. Within such discourses, a single issue or concern often caught the attention of the public and came to drive the public debate, typically against the proposed policy. In some cases, such concerns were 'proxy-concerns' promoted to align with more narrow interests of certain groups.

While paradigms may be deeply embedded and appear difficult to change, they are not immovable, and can be influenced and reshaped over time in response to both new evidence and positive experiences of similar actions. Furthermore, depending on how things are presented, different groups and individuals have been shown to be adaptable to different perspectives and values. The analysis of public acceptability within DYNAMIX has sought to map how policy sequencing can be used within these pathways of interactions in a way that might lead to the required paradigm changes over time. Public acceptability itself is both influenced by the impacts identified in the social, economic, and to some extent the environmental assessments; and at the same time, a necessary condition for the implementation of the more ambitious further policies (or for the more ambitious roll-out of individual policies) identified as essential in delivering the ambitions behind our policy mixes, and achieving a resource efficient economy.

The resulting **recommendations** are aimed at those formulating policy:

(i) Become aware of the worldviews and paradigms of all those inputting into the policy formulation, including your own and those supporting you. Failure to do so risks disconnect, and a reactionary discourse in response to policy proposals or initial policy implementation.

[3] i.e. the collective and sometime unconscious values, beliefs and ideologies in which people are immersed and which are used to navigate any new evidence, challenges or choices

(ii) Give prominence to public acceptability issues and be prepared to make adjustments to the policy to secure acceptability and maintain it.
   - Value and engage with all perspectives and groups through consultation and participation in the policy design process.
   - Consider making concessions to target groups.
   - Be prepared to support transitions in sectors most affected.
   - Frame the change in the context of a wider transition over the longer term and highlight where equivalent paradigm shifts have.
   - Use policy sequencing of softer measures such, as voluntary schemes, to introduce the concept change required.
   - Recycle any revenues generated from implementing policies, aiming at those most affected by the policy.

(iii) Avoid sidestepping difficult paradigms, and where necessary, be prepared to invest considerable political capital. Often the most challenging and necessary paradigm changes will provide a return on the investment with 'interest'.

5.2 The use of tax instruments to internalise external costs: the importance of careful design, and the need to address system boundaries

The policy mixes set out in Ekval et al 2015 include, and to some extent rely on, significant development of tax instruments. The assessments carried out have a range of implications for the design and use of tax instruments, particularly deriving from the economy-wide scale of some of them. There are both some general challenges in relation to the development of tax instruments; and some specific challenges in relation to the parallel development of different tax instruments, and management of the risks of overlap between them.

As the economic assessment explains in more detail, environmental economics prescribes that the environmental regulation of the use of an input to a productive activity should find the optimal balance between the beneficial aspects of that input and the damages it generates. Since benefits are usually by and large private and damages affect the society at large, the condition to reach overall optimality is that marginal (private) benefits equate marginal (social) costs, which include private production costs and public damages. A Pigouvian tax is the instrument of choice in first best theoretical setting to restore social optimality by inducing the internalization of external costs, i.e. that portion of social costs that are related to the damages and are not taken into account by the producer. In a second best setting, where optimality is not attainable, the goal is to minimize the cost of reaching a given target selected exogenously by policymakers. This entails driving the regulated agent to select that level of activity that equates the private marginal cost of reducing the externality with the marginal social benefit of such reduction, or in a second best setting, induce the agents to reach the desired target at the lowest possible social cost. While all taxation creates distortion to some extent, the distortion induced by Pigouvian environmental taxes, boils down to correcting an existing distortion (the one between social costs and private costs of the activity generating the externality) and thus is actually welfare improving.

However, a range of real world challenges arise in implementing tax policies. The first problem is that a green tax reform is being introduced in an established economy, subject to a number of policies

already in place, and to policies being developed in parallel; these other instruments may reduce the impact of the tax, or even change the direction of the impact. The second is that there are likely to be transaction costs, which in turn are linked to the simplicity of imposing a tax – where, for example, a tax is imposed on a broadly defined set of environmental impacts which may be difficult to measure or define for individual products, transaction costs may be high. A third problem relates to public acceptability of a tax instrument. It can be difficulty for the general public to accept and value the co-existence of an environmental and an economic objective; and attempts to explain the linkage can be hampered by the fact that politicians and tax polices hardly ever enjoy the unconditional trust of taxpayers. There are also difficulties in relation to the distribution of the impacts of tax measures; on the one hand, environmental taxation is regarded as generally regressive, suggesting that its introduction may create public acceptance barriers, and require countervailing measures to redress the distribution of the overall tax burden among income groups; on the other hand, different economic sectors will be differentially affected by a tax – in part, simply because different sectors will currently enjoy the benefits of undervaluing of their external impacts – which will lead to strong concerns from some sectors. These acceptability and governance challenges are, in practice in the EU, likely to create further difficulties, since they will be differentially present in different Member States, yet tax measures require unanimity, as noted by the legal assessment.

A further challenge, relevant to the combination of tax instruments envisaged in the over-arching, land use, and metals policy mixes, is the problem of defining boundaries between taxes. While individual policy areas will, rightly, see the introduction of tax instruments (assuming feasibility constraints can be addressed) as an attractive approach to tackling environmental damage, introducing a separate tax for each type of environmental damage, or for each type of business or produce, would create a complex patchwork.. This can happen within the same policy measure: the externality tax, for instance, foresees that all sectors should be taxed on the basis of their overall level of externality, which is linked to emissions; however the taxation for sectors using water might introduce a double taxation for these sectors. In the DYNAMIX policy package, overlapping taxation can happen also across policy measures and policy mixes. If material taxes are also implemented and each policy foresees a tax which is commensurate to the externality, the final outcome is over-taxation with a triple taxation of the same item or activity. This would draw the externality level well below the social optimum with a rise in inefficiency. The circular economy tax trio also potentially overlaps with other environmental taxes on materials.

Overlapping taxation is not only an issue per se, but casts additional doubts on the feasibility of the affected measures. The co-existence of very similar measures does not help to foster public trust in government, if government does not seem to take consistent and efficient action to protect the environment. Coherence in government action is clearly an important aspect to consider in order to build public trust. It is thus very important for the efficiency of the market based measures proposed in the DYNAMIX package, that they are rationalized and designed in such a way that the possibility of actual overlapping and double or triple taxation is excluded or at least, minimized, without, conversely, introducing excessive complexity in the definition of boundaries between the coverage of different tax instruments.

5.3 The need for a coherent approach to imports and exports, and the need to address risks of leakage

Trade issues, including the consistent treatment of imports and exports, and the need to address non-EU impacts, are prominent in the economic, environmental, and legal assessments. All three point to the need for a consistent approach by policymakers.

The economic literature has long been aware of the possibility that introducing a policy measure that increases the production costs of an internationally traded good can result in a loss of competitiveness for the firms of that country on the international markets with respect to the firms operating in countries where environmental regulation of the same sectors is less stringent. This stems naturally from David Ricardo's (1817) comparative advantage theory of international trade: countries will be most successful selling on the international market the goods of which they are comparatively "better" producers, than those goods for which production is cheaper in that country than in other ones. Taxing the production of two otherwise identical goods in country A but not in country B, gives a clear advantage to the latter.

Imposing more difficult operating conditions, either directly through increased costs via taxation or indirectly through standards and regulations, as the preservation of environmental quality often requires, has led many to be concerned about the consequences in terms of competitiveness of the affected industries and the corresponding risk of reduced policy effectiveness via leakage of environmental impacts.

However, more recently, alternative views put forward the opposite possibility that forcing firms to deal with the environmental consequences of their business through the introduction of regulatory standards would lead them to adopt innovative technological solutions that would ultimately yield them a competitive edge, particularly if the same environmental issues, and the need to tackle them, arise in competing countries. This is the so-called Porter Hypothesis (Porter 1991).

Despite the abundant theoretical literature on the relationship between environmental regulation and international competiveness, the ultimate validation of the two theories remains an empirical matter. A recent survey (Dechezleprêtre and Sato 2014) describes the state of the art of this empirical literature and overall indicates that the balance appear to be in favour of the Porter hypothesis: "There is little evidence to suggest that strengthening environmental regulations deteriorates international competitiveness. The effect of current environmental regulations on where trade and investment take place has been shown to be negligible compared to other factors such as market conditions and the quality of the local workforce. However, the impact could increase in the future if efforts to control pollution diverge significantly across countries". (p.3).

