



POLICY BRIEF

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Policy mixes for decoupling economic growth from resource use – Synthesis brief

SUMMARY

- *Wicked problems, e.g. unsustainable resource use and climate change need elaborate policy mixes that can tackle a multitude of drivers while avoiding policy layering and taking a long term perspective into account.*
- *An elaborate policy mixing approach should encompass a number of steps, including qualitative and quantitative ex-ante assessments or potential policy effects. According to the assessment results the mix should be refined and based thereupon prepared for implementation.*
- *In the DYNAMIX project three policy mixes were developed and assessed applying the elaborate policy mixing approach: an ‘overarching policy mix’, a ‘land policy mix’ and a ‘metals policy mix’*

1 Resource use and its interlinked drivers

Global resource extraction has been growing in the last three decades to around 78 billion tonnes (2011) [1]. The EU-27 alone uses 600-800 megatonnes of metals (raw material consumption; RMC) per year, with demand still increasing [2]. Global megatrends, such as the spread of westernised lifestyles, rising affluence levels and a growing population are expected to further accelerate the demand for consumer goods, infrastructure and services. The International Resource Panel expects that the raw material extraction rate will reach approximately 140 billion tonnes in 2050 [3].

While some resources (i.e. iron) are abundant, some resources are getting scarcer or are not available in high concentrations (i.e. Heavy and Light Rare Earth Elements), leading to higher prices [4]. Mining low ore grades requires high amounts of energy to get materials out of the ground and process them. Already today the metals industry demands 6% of the global energy [5].

At the same time the shift to a low-carbon society relies on (new applications for) raw materials. Especially the reconstruction of the energy system (renewable energy technologies, storage systems, additional electricity grids), or other green technologies, such as e-mobility, require a number of critical materials. The substitution of non-renewable materials and fossil fuels with

Global resource use is expected to continue to grow until 2050 due to megatrends, such as a growing population and westernised lifestyles.



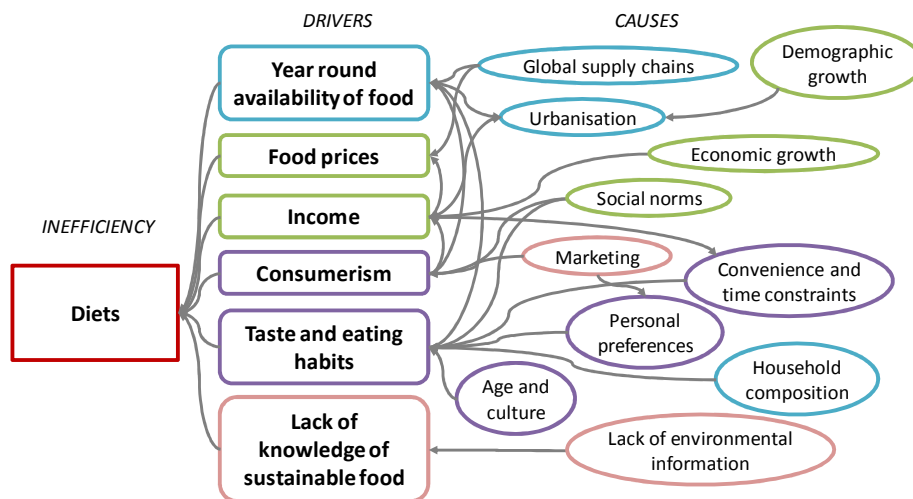
Reducing resource use in the EU needs to be balanced with the materials needs of the energy transition to a low carbon society. Renewable energy technologies need critical raw materials.

renewable materials and biofuels impact the scarce resource land. These interlinkages, as well as the multitude of drivers and actors and the long time frame in which the resource challenge needs to be tackled makes resource efficiency policy a fine example of a ‘wicked problem’, which requires more than ‘classic’ policy making tackling single drivers or goals.

Reducing resource use and increasing resource efficiency is important to alleviate the demand on resources that will arise due to population growth and the subsequent need to build large infrastructures, especially in urban centres in Asia. Improving resource efficiency can help to increase economic value and/or well-being from a given resource base.[6] Reducing resource use would also make the EU more resilient and less dependent on imports, as the majority of raw materials need to get imported.

Single materials are used in a multitude of products and infrastructures. These materials are processed and traded in complex global supply chains, complicating the search for drivers for materials use and the opportunities for policies to increase resource efficiency. The main driver of resource use is our economic system, in which businesses focus on selling products rather than providing services and which requires constant economic growth [7]. The web of interrelated drivers also comprises cultural values or habits, such as consumerist values, lack of knowledge or prevalence of non-efficient techniques sometimes due to lock-in effects (i.e. fossil fuel dominated infrastructures) [8]. As an example the following figure gives an overview of the interlinkages of drivers that impact diets.