Thus, while the current balance in terms of international competitiveness seems in favour of environmental policies, we cannot exclude that some countries competing in some specific sectors may be more severely hit in the future; or that some of the policy instruments we envisage, particularly taxation, may pose greater problems for competitiveness. Should these competitive concerns become prominent for the viability of the EU sectors for which resource efficiency is a priority, the solution will require a careful reconciliation of environmental and trade considerations, with important consequences on the legal side. The theoretically simple way out would imply imposing the same level of stringency in environmental matters on both EU-produced and imported goods, for example through border adjustment mechanisms or border tax adjustments. This might be seen by non-EU countries as an infringement of trade agreements, and cause retaliations which can seriously damage EU exports. The practical solution of these issue is by no means simple and will require the provision of more powerful legal checks and balances within commercial treaties for countries genuinely interested in the transboundary aspects of environmental preservation, as well as the diplomatic and political efforts of policymakers to include environmental considerations in economic and trade treaties in a way that balances fairness and environmental effectiveness.

Even if a consistent approach can be applied to the environmental impacts of EU consumption of on the one hand good produced in the EU, and on the other hand goods produced outside the EU, challenges would remain for policymakers as a result of the different levels of ambition on resource efficiency and environmental protection in different economies. Thus, if EU policies to tackle production impacts in the EU lead to a reduction in EU production, but unaccompanied by a reduction

in EU consumption, the relative share of consumption that is sourced from other economies will increase. This will in turn generate both economic and environmental impacts in those economies, including, potentially, accelerated resource depletion and environmental degradation. While the trade-off implied for those economies may be acceptable to their citizens in the short term, the immediate and longer-term environmental impacts need to be carefully considered by EU policymakers, particularly in the case of global environmental challenges such as climate change mitigation.

5.4 The importance of addressing social impacts in the design of the policy mix

Careful consideration of the policy instruments and mixes is necessary if their impact on social inclusion of the most vulnerable groups - children, disabled, women, elderly or immigrants, for example - is to be well understood. In particular, measures to reinforce the shift to resource efficiency among low-income households should be considered. While direct support may be more challenging to implement, public policy could focus on supporting the transition in the low-income neighbourhoods by providing sustainable alternatives to current consumption patterns. Two examples are in the social assessment report: support for deep retrofits and improving mobility through public transport development.

At a regional level, measures to support the transition in regions which are currently dependent on the resource-intensive sectors, such as mining or heavy industry, should be considered. This can be done, for example, through the existing framework of EU structural and cohesion funds, with benefits applying particularly to the poorest regions within the Union. Additional funds from green fiscal reform could be channelled towards new programmes, or those already in place may be used after 2020; an approach similar to the use of funds generated by decarbonisation instruments such as the sale of allowances in the Emissions Trading System in the current financial perspective.

5.5 Coherence and consistency: the nature of a successful policy mix

A policy mix goes beyond combining loosely or rather unconnected policy instruments. In fact, a policy mix long-term qualitative objectives and short- to mid-term quantitative tar-gets are linked to an instrument set applied in a time-dynamic sequential process approach to achieve the objectives and targets. Therefore, compiling a policy mix requires:

- a forward-looking roadmapping, i.e. relating different policy instruments to each other in a time sequence that helps optimising synergetic effects and minimizing un-intended negative side-effects
- consideration of political processes in multi-actor networks and polycentric govern-ance systems in order to be able to monitor processes and adapt the mix in feedback loops over time.

Thus, the concept of policy mixes appears to clash with political practices and experience, where policy formulation often entails so-called policy layering, i.e. stacking new instruments or objectives on-top of existing ones without any overarching design (del Rio and Howlett, 2013). Resulting from political needs, such as existing alliances, election-based tactics or lacking time or knowledge, policy layering increases the risk of unplanned mixes with contradicting objectives and measures and hence trade-offs in effectiveness.

Designing, implementing and evaluating policy mixes is much more difficult than individual instruments loosely bundled. Political realities as well as the dynamics and path dependencies of legislative periods run counter to a strategic and more long-term implementation procedure of policy mixes. Therefore, compiling a policy mix needs to consider political pro-cess in multi-actor polycentric governance systems to identify and exploit opportunities for long-term, adaptive policy formulation.

In this context, designing a policy mix needs to ensure a good fit between instruments and targets within a single level of policy (horizontal mixing) as well as with institutional frame-work conditions (i.e. various policy fields and governments active in these fields = vertical mixing) (del Rio and Howlett 2013). This encompasses the need to consider both consistency and coherence of the instruments sequentially linked in a policy mix. While consistency in a more narrow sense denotes the absence of conflicts and contradictions, coherence refers to ensuring synergetic effects and positive interactions between instruments (denoted as strong consistency by Rogge and Reichhard, 2013) as well as between different policy and administrative levels (del Rio and Howlett 2013, Rogge and Reichardt 2013).

Consistency and coherence can be fostered by combining primary with supportive instru-ments. Primary instruments mainly serve to achieve the/a set objective and should be as lit-tle controversial as possible; supportive instruments serve to minimise or mitigate unin-tended negative side-effects of primary measures and hence to increase their acceptability and feasibility (Givoni et al 2013; Rogge and Reichardt 2013).

Annex 1: Key findings from individual evaluations

1 Key findings from the environmental assessment

There are a range of common issues underlying the judgements set out in the assessments, which affect the overall assessment for each policy mix. Some of those issues overlap with the subject matter of the other assessments (social, economic, and in particular governance), and will require more detailed work in the light of the findings of the relevant tasks. Some issues which might usefully be addressed in further development of the policy mixes, however, can already be identified.

1.1 Uncertainty

There are a number of drivers of uncertainty in the impact of policies, and the assessments adopt slightly different approaches to its treatment. Some of the drivers of uncertainty are linked to issues pursued in more detail in the other assessments, and may need to be revisited following a synthesis of the findings. For example, governance challenges, both in terms of legal feasibility and in terms of public acceptability, are likely to have a significant impact on the implementation and effectiveness of the individual policies; and those governance challenges are themselves likely to depend in large part on likely (or perceived to be likely) economic and social impacts.

Other drivers of uncertainty are more intrinsic. Uncertainty over feasibility is a case in point: in advance of detailed work on the design of a policy, and indeed the testing of its implementation in practice, it is difficult to predict how feasible it will be to implement. The assessment of the enhanced producer responsibility policy in the overarching policy mix takes the approach of assuming that it will be possible to implement before assessing impacts, which is a valid simplification. However, it may be that for many of the policies which involve the extension of existing tools to new sectors, it will be found that the sectors which have already been targeted with those tools are those for which they are most adapted, and where implementation is easiest.

There are also in many cases uncertainties over the nature and extent of the impacts, beyond the immediate first order effects targeted by the policies. Reducing the environmental footprint of land use in the EU, particularly the agriculture sector, is one example of this problem. Many of the policies developed imply, or create risks of, reductions in production. Even in the event of a reduction in consumption (in response to the consumption policies also included in the mix), there would be an opportunity cost to that reduced production, and the impact on global supply and demand of agricultural products needs to be taken into consideration, with possible impacts through expanded land use in other economies. Similarly, reduction in EU demand for metals may lead to reduced commodity prices, with potential for increased consumption elsewhere. One possible lesson to draw from this is that – as with climate change - the full benefits of resource efficiency policies, as well as the full cost implications, are likely to depend on the extent to which similar policies are adopted in other economies in the world.

1.2 Flexibility of policy

One response to the problem of uncertainty identified above is to ensure that policy mixes designed to be flexible to a range of responses, recognising both the difficulty of predicting behavioural response and the reality of the democratic process. The policy mixes each have some elements which

are designed to have an immediate impact, and others which are designed to ensure a gradual change in attitudes; this appears to be a pragmatic approach to the challenge of developing the range of policies needed to secure a sufficient shift in resource efficiency. Other policies are capable of being progressively made more ambitious in response to greater political feasibility.

One disadvantage of flexibility in approaches, however, is that it makes it more difficult for the private sector to read what is likely to be required in terms of product and process innovation. A possible avenue for further work is therefore to consider whether clarity of direction can be provided through over-arching policy statements, or through enshrining specific policy objectives for resource use in legislation.

1.3 Volume control

Perhaps the most significant challenge for addressing resource efficiency and the need to live within planetary limits through these policy mixes is the difficulty of developing mechanisms to manage the volume of resource consumption. Environmental policy is largely built around quality control mechanisms – either minimum requirements for the safety and environmental impact of products, or emissions controls over production facilities.

Volume control instruments have been developed in some areas – for example, the Emissions Trading System for greenhouse gas emissions; and the National Emissions Ceilings Directive. However, it has been possible so far only where it depends on the ability of Governments to both monitor and exercise regulatory control over emissions; in effect, these are volume control instruments added to existing mechanisms for quality control over the emissions from production processes. Introducing constraints on the overall volume of raw materials and other resources used in the economy is much more challenging to design, since it implies a significantly greater degree of Government influence over the inputs to production processes.

Further work to examine options for volume control policies could be useful – for example, based on monitoring of resource use, with indicative trajectories consistent with resource efficiency identified in advance, or with triggers created in legislation for the introduction of more constraining policies/ higher taxes in the event of particular levels of resource intensity being crossed.

2 Key findings from the economic assessment

2.1 Lesson 1: Mixing is important

The decoupling policy agenda includes several targets which spell out the overall objectives in the many economic sectors and for the many parts of society which have a relevance for the overall goal. The only hope to advance towards such a goal is to put together a well-designed mix of policies which take care of the various aspect of this complexity by addressing the various sub-objectives and takes advantage of the known synergies and complementarities of certain policies. This recommendation is by and large already well taken into account in the proposed policy mixes. The economic assessment points to policy instruments such as information policies and the removal of distortionary subsidies which, while being not sufficient on their own to achieve absolute decoupling, do pave the way for more decisive policies by providing a smoother and clearer underlying market conditions. It also welcomes the synergies well known in the economic literature that appear to be implied by the policy mixes, such as, for instance, the one between R&D support policies and market-based instruments. However, there is a limit to the number of policies to be included in a mix.

2.2 Lesson 2: Choose ingredients carefully.

Indeed, as is obvious to any tolerably skilled cook, the secret of a tasty recipe lies not only in the quality of its ingredients, but also in the balance among them. There is no guarantee that adding together two delicious preparations will result in an equally or more delicious dish. Analogously, two perfectly reasonable and promising policy ideas, if implemented jointly may lead to undesirable outcomes. In particular, it is quite important to be parsimonious in deploying policy instruments of the same kind on the same or on similar or closely connected target, even when the instrument of choice is regarded as one of the best on the menu. The risk is to overshoot the target through an excessive application of the same sort of policy lever on the same group of economic agents. In the policy mixes proposed in Deliverable 4.2 this risk is clearly present for the market-based instruments, in particular for the taxes which have metals as one of their targeted sectors or as their sole one. A comprehensive rationalization and integration of these taxes would solve this issue. On the other hand as pointed out in Lesson 1, complementarities and synergies are crucially important, thus there are policies that *must* be deployed jointly. You do not get bread without mixing flour, water and yeast in the right proportions.

2.3 Lesson 3: The devil is in the details.

The right proportions are important. As an extra generous pinch of salt can spoil the house specialty, implementing a theoretically sensible policy mix without carefully dosing the intensity of the policy measures can lead to disaster. There is thus a need to fine-tune taxes, subsidies and standards to values which are well grounded in the environmental and economic reality to which they are applied. The right “numbers” are generally speaking not known a priori, thus they must be sought through careful empirical analyses and possibly pilot implementation of the policies in selected locales.

Another level of detail not to be overlook is the provision of an effective compliance monitoring system, coupled with effective enforcement powers to make sure that the implementation of policy measures takes place as policymakers intended it in the first place. Oftentimes this level of policymaking is given for granted in theoretical policy analysis, but realistically policymakers cannot

rely solely upon the goodwill of the agents they have jurisdiction upon. A transparent and efficient monitoring system coupled with clear rules for the retribution of non-compliant behaviour is crucial for the effectiveness of the policies. The existence of a working monitoring and enforcement system may also contribute to ingraining into the society's mentality the idea that abiding to the new measures is the right thing to do, and hence endogenously increasing the baseline compliance level. This could probably be more easily accomplished if supported by educational and information policies (Muehlbacher, Kirchler, and Schwarzenberger 2011), and varies across different national cultures (Cummings et al. 2005)."

3 Key findings from the social assessment

The social assessment focused on three key areas:

1) **labour market impacts**, including worker reallocation through job creation and destruction, changing job quality and innovations in the workplace,
2) **health impacts**, including both impacts related to changing levels of pollution and the socio-economic environment,
3) **social inclusion impacts**, including greater equality or inequality.

The table below summarises the results of assessment.

Table 2 - Social assessment outcomes

	Likely labour market, health and social inclusion impacts	Total score
Land policy mix		
1. Stronger and more effective environmental and climate dimension for EU land management in the CAP	Overall assessment **uncertain, likely neutral or rather positive**. Positive health impacts of this measure are likely to balance or even outweigh the possible limited negative impacts on employment and social inclusion.	(0/+)
2. Revised emissions levels in the National Emissions Ceilings Directive (NECD) and additional measures for better management of the nitrogen cycle on farmland	Overall assessment **uncertain, limited, likely rather negative or neutral impact**; possible negative employment and social inclusion impacts are likely to outweigh or balance the potential limited health improvements resulting from the mix.	(-/0)
3. Promotion of "Payment for Ecosystem Services" programmes	Overall **likely positive** social impacts; PES programmes provide opportunities for win-win solutions (improving both local environment and economy).	++
4. Regulation for Land Use, Land Use Change, and Forestry	Overall assessment **uncertain, likely rather positive impact**; the key uncertainty is whether LULUCF regulation will be effective in lowering the total costs of climate change mitigation.	(0/+)
5. Strengthened pesticide reduction targets under the Pesticides Directive, and provision of guidance to farmers on integrated pest management	Overall assessment **uncertain, limited, likely rather negative or neutral impact**; possible negative employment and social inclusion impacts are likely to outweigh or balance the potential limited health improvements resulting from the mix – similar to PI2.	(-/0)
6. Targeted information campaign to influence food behaviour towards: reducing food waste and changing diets	Overall **likely rather positive** social impact related to the potential productivity improvements and healthier consumption patterns.	+
7. Development of food redistribution programmes/ food donation	Overall **likely rather positive** social impact, the policy alleviates the possible negative impacts of other policies on the standard of living of the low-income households, but does not solve the root causes of social exclusion (e.g. through creating new employment opportunities).	+

8. VAT on meat products	Overall **likely rather negative** social impact; possible slight average health improvements are outweighed by social inclusion concerns related to the nutrition and labour reallocation challenges.	-
Metals policy mix		
1. Green fiscal reform: internalisation of external environmental costs	Overall assessment uncertain, likely (rather) positive. Positive health impacts outweigh potential negative impacts on the labour market and social inclusion.	(+/++)
2. Green fiscal reform: materials tax	Overall assessment uncertain, likely rather negative or neutral. Limited positive health impacts do not outweigh potential negative impacts on the labour market and social inclusion.	(-/0)
3. Promotion of sharing systems	Overall likely positive social impacts. Sharing systems will likely enhance social inclusiveness and effectiveness of transition towards absolute decoupling.	++
4. Increased spending on research and development	Overall highly uncertain, positive impact. In general, R&D increases the number of available decoupling measures, thus lowering the costs of achieving any given resource efficiency goals for the society. Its outcomes are, however, highly uncertain – both in terms of effectiveness of research and development efforts as such, as well as the impacts of resulting innovations on the labour market and inequalities.	((++))
5. Product standards	Overall likely rather positive social impacts. This measure will likely have no significant impact on the labour market and social inclusion, while at the same time decreasing harmful pollution related to the production and use of affected products.	+
Overarching policy mix		
1. Circular Economy tax Trio	Overall assessment uncertain, neutral or rather positive social impacts, depending on the extent to which likely health improvements will be balanced by potential negative employment and social inclusion outcomes.	(0/+)
2. EU-wide introduction of feebate schemes for selected products categories	Overall assessment uncertain, rather negative or neutral impacts; possible negative impacts on low-income households may outweigh limited positive health outcomes.	(-/0)
3. Reduced VAT for the most environmentally advantageous products and services	Overall likely rather positive social impact, this measure is less regressive than instrument 2, while also offering (limited) positive health outcomes.	+
4. Boosting extended producer responsibility	Overall likely neutral social impact due to the limited scale of the intervention.	0
5. Skill enhancement programme	Overall likely very positive social impact, both direct (labour market) and indirect (social inclusion).	+++
6. Enabling shift from consumption to leisure	Highly uncertain social impacts which depend on the specific instruments which will be chosen to enable shift from consumption to leisure.	((-/+))
7. Step-by-step restriction of	Overall likely rather negative social impacts, as negative labour market	-

advertising and marketing	outcomes will probably be more significant than potential benefits from increased social capital.	
8. Local currencies for labour-based services	Overall likely neutral social impact due to the limited scope of the instrument.	0

The policy mixes under consideration to a large extent reflect key social issues:

- inclusiveness of the taxation system (green fiscal reform),
- new skill formation,
- promoting sustainable and cheap alternatives to the resource-intensive consumption,
- decreasing environmental and health externalities through taxation and command and control measures.

Their introduction will probably lead to challenges in terms of social inclusion and reallocation of workers, while bringing significant benefits in terms of public health.

Policy mixes can be further tailored to minimise social costs and ease the transition period:

- avoiding policy instrument overlaps (double taxation, overregulation risks) which increase the transition costs,
- providing sustainable alternatives to current consumption patterns in the low-income neighborhoods,
- assisting regions which are currently dependent on the resource-intensive sectors,
- ensuring that measures which support the transition on labour market are voluntary both for persons employed and employers.

The transition challenges should always be compared with the risks of inaction, which in the longer term are likely to lead to even higher, perhaps uncontrollable, social costs.