Figure 1: Drivers and causes for unsustainable diets and food choices; Source: [7]



2 The instruments to tackle resource use – and how to combine them in policy mixes

2.1. Policy mixing as an approach to tackle wicked problems

The complexity of tackling the reduction of resource use and increasing resource efficiency requires an elaborate approach to policy making that takes the different drivers as well as the time-dynamics into account. Policy mixing can be such a systemic approach. A policy mix includes a number of instruments to tackle the multitude of drivers and aims to achieve a number of policy objectives and targets.

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Beyond that, a policy mix aims to create synergies between the policy instruments, which requires the instruments applied to be consistent. Simply adding different policy instruments on top of each other without taking the interlinkages into account – so-called policy layering – must be avoided [9]. In designing a policy mix the full range of policy instruments as well as the costs of policies (regarding implementation, transaction and compliance) and unintended side-effects must be taken into account [6].

While seemingly obvious, overlooking unintended – but foreseeable – negative side-effects of policy instruments or mixes has been a common problem of policy making in the past. For example, pay-as-you-throw systems that aim to increase recycling and reduce waste could lead to an increase in wild dumping in no counter-instruments are included [10]. Possibly the biggest unintended consequences in resource policy making is burden shifting of environmental impacts to other countries by relocation of production sites, instead of actual resource use reductions or efficiency gains. Hence, monitoring and evaluating policy impacts is key in order to allow for adaptive policy mix design that includes instruments mitigating unintended side-effects.

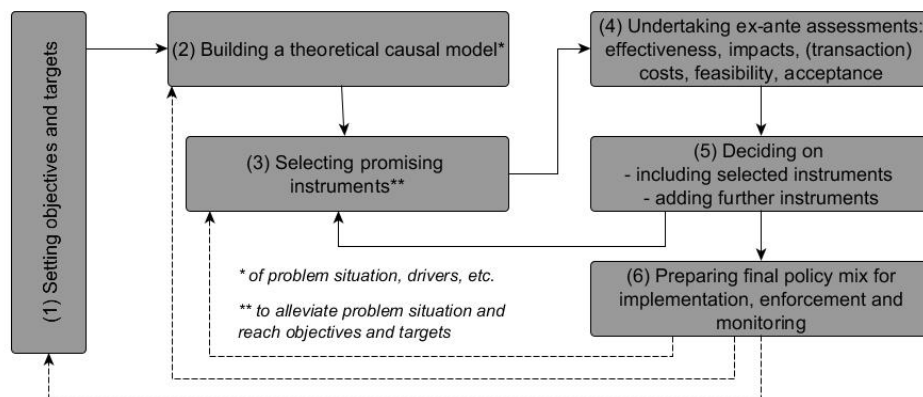
2.2. The DYNAMIX approach to policy mixing

The DYNAMIX project (DYNAmic policy MIXes for absolute decoupling of environmental impacts of EU resource use from economic growth, www.dynamix-project.eu) has applied a systematic policy mixing approach. The heuristic framework, adapted from [11], consists of six stages [6]:

- 1 Defining long term objectives *and* concrete targets.
- 2 Developing a causal model for problem solving in the respective policy area (including an analysis of the problem and underlying drivers).
- 3 Selecting policy instruments based on the previous analyses for an initial policy mix.
- 4 Undertaking ex-ante assessments of the policy mix (using literature review, participatory scenario building and quantitative model simulations).
- 5 Revising, if necessary according to the ex-ante assessments, the mix by adapting or adding instruments; then the steps of the ex-ante assessment should be undertaken again, and the policy mix finalised.
- 6 The final policy mix should then be prepared for implementation, enforcement and monitoring of the policy mix.

Figure 2 shows the approach as applied in the DYNAMIX project.

Figure 2: Heuristic framework for policy mixing; Source: adapted from [11]



The DYNAMIX approach to policy mixing encompasses six stages including an ex-ante assessment of a first mix and its refinement taking the results of the ex-ante assessment into account.

In the DYNAMIX project this framework was applied in three different policy mixes: an overarching policy mix, a metals policy mix and a land use policy mix. After defining objectives and targets (step one), developing a causal model for problem solving (step two) the policy instruments were selected (step 3):

In DYNAMIX three policy mixes were developed and assessed: an 'overarching mix' to foster sustainable consumption and production; a 'metals mix' to reduce metals and materials use and a 'land mix' to reduce the impacts of agricultural production and consumption.