4 Key findings from the governance assessment:

4.1 Key findings from the legal assessment:

The legal assessment aims to provide a first estimate of the legal feasibility and implementability of the selected instruments of the policy mixes. This is followed by suggestions for possible adjustments in the formulation and design of the instruments as well as the policy mixes.

The instruments were therefore analysed on their compatibility with relevant *status quo* provisions in international treaties and agreements as well as relevant stipulations of the European Treaties with a focus on competition and trade law as these provisions are obstacles potentially interfering with or counteracting the policy mix set-up for achieving decoupling.

On the one hand summarising results of assessments of individual instruments is uncommon in legal practice and leads to generalisations that could distort the image when it comes to the individual instruments. On the other hand the law system, especially the material law, is subject to constant changes and adaptations on the basis of the political guidelines as well as court decisions. Therefore, depending on the importance of an instrument for the achievement of the overall objective of absolute decoupling, it is advisable to adhere to this instrument even if it might be incompatible with current legislation.

This said, the compatibility checks indicate that:

All selected instruments of the *metals policy mix* seem to be compatible with WTO-law. This policy mix in general makes use of categories of instruments that have at least partly established predecessors on the EU-level and the international level. This basis adds to the compatibility of a further development and extension of the instruments with WTO-law. With respect to EU-law, however, the measures that use some kind of tax as the principal instrument seem to cause feasibility problems. This is due to the fact that a harmonisation of tax on the EU-level needs a unanimous vote of the Council. Besides this, the tax needs to be necessary to ensure the establishment and the functioning of the internal market and to avoid distortion of competition, which is doubtful with regard to some of the instruments and thus still needs to be proved in the further description of the instruments.

Regarding the *land-use policy mix* some of the chosen measures of the production side imply a mix of product standards/technical regulation, subsidisation and taxation. This adds to the complexity of the compatibility check and leads to some pointers for revision. With regard to the consumption side the funding of the measures still needs to be clarified – at least two out of the three measures, however, seem to be compatible with WTO-law. The intended exemption within the third measure (VAT on meat) complicates the compatibility check. With the exception of the VAT on meat products, the proposed measures do not raise immediate concerns in view of EU-law.

The picture is uneven with regard to the measures under the *overarching policy mix*: While some of the measures (especially those establishing voluntary systems) do not even have a connecting point with WTO-law, others raise several questions on the compatibility with WTO-law. In view of EU-law the measures in general do not raise immediate concerns with the exception of the circular economy tax trio and the feebate scheme.

Based on the results of the compatibility checks and by adding the results of the general reflections on implementability of legal provisions the following pointers for revision are identified:

With respect to *all three policy mixes* it is recommended to put each one of the instruments into the overall context of, and explain its importance for, reaching the overall target of reducing the

consumption of virgin metals in the EU by 80 % compared to 2010 levels, measured as tons of RMC in the general description of the instrument.

Additionally, consideration should be given to the question if the objectives could be reached through (multilateral) environmental agreements. At least negotiations for multilateral environmental agreements should be sought, especially when it comes to planned global standards, in order to prevent the allegation of unpredictable behaviour in conflict with the WTO transparency principle. In general, WTO members should provide as much information as possible about the environmental policies they may take, when these can have a significant impact on trade. This is mostly done by notifying the WTO secretariat of planned measures.

The use of Border Adjustment Measures (BAMs) might be a suitable instrument to target importing countries with less stringent measures especially to prevent leakage but also competitive disadvantages of the domestic industry. Border Adjustment is referring to a range of measures taken at the border to compensate or adjust for added costs imposed by regulatory policies. BTA refer more explicitly to taxes imposed at the border on imported goods so as to match the domestically imposed taxes on like products or inputs.[4] BTAs are explicitly allowed by the GATT provided that the tax imposed on imports is no greater than the domestic tax and the rebate of tax on export is no greater than the tax previously paid (see Article III (2) GATT). However, there is still uncertainty if BAM or BTA can only be based on the physical composition of the end product or if the adjustment measures can also be imposed on substances used in the production process, for example on the energy used in the production.[5]

Even if assumed that different production methods could render products 'unlike', the challenge is to design BAMs or BTAs in a way that imposes identical burdens on imported and domestic products and therefore comply with material provisions of the GATT, i.e. in particular Article III (2) and Article I. Besides this, Article XX GATT requires negotiations between trade partners before introducing a BTA.

Besides these legal challenges in the design of BAMs/BTAs, the environmental and economic effectiveness of BAMs are highly disputed.[6]

With respect to EU-law it is important to check if the instrument does fall within the scope of harmonised EU legislation (such as for example the VAT Directive). Only if this is not the case a measure might be relied on grounds of the protection of health and life of humans, animals or plants to justify deviations from (harmonised) EU legislation. Besides this, any harmonisation of legislation concerning turnover taxes, excise duties and other forms of indirect taxation requires a unanimous vote by the Council, constituting an obstacle to the instruments' adoptions. Additionally, it is important to prove that the instrument is necessary to ensure the establishment and the functioning of the internal market and to avoid distortion of competition.

As the TFEU and the TEU aim for a high level but not the highest possible level of environmental protection and Union policies must adhere to certain principles such as the precautionary principle but not to a principled priority of environmental and climate issues a change of the EU primary law might also be an alternative. This, however, might imply a time-consuming and complex procedure.

[4] Coetzee, Kim (2010): Briefing paper – Border Carbon Adjustments.

[5] For more details see Meyer-Ohlendorf et al. (2009).

[6] See for example: Barrett, John, Robin Vanner, Marco Sakai, Anne Owen (2012). GHG emissions embodied in trade - Is Border Adjustment an appropriate and effective response? Centre for Low Carbon Futures, Report no. 010, June 2012, p. 20 f.; Meyer-Ohlendorf, Nils, Christian Pitschas and Benjamin Görlach (2010): Emissions trading – proposals for further development with special focus on measures in energy-intensive industrial sectors, p. 56 ff. and 67 ff.; Ekardt, Felix, Andrea Schmeichel (2008): Border Adjustments, WTO Law, and Climate Protection, Critical Issues in Environmental Taxation 2008, p. 737.

With respect to the instrument choice it is not possible to give a general advice either for the instrument Directive or Regulation on the EU-level. It is, however, important to ensure effective tools to monitor and measure progress with regard to the overall objectives. Besides, the criteria guaranteeing an effective enforcement such as effective reporting and sanctioning and well-designed, clear, fair, transparent, effective and easily accessible remedies that enjoy public confidence for citizens, should be respected.

Similar to WTO-law, it is advisable and often required to notify the EU Commission of any planned measures that could affect trade law (such as subsidies, etc.).

5 Key messages from the public acceptability assessment

The policy packages as proposed under DYNAMIX face a challenging implementation context. Many of the proposed measures require EU-wide implementation, and therefore agreement among all Member States (whether absolute or qualified). The **approach** used to assess public acceptability of the proposed polices has been to reference previous relevant public discourses as a means of understanding how the public would likely respond if the policy were to be proposed in the real world. This assessment has set out to ensure that any policy assessed as 'highly contentious' be subject to mitigations and/or sequencing in a way that permits acceptability thresholds to move over time (i.e. paradigm change). The results of this assessment are summarised in Table 3.

Table 3 - Public acceptability assessment outcomes

Policy instrument fiche	Public acceptance - unmitigated	Public acceptance - mitigated
Green fiscal reform: internalization of external environmental costs	---	--
Green fiscal reform: materials tax	---	--
Stimulation of sharing systems	(-)	0
Product standards	---	(--)
Targeted information campaign on changing diets and on food waste	0	0
Development of food redistribution programmes/food donation to reduce food waste	--	-
Value added tax (VAT) on meat products	---	--
A 'circular economy tax trio' - taxes on the extraction of selected virgin materials and on landfilled and incinerated waste	---	--
EU-wide introduction of feebate schemes for selected products categories	++	++
Reduced VAT for the most environmentally advantageous products and services	-	0
Boosting extended producer responsibility	(--)	-
Enabling shift from consumption to leisure	(---)	-
Step-by-step restriction of advertising and marketing	(---)	--
Local currencies for labour-based services	-	0

Key:

+++	Likely very positive
++	Likely positive
+	Likely relatively positive

0	Unnoticed
-	Uncontentious
--	Contentious
---	Highly contentious
(++)	Assessment uncertain
((--))	Assessment very uncertain

The **results** as shown in Table 3 show that, of the 14 policies that underwent full assessment, 7 were assessed to be potentially highly contentious. Once mitigated however, all of these were assessed to be no more than potentially contentious, and therefore can be implemented with the investment of political capital alone and without the need for an enabling political window of opportunity.

The identified limits or **thresholds** in public acceptability included:

- *Green fiscal reform*: The threshold of the measure centres not only on affordability but also a sense that they are being imposed fairly and evenly, and not just where it is possible.
- *Stimulation of sharing systems*: The threshold of acceptability is associated with those citizens who either don't want to or can't participate, and then focused on the level of public funding provided.
- *Product standards*: Consumers in some more Eurosceptic Member States are presently liable to reject collective action for environmental purposes.
- *Food waste policies*: Acceptability thresholds have been identified around policies that threaten to increase living costs or significantly reduce the consumer's right to shop freely and throw unwanted food away.
- *Value added tax (VAT) on meat products*: Acceptability thresholds have been identified associated with fairness concerns, border issues and competitiveness issues.
- *Step-by-step restriction of advertising and marketing*: The threshold of acceptability is associated with restrictions on advertisement on luxury goods linked to conspicuous consumption.
- *Local currencies for labour-based services*: It is likely that there would be objections to Local Exchange Trading Systems (LETS) where they are perceived as being primarily motivated as a way of avoiding taxation, or where they become compulsory for buyers or sellers to participate in.

The more significant **recommended mitigations and adjustments** include:

- *Green fiscal reform:* Ensure that the tax is introduced on a consumption rather than production basis to avoid effectiveness and completive concerns (i.e. as materials tax). Also, any increase in take-home pay is better seen in notable sums, and ahead of consumers experiencing any increase in prices.
- *Product standards:* A timed exemption for some Member States, particularly the UK, might ensure that the benefits (or at least a lack of feared disbenefits) are demonstrated in other EU Member States ahead of implementation.

- *Value added tax (VAT) on meat product*s: A 5-year transitional exemptions for certain non-luxury meat products is recommended.

There are a number of more ambitious or '**horizon' policies** identified by the analysis. These included for:

- *Reduced meat consumption***:** The introduction of 'meat free days' in public food outlets, as well as the labelling of meat portions when selling meat products.
- *Food redistribution***:** Policies to require the publishing of data on, and the offering for redistribution of, all food wastes from the production and retail sectors. Additionally, full-product-chain food waste targets could be introduced on large retailers.

In addition, the introduction of step-by-step restrictions on advertising and marketing would likely play an important part in laying the ground for enabling a shift from consumption to leisure and LETS policies.

Annex 2: Revisions to the policy mixes

The following section identifies the lessons emerging from the qualitative assessments referred to in this report, in combination with the quantitative assessments in Ekval et al 2016 and Bigano et al 2016, for each of the policy mixes in turn, and suggests amendments to the policy mixes.

1 Overarching policy mix

The overall environmental impact related to consumption of goods and services in the EU continues to grow, both within and beyond the EU. Since an increasing share of the final and intermediate goods consumed in Europe are produced outside of Europe, we shift a growing proportion of impacts of our consumption (linked to extraction of materials, processing and manufacturing and transport of final and intermediate goods) to other parts of the world. For instance, from 1995 to 2008, the share of GHG emissions outside the EU caused by the production of goods exported to the EU increased from 13% to 24% (EEA 2015).[i]

A web of interrelated drivers appears to be at the root of observed trends towards increasing consumption over the last decades – these include demography (e.g. population growth, higher life expectancy), rising affluence, decreasing production prices, increasing pace of product innovation, increasing consumer choices through the expansion of trade, infrastructure design and consumption patterns shaped by social norms, advertising and consumerist values (Hirschnitz-Garbers et al. 2015, Tan et al. 2013).[ii]

Aiming to tackle this web of drivers, the overarching policy mix combines price-based instruments, incentives for innovation, regulatory instruments, information for and education of consumers to achieve the following vision.

By 2050 all European citizens meet their basic needs and enjoy high levels of quality of life and well-being. At the same time, significant shifts in production and consumption patterns have significantly reduced the impacts associated with the average consumption of a European citizen and have brought Europe's overall footprint within the earth's carrying capacity. Including through system innovation, resource efficiency and recycling have been substantially improved, and resources are used in an almost perfect circular economy.

The overarching policy mix comprises eight policy instruments (see table below):

Table 4: Drivers, objectives and corresponding policy instruments of the policy mix

Drivers	Longer-term objectives	Instrument
Rising affluence and material aspirations	Enabling translation of higher income levels to more leisure instead of additional consumption.	Labour market reform fostering a shift from consumption to leisure
Inadequate resource pricing, insufficient availability and affordability of more sustainable choices	Smart pricing – full cost pricing for resource provision, internalisation of externalities to the extent feasible	Tax on material use, incineration and landfilling (Circular Economy Tax Trio) Price incentives for resource-efficient products through

		1. feebates 2. VAT reductions
Short product lifespans	Products are more easily repairable and have longer durability and operational lives.	Extended producer responsibility (EPR)
Technological and social lock-ins	System innovation replacing inefficient and resource intensive systems are fostered.	Skill enhancement programme Support for local currencies
Consumerist values and pace of innovation fuelling consumption	Enable more responsible choices vis-à-vis overconsumption andwaste generation	Step-wise approach to restricting advertising

Adapted from on Ekvall et al. (2015)[iii]; please see Ekvall et al. (2015) for more details on the instruments

Overall, the overarching policy mix can be considered to have likely positive **environmental effects** (see Nesbit et al. 2015). Benchmarked against achieving the DYNAMIX environmental key targets (see Umpfenbach 2013)[iv], it can be considered rather effective as in combination the eight policy instruments will

i. increase prices for use of materials and material-intensive products as well as for waste incineration and landfilling;
ii. increase availability and affordability of less material-intense and more climate-friendly products and services;
iii. help integrating resource efficiency into product design through expanding EPR systems to additional waste streams (e.g. waste tyres, waste oils);
iv. provide enabling frameworks for reducing material consumption in businesses through skill enhancement programmes, and among households via encouraging reduction of working hours, restricting consumption-fuelling advertising and supporting local service exchange through local currencies.

Thus, although no exact level of contribution can be given through the qualitative assessments, with great likelihood the policy mix will contribute to

2. dematerialisation and a circular economy serving to reduce the consumption of virgin materials => very likely contributing to the DYNAMIX target of a 80% reduction in consumption of virgin metals by 2050
3. decarbonisation serving to reducing GHG emissions on a per capita basis => very likely contributing to the DYNAMIX target of limiting emissions to 2 tonnes CO2-equivalent per capita and year by 2050.

Due to the policy mix' focus on consumption – by businesses and households – of materials, products and services, the overarching policy mix has rather low likelihood of contributing to and only very implicit links to

4. reducing consumption of arable land: potentially through reducing the size of and/or the need for (additional) extraction or landfilling sites => low likelihood of contributing to the DYNAMIX target of zero net demand of non-EU arable land by 2050
5. reducing nutrients input: potentially through providing rebates for organic products and encouraging more small-scale (urban) food production in households' leisure time => low

likelihood of contributing to the DYNAMIX target of reducing nitrogen and phosphorus surpluses in the EU by 2050 at the level BAT can achieve.

However, potentially negative side-effects of the policy instruments might prevent this policy mix from being implemented – or might change its nature – so that the above potential environmental effects may not occur or be different. In this context, economic, social, and legal impacts as well as public acceptability of the mix must be considered.

In terms of **economic impacts**, Zotti et al. (2015) identify potential weaknesses that may reduce the environmental effectiveness of several instruments of the overarching policy mix:

i. Revenues generated by economic instruments need to be wisely used: For instance, to mitigate potential closure of quarries or extraction sites through supporting the re-introduction of laid-off workers on the labour market (this already shows a clear link to the relevance of the instrument skill enhancement programmes to help guide re-introduction); but also to pay for subsidies (rebates) granted in order to achieve as much as possible budget-neutrality of bonus-malus-schemes;
ii. VAT reductions may increase compliance costs for enterprises and tax authorities; a wider VAT reform may allow a neutral or even positive design for public budgets;
iii. Expansion of EPR schemes could suffer from additional administrative effort to monitor and sanction non-compliance and hence increased enforcement costs;
iv. State actors will face difficulties in identifying future qualification needs in a Circular Economy, complicating to set up appropriate skilling programmes to align supply and demand on the future labour market, potentially causing inequalities;
v. Political feasibility of instruments may suffer from inappropriate communication of (proof for) the need for the instruments, leading to potentially lowered understanding and acceptance of the instrument by the public;
vi. Regulatory instead of incentive-based instrument design may counteract instrument efficiency and yield inequalities, e.g. a forced decrease in working hours potentially hits low-income earners hardest, while voluntary, incentivised shifts towards leisure may appeal to better paid workers and in turn lead to reduced inequalities.

Assessing potential **social impacts** of the policy mix, Bukowski et al. (2015) find potential labour-market and health impacts as regards:

(a) short- and long-term implications of shifts in economic sectors providing new employment opportunities in some sectors at the cost of job destruction in other sectors (e.g. in mining or advertising); e.g. while potential closure of extraction sites will impact local economies dependent on mining, shifting from waste incineration and landfilling towards recycling potentially has a net positive labour-market impact as recycling is more labour-intensive than disposal and incineration;
(b) demand shifts within product categories likely will be captured by labour reallocation within the affected companies, so absorbing the shock within the given sector;
(c) Skill enhancement programmes are essential to allow the labour-market to adapt to a Circular Economy and to mitigate negative employment impacts of other instruments; such programmes could increase the efficiency of matching between employers and employees, thus shortening job search and reducing frictional unemployment;
(d) flexible labour market regulations that empower part-time working arrangements could increase appeal for a highly qualified workforce and facilitate labour market entry for (i) students and young mothers not having enough time for a full-time job; (ii) parents, who will

be able to return to the labour market earlier; and (iii) younger pensioners, who may no longer have the vitality to take a full-time job.

(e) involuntary shifts from consumption to leisure may lead to lay-offs and a decrease not only in employment but also in productivity and wages.

(f) positive health impacts through (i) lower industrial pollution, e.g. reduced pollution from landfills and waste incineration; and (ii) improved work-life balance and psycho-social wellbeing through more time and opportunities for social contacts.

Vanner et al. (2015) assess issues of **public acceptability** of the instruments and find

(a) incentivising instruments, i.e. feebate schemes and VAT reductions, to be generally well-understood, broadly accepted by the public and hence fairly uncontentious; however, feebate schemes should be implemented so that they are not perceived to be discriminating against consumers who need to own a larger or more energy-consuming product; collective action is needed to remove concerns for VAT reductions in the context of the existing EU VAT Directive;

(b) linking incentives in terms of offering money-back and convenient structures to be aiding acceptability and implementation of EPR schemes;

(c) taxing material use may reasonate with the public more in terms of making sacrifices for the environment than having beneficial societal and even individual effects, for instance because health or employment benefits are rather long-term and difficult to relate to people individually

(d) significant opposition and resistance to regulation affecting business and individual decision-making and going beyond established regulatory regimes; this applies both (i) to mandatory reductions in working hours, inter alia for reasons of perceived inflexibility and increased labour costs and the importance of maintaining employer and job market flexibility for economic competitiveness; and (ii) to restrictions on advertisement of luxury goods linked to conspicuous consumption

As regards aspects of **legal feasibility** of the overarching policy mix vis-à-vis WTO law and EU Treaty, Lucha and Roberts (2015)[v] identify potential conflicts with regard to

(a) EPR product waste streams, for which it has to be ensured that the products are not singled out for discriminatory treatment based on their source of origin.

(b) the unanimity requirement and the further criteria of Article 113 TFEU, which the Circular Economy Tax Trio, feebate schemes and the VAT reductions are not (really) meet as these instruments do not seem “necessary to ensure the establishment and the functioning of the internal market and to avoid distortion of competition.”

(c) risks of discriminatory treatment concerning skill enhancement programmes, which need to ensure that there are no artificial barriers to entry for students and/or professionals coming from other Member States.

(d) the design of step-by-step restriction of advertisement, which must not entail differential treatment of domestic products and of those from other Member States.

In the light of the above summary of findings, implementability of the overarching policy mix seems likely if the (most important of the) above side-effects are corrected and the policy instruments adjusted accordingly. Hence, the policy mix may be a promising contribution to the environmental targets, when for instance:

- ✓ a sequenced approach is chosen for first introducing less contentious measures (e.g. first targeting mis-leading claims and visual pollution in restriction of advertising);

- ✓ the VAT reduction is made part of a wider VAT reform allowing public budget neutrality and coordinated as regards potential concerns from the VAT Directive;
- ✓ EPR scheme expansion is linked to a deposit scheme encouraging return of used products, hence making product design innovation relevant through regaining end-of-life residual value;
- ✓ the Circular Economy Tax Trio becomes part of a wider environmental tax reform, ensuring revenue recycling as close as possible to the sector or groups facing the tax

working time reductions are incentivised, voluntary and refocused around a specific cause for extra time, e.g. for a specific cause such as parental leave or career's leave.

2 Metals mix

Aim and objectives

Human consumption of renewable and non-renewable material resources is skyrocketing. Rising global population and affluence levels, ever more widespread adoption of westernized lifestyles and production and consumption patterns risk contribute to future increases in resource consumption. The resource use and associated environmental impacts contribute to transgressing existing planetary boundaries. Human activities are expected to require two planet Earths around 2030 (Moore et al. 2012).

Umpfenbach (2013) indicates, based on Bringezu (2009) and UNEP's International Resource Panel (Fischer-Kowalski et al. 2011) that the use of virgin metals in the EU need to be reduced by 80%, calculated as RMC, to reach a sustainable level. The level of this target can be disputed; however, the extraction and production of metals are responsible for a significant share of the energy demand, GHG emissions and toxic impacts of human society. Reducing the dependency on virgin metals can also counteract risks related to future supply of certain metals, because the resources might be scarce in the mid-term (relevant for, e.g., silver), or because the mineral reserves and/or mines are located at very few places in the world (relevant for, e.g., several rare earth metals; European Commission 2014e). Increasing the efficiency in the use of metal resources is, in addition, important for to generate as much economic value and/or well-being and serve as many functions as possible with a given resource base. For these reasons, our policy mix aims at significantly reducing the use of virgin metals in the EU.

A policy mix that simply shifts the use of virgin metals or associated environmental impacts from the EU to other parts of the world does not address global environmental justice or sustainability. To reach a sustainable future, the global recycling rate is, for example, more relevant than the recycling that takes place within the EU. Hence, the policy needs to also account for impacts beyond the EU boundaries.

Metals compete with many other materials in important applications: with concrete and wood in constructions, with paper and glass in packaging, with polymers in packaging and in components in machinery, and with textiles in furniture. However, shifting to the use of other materials sometimes is detrimental for the environment, the economy or other societal goals. A reduced use of reinforcement (steel) bars in concrete buildings is, for example, likely to result in an increase in the use of concrete large enough to increase total GHG emissions. To avoid burden-shifting to other material resources, the scope of the policy needs to be expanded to include not just metals but also the competing materials.

In conclusion, our policy mix aims to steer the EU towards the 80% target in reduced use of virgin metals, without significantly hampering the economy, without increasing the use of virgin metals in other parts of the world, and without significantly increasing the use of other material resources and environmental impacts. This aim serves the purpose to reduce the impacts on human health and environment. It also contributes to making the economy more robust with respect to risks related to future supply of metals.

For this aim, the policy mix on metals and competing materials has the following objectives:

- Increase the efficiency in the use of metals and all competing materials
- Increase the global recycling rate of these materials
- Substitute metals by other materials, where this is beneficial for the environment and well-being

The policy mix includes a few strong primary instruments, aiming to achieve these objectives: a materials tax, extended producer responsibility, technical requirements, and general environmental taxes (see Primary instruments below and Figure 3). It also includes a larger set of supportive instruments that are less controversial and that aim to reduce the negative side-effects of the primary instruments.

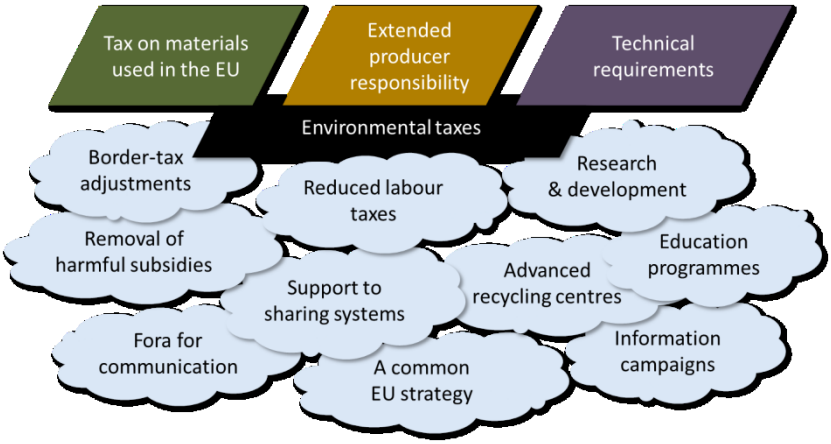


Figure 3: Illustration of the policy mix on metals and competing materials. The four primary instruments are embedded in a larger set of supportive instrument.

An important part of the combined policy mix is a radical green fiscal reform where taxes on rmaterials use, pollution etc. are introduces and gradually raised while labour taxes are reduced (see Figure 4). The supportive instruments include, but are not limited to:

- Border tax adjustments, to reduce the impact on the competitiveness of EU industry
- Retraining programmes, to facilitate a change in economic structure
- Spending on research and development (R&D), to facilitate changes in technology
- Information campaigns and infrastructure to facilitate changes in behaviour

The policy mix is dynamic in order to first create a shift in paradigms, available technology, and other important conditions, and then a significant increase in material efficiency and recycling. The first steps includes, for example, R&D spending and the creation of a common EU strategy. The tougher instruments, notably the material and environmental taxes, are gradually introduced with willing Members States leading the development. To what extent they can be harmonized within the EU will depend on whether the EU becomes a stronger or a weaker union.

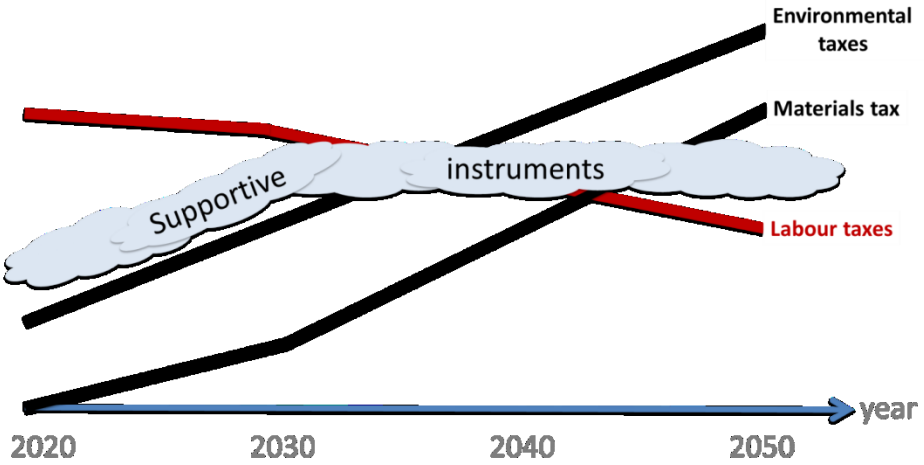


Figure 4: Qualitative illustration of the dynamics of the green fiscal reform.

Primary instruments

The primary instruments in the policy mix are chosen to achieve the objectives of material efficiency, recycling and justified substitution. They are designed to be effective but not more controversial than necessary.

A substantial materials tax (to increase material efficiency)

A tax on metals and all competing materials that are used in the EU is introduced in 2020 and then gradually increases to 30% of the net price of the finished material in 2030 and 200% of the net price in 2050. This tax aims specifically at increasing material efficiency, primarily in the manufacturing and construction industry. It is gradually increased over 30 years to allow for the industry to adapt to the tax.

The materials tax is to be levied on all types of materials in order to avoid burden shifting from metals to other materials. It is levied even on renewable and recycled materials because also these need to be used efficiently.

a. Extended producer responsibility (to increase global recycling)

The extended producer responsibility (EPR) is the instrument in the mix that specifically aims at increasing materials recycling. A supply of recyclable material is a prerequisite for recycling of all materials. For metals and paper, where a global market for recycled materials is well established and where recycled and virgin materials compete in many applications, an increase in the supply of recyclable material is the most effective way to increase global recycling. This is because the global supply of recyclable material is limited.

The EPR means that producers in a broad sense are given the responsibility for securing a specified level of collection and recycling of their own products and packaging. A system of EPR is already implemented in the legislation of several Member States. Our policy mix includes an expansion of EPR to additional product groups (and to materials rather than product groups) in all Member States.

The EPR scheme is funded through fees from the producers. For packaging and some products, a material-specific fee is charged per kg of mass. For other products, a specific fee will be charged per item. This basic set-up will be common all through EU. However, individual Member States are allowed to organize the EPR scheme in a way that fit the national conditions. They can also vary the

charge per item or kg depending on the design of the product to stimulate design for recycling and material efficiency.

b. Technical requirements (substitution and material efficiency)

This instrument entails the development of technical requirements and of for specific metals products and metals components that are sold and used in the EU. These documents regulate the design of these products and components to, for example:

- Improve the modularity to increase reparability and reuse of components, taking into account impacts on energy efficiency.
- Reduce the unnecessary use of material.
- Substitute metals for other materials when appropriate, for example shifting from copper water-piping to polymer piping.

Compliance to the technical requirements is mandatory; however, we propose that Members States be allowed to negotiate temporary exemptions from specific technical requirements that they find difficult to accept. In other respect, this instrument is similar to the product standards described in Ekval et al 2015.

c. Increased environmental taxes (all objectives and reduced environmental impact)

The idea of environmental taxes is based on the Polluter Pays Principle. In this policy mix, already existing environmental taxes are gradually increased and expanded with an aim to fully internalise all external environmental costs by the year 2050. The environmental taxes are not metal-specific but also levied on other natural resources that are extracted in Europe (raw materials, energy and water) and on emissions that occur in all economic sectors in Europe. This will increase material efficiency and recycling, and, at the same time, avoid simply shifting of environmental burdens from the metals industry and metals products to other sectors or commodities.

Supportive instruments

There are many barriers to implementing the primary instruments above. If implemented without additional measures, they can significantly reduce the industrial competitiveness, hamper economic growth and increase unemployment in the EU, and shift polluting activities and resource use to other parts of the world. This would make them ineffective to increase sustainability, unacceptable for the public and politically unfeasible. Supportive instruments are designed to reduce the barriers of implementing the primary instruments, for example by reducing the negative side-effects. In addition, the supportive instruments can give direct contributions to the objectives of the policy mix.

a. Border-tax adjustments (to reduce impacts on competitiveness)

The materials tax is levied also on imported materials and simple manufactured products. Exported materials and corresponding products are exempt from the tax. With such border-tax adjustments, the materials tax does not distort the competitiveness of domestic materials production within nor outside the EU.

To reduce the impacts of environmental taxes on the competitiveness, border-tax adjustments can in principle be implemented also for the environmental taxes. This would ideally result in a full internalisation of external costs of production outside the EU, when the products are imported to the EU. It would also mean an exemption from environmental taxes for products that are exported from the EU. In practice, border-tax adjustments with respect to external costs are difficult to implement, because it requires that the external costs are agreed upon. To reduce distortions to the competitiveness caused by environmental taxes, we propose that EU strives in this direction.

b. Labour tax reductions (to stimulate employment)

Part of the revenues from the materials tax and the environmental taxes will be used for funding the rest of the policy mix. As a very crude estimate, this might require half of the materials tax and half of the increase in environmental taxes until the year 2030 and then remain at the same level. The rest of the revenues will be used for reducing labour taxes. This means labour taxes can decline slowly until 2030 and more rapidly after that.

c. Removal of harmful subsidies (for a coherent fiscal reform)

A green fiscal reform is likely to be more easily communicated, understood and accepted if it includes the removal of environmentally harmful subsidies. This policy mix includes the removal of two subsidies related to metals: the limited liability for accidents related to metals extraction and subsidies associated with the purchase of company cars.

d. R&D spending (to facilitate technological improvements)

The primary instruments make material use and pollution more expensive. This serves to increase the competitiveness of resource-efficient and clean products, production processes and systems. When the materials tax and the environmental taxes result in the use of more efficient technology, these instruments can stimulate economic growth (Bukowski and Sniegocki 2016).

However, for the industry and consumers to choose resource-efficient and clean options, these must be available at a cost that is not prohibitive. Successful public spending on R&D for material efficiency and recycling contributes to making the technology and systems more resource-efficient and cleaner. It also contributes to reducing the cost of these options. This can increase the positive impact of the materials tax on resource efficiency as well as the economy. Successful R&D can also contribute to increasing resource efficiency without the need for materials and environmental taxes. At any rate, the positive impact of the policy mix is likely to be greater when R&D is added.

e. Education programmes (to facilitate an economic shift)

The policy mix is likely to shifts the structure of the economy, for example from production of materials and goods to services and new business models. This can cause a mismatch between the workforce and the skills required as the policy mix shifts the structure of the economy from production of materials and goods to services and new business models. This instrument includes the development and implementation of programmes for retraining of workers in sectors where unemployment is likely to occur in order to give them the skills required in sectors that are likely to grow.

The educational programmes also include a strategy for including resource-efficiency aspects into relevant academic and vocational curricula.

f. information campaigns (to stimulate and facilitate behavioural change)

Changes in consumption patterns and source separation are needed to achieve a shift to more efficient products and services, and to increased recycling. Information can be effective, when combined with other instruments, at different stages of a shift in behaviour. It can be used to explain why a change is needed, how to go about it, and to what extent a change has been successful.

g. Sharing systems (to facilitate behavioural change)

A shift to sharing of products means that fewer products need to be produced, which contributes to increased material efficiency. This instrument includes the establishment of public sharing systems for cars, bicycles, tools and equipment, or economic support to private sharing systems.

h. Advanced recycling centres (to facilitate behavioural change)

To stimulate recycling and reuse, local or national governments invest in centres for recycling and reuse.

i. Fora for communication (to stimulate networking)

The EU will co-fund the establishment of fora for communication between actors throughout the value-chain of important products and recycled materials. This can contribute to establishing markets for new recycled materials such as textiles. It can also contribute to products becoming more resource-efficient from a life cycle perspective.

j. A common EU strategy (to harmonise legislation in Member States)

An EU policy mix on metals and competing materials require that the Member States agree on what should be included in this policy mix. The development of an EU action plan or strategy can be a way to initiate such harmonisation of views and legislation. This could be part of a revision of the Circular Economy Package, but it could also be a separate document - a strategy for dematerialization.

3 Land use mix

The ex-ante assessment reveals a number of areas where the policy mix could be strengthened; or where policies as initially proposed are shown to have a limited impact on delivery of the targets in comparison to the challenges associated with their implementation.

A key gap in the policy mix is a general absence of quantified objectives for the individual measures, particularly on the production side – for example, on reform of the CAP, on the introduction of a land use, land use change and forestry (LULUCF) regulation, on revised limits under the National Emissions Ceilings Directive. The absence of quantified objectives for the individual consumption measures, on the other hand, reflects their largely uncertain behavioural impact. This challenge of quantification at an individual policy level in part reflects the lack of an overall metric focused on resource efficiency issues in respect of land use. The development of an indicator to reflect the EU's net land use impact is proposed as an accompanying measure to the policy mix; but should instead be treated as a key element in the policy mix itself, as a mechanism for focusing policymakers' attention on resource efficiency in this sector.

Production side policies

The production side policies we suggested appear to require a strengthening through clearer numerical targets. Accompanying this, we recommend an increased focus on accompanying measures for agricultural businesses and the agricultural workforce, in order both to ensure that environmental impacts are addressed in ways which improve resource use efficiency, and to address potential social impacts of the transition. Moreover, the assessments, and the conclusions we draw from them below, point to the need for an integrated approach to land as a resource, given competing pressures for services (energy; food; recreation; biodiversity); and we recommend that the EU (insofar as its competences are affected) and its Member States address this need through the development of an integrated long-term strategy for land use.

Particular changes to individual instruments that could be introduced include:

Stronger and more effective environmental and climate dimension in the Common Agricultural Policy - Clear, quantified objectives should be developed for relevant environmental impacts of agriculture, and the allocation of funding under the CAP should be linked to the delivery of those objectives, broken down at national and regional level as appropriate. Objectives could cover issues such as (i) net greenhouse gas emissions; (ii) a reduction in emissions of key air and water pollutants; and, potentially, (iii) the sustainable productivity of agriculture, in order to ensure that other environmental objectives are not met at the expense of an increase in the EU's net land use.

Revised National Emissions Ceilings Directive targets - In principle, clear targets for the agriculture sector under the National Emissions Ceilings Directive would be valuable. The Directive's approach is to apply targets across sectors; however, for ammonia, the main

source for emissions is the agriculture sector, particularly from fertiliser and manure application. The Commission proposal in its package of measures for revision of the Directive is for a 27% reduction, which seems to the policy mix authors to be appropriate, although greater ambition is also possible. Translating the NECD into clearer expectations of the need for reduced emissions from the agriculture sector in individual Member States would help to create the conditions in which individual farmers, and the upstream supply chain in terms of manufacturers of fertiliser and other inputs, can plan and innovate.

Payment for ecosystem services – the lack of precision in the policy as described makes it difficult to assess its potential impact; and, indeed, it seems likely that in the relatively limited and voluntary approach set out, while it helps to avoid public acceptability risks, and also helps to avoid potential perverse incentives of a regulatory approach to payment for ecosystem services, limits its potential to effect change. While no changes are required to this policy instrument, further work to identify approaches which enable it to exert more leverage over environmental outcomes could be explored; for example, whether water undertakings might be required to develop such payment systems in certain circumstances; and it looks unlikely that the instrument would be capable of contributing significantly to improved resource efficiency.

Regulation for Land Use, Land Use Change, and Forestry – the key finding from the qualitative assessment is the importance of careful design of this instrument to ensure that it delivers additional climate mitigation, rather than simply being used to offset the requirements for emissions reduction in other sectors of the economy. While, as noted by the social assessment, there are potential benefits in terms of reduced costs from broadening the scope of EU climate action, this would negate the contribution of a LULUCF regulation to increased mitigation ambition. Recent reports and policy papers[7] have noted the importance of LULUCF action contributing to an increased level of EU mitigation ambition. The policy proposal therefore needs to be understood in this sense.

Strengthened Pesticide Reduction Targets – The reliance on targets, combined with flexibility for implementation of supporting instruments at Member State level, means that it proved difficult to assess this instrument with precision. However, it seems likely from the economic, social and environmental assessments that the more effective element of the policy combination to support targets would be the provision of advice to farm businesses on improved pesticide management using significantly lower volumes of active ingredients. An enhanced emphasis on this aspect would therefore be valuable, as could improved integration into the separate measure for a stronger and more effective Common Agricultural Policy.

Consumption side policies

A clear distinction emerges from the assessments between policies which are more constraining, or likely to increase prices, and are therefore likely to provoke significant public

[7] See for example, Nesbit, M, et al (2015) Designing a LULUCF pillar that works for forests and climate. Institute for European Environmental Policy, London

opposition (such as the imposition of VAT on meat products); and those which are based on voluntary measures, such as the information campaign. The physical and environmental component of the quantitative assessment, which (it is important to note) assumed that the policy instruments were fully effective in driving change, underlines the potential impact on environmental objectives, particularly climate change mitigation, of action on food consumption; the social assessment notes the potential benefits for health. However, it is clear from other areas of the qualitative assessment that significant shifts in behaviour are unlikely to be provoked by information instruments alone. The instruments in this policy mix should therefore be considered as a sequenced approach, ensuring, first, that there is an improved public understanding of the impact of food consumption on resource efficiency, land use, and climate change; using this improved understanding to drive voluntary change; and then allowing for the progressive introduction of more constraining measures (including taxation) once a sufficient shift has occurred in public opinion. A parallel can be drawn to the shift in attitudes (and regulatory approaches) to tobacco consumption over recent decades.

However, this is an optimistic scenario, and alternative approaches need to be considered in the event of delays in the paradigm shift. Approaches which, as explored below in relation to tax instruments, make clear the trade-off between action on food (including meat and dairy consumption and food waste) and increased action in other areas of the EU's overall climate and resource use footprint, could be considered in this context.

Targeted information campaign to influence food behaviour – The context of the findings from the assessments need to be considered carefully; for example, differences in approach explain the difference between the optimistic findings of the physical and environmental assessment, which considered the potential impact of this instrument *assuming* it was fully effective in driving a shift in consumption patterns, and the results of the qualitative assessments, which note that the provision of information is unlikely, on its own, to provoke a significant change in behaviour. The information campaign is therefore best considered as a contribution to progressively changing the terms of political debate, with the added benefit of an impact, in the short term, on behaviour. Moreover, it should best be considered as a range of targeted campaigns, using the techniques informed by a careful understanding of heuristics applied to purchasing, cooking and eating habits, targeted on individual countries, regions, and consumer groups.

Development of food redistribution programmes - This instrument is viewed positively by all the assessments, although differences emerge in assessment of the scale of the impact (it should be noted that the relatively high impacts noted in the environmental assessment are based on consideration only of the food currently wasted in retail, rather than in relation to food consumption as a whole). A key element in improving the impact of such programmes emerges from the economic assessment as the need for a favourable VAT regime. Finally, the recent introduction of legislation in France[8] requiring food shops to make available unsold food for charitable redistribution suggests that a more direct approach may be possible – it will therefore be important for policymakers at EU level and in other Member States to take advantage of policy evaluations of the French legislation as its implementation progresses.

[8] LOI n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire

Value added tax on meat products – the assessments suggest that this instrument is at the same potentially highly controversial, difficult to secure at EU level, regressive in its social impacts, and unlikely to be fully effective in shifting consumption patterns. It is therefore unlikely to be a good candidate for early implementation. However, it is the only constraining instrument in our policy mix, and (in the absence of signs of a voluntary shift in consumption behaviour) may need to be considered further; paradoxically, however, its introduction would be politically more challenging in the absence of a shift in attitudes to meat products. Adaptations including a progressive introduction focusing first on ruminant products with the highest greenhouse gas impacts could be considered as a means of facilitating its implementation. Policy work could also consider (given the need for progressively reduced hard limits on global greenhouse gas emissions, and the likelihood that food consumption will, in the absence of significant consumption shifts, take up an increasingly significant share of the available budget for anthropogenic emissions) an approach which explicitly addressed the currently implicit trade-offs between mitigation action on food consumption and mitigation action in other areas of the economy. For example, targets could be set for a gradually declining level of consumption emissions from food, with a commitment to introduce taxation measures if consumption significantly exceeded those targets, and a recycling of the products of any such tax to social payments to compensate poorer households and/or the purchase of emissions reductions from other sectors of the economy in the form of emissions trading system permits.

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