- 1 The '**land use policy mix**' aimed at reducing impacts of agricultural production and consumption on the European and global level through eight instruments: revision of the common agricultural policy; measures limiting nitrogen emissions; regulation for land use, land use change and forestry; improved pesticide management; promotion of payment for ecosystem services programmes) target the production side to enhance biodiversity, as well as soil and water quality; value added tax on meat products; targeted information campaigns on changing diets and on food waste; development of food redistribution programmes [12]
- 2 The '**metals policy mix**' aimed to reduce metals and materials use (virgin metals use of the EU should decrease 80% in 2050) without major increases in the use of other resources or environmental impacts. The policy mix consists of five main instruments: a green fiscal reform including the internalisation of external environmental costs and a materials tax; the promotion of sharing systems; product standards; research and development for material efficiency and recycling. And five supporting instruments: an EU strategy for dematerialisation; information campaigns; establishment of fora for communication; removal of environmentally harmful subsidies and the establishment of advanced recycling centres [12].
- 3 The '**overarching policy mix**' aimed to foster sustainable consumption and production to support decoupling and included eight main instruments: a labour market reform fostering a shift from consumption to leisure; a step-by-step restriction of advertisement and marketing; boosting extended producer responsibility; a circular economy tax trio; a feebate scheme; VAT reductions; skill enhancement programmes and support for local currencies [12].

2.3. The ex-ante assessment of the DYNAMIX policy mixes

While the first three steps of policy making are applied – albeit often only rudimentary – in “standard” policy making processes, the policy mixing approach sets itself apart from the ex-ante assessment onwards. All policy mixes processes should comprise an ex-ante assessment combining qualitative and quantitative methods in order to estimate the effects of the mix to reach the set objectives and targets and identify unintended side-effects or trade-offs. The three DYNAMIX policy mixes were assessed

- **qualitatively** regarding their environmental and economic effects, their social impacts, legal, and their public acceptability [13].
- **Quantitatively** a physical and environmental assessment and an economic assessment were undertaken [14].

Qualitative assessments

It was the overall goal of these assessments to identify the possible impacts as thoroughly as possible and then select the most relevant impacts for the respective assessment area. In undertaking qualitative assessments for policy mixing a balance must be struck by the scientists to identify all relevant impacts (to not overlook unintended side-effects as described exemplary

Policy mixes should be assessed using qualitative and quantitative methods.

above) and to provide hands-on conclusions for the refinement of the policy mix. The qualitative assessments were undertaken using a range of different methods. While not all assessments can be described in detail here, the approach of the social assessment [15] can serve as an example of how to undertake a thorough assessment.

In the social assessment a social impact matrix was filled with a comprehensive list of possible social impacts. The matrix provided a framework for the systematic screening of possible social impacts across all the policy mixes. In the following all possible impacts were rated (from “0” no impact to “3” great impact). Then the average scores of the matrix were computed and, building on the results, a short list of three key social impacts - labour market impacts, health impacts and social inclusion impacts – were assessed. As a next step a conceptual framework to assess the key impacts – while also taking into account the interconnections between the impacts – was developed. For example to assess the impacts on the labour market a human rights approach (referring to the UN declaration of Human rights stating everyone has the right to work) was taken and the impact of the policy mix to create and destroy jobs on certain groups of society, its impact on wage development etc. was applied. To ensure comparability of results a qualitative scoring system for impacts (from “likely very positive to “likely very negative” was applied in all qualitative assessments [13].

Quantitative assessments

The three policy mixes and their respective instruments were quantitatively assessed with up to three applied macro-economic models: a Computable General Equilibrium model (Intertemporal Computable Equilibrium System; [ICES]) and two Dynamic Stochastic General Equilibrium Models (Macroeconomic Mitigation Option Model [MEMO II] and Material Energy Waste and Agriculture model [MEWA]).

When undertaking quantitative ex-ante assessments it can be recommended to use more than one quantitative model. As numbers have a tendency to speak louder than words in the political process, applying various models is important to provide more robust numbers and make model assumptions and limitations more transparent.

In DYNAMIX the three different models provided sometimes highly differing model results. This helps to understand the differing results in their respective modelling logics rather than as “a forecast” of the future and consequently it reveals the connections between different models in a mix. For example, the green tax instruments of the metals mix yielded very different results in the three models. One model result indicated a very positive result with regards to the increase in materials efficiency due to the materials tax. Another model did not only have a very weak positive effect of the materials tax it also indicated that the materials tax would harm the economy whereas the other modelling results indicated a positive effect, i.e. GDP increase in comparison to a baseline.

The key message to be taken from these results is that “the cost of the policy crucially depends upon (a) the sensitivity of the production system to the dynamic incentive to dematerialize induced by the policy signal, i.e. ultimately upon the reaction (or availability) of technological progress (b) the use of tax revenues, i.e. on the implementation of an appropriate revenue-recycling scheme” [16]. Thus not only insights to the effect of the instruments, but also to the preconditions for its success – or which other instruments need to be mixed – were gained.

To assess quantitative modeling more than one model should be applied.

3 Selected results of the ex-ante assessments

The '**land policy mix**' was assessed to have positive environmental effects, which would contribute to the set targets, especially the limitation of per capita greenhouse gas emissions to 2 tons of CO₂ and reducing nutrient surpluses. With regards to the socio-economic impacts a positive side-effect on health is expected. Nevertheless, as in the other policy mixes a lack of public acceptance might prevent the implementation of the mix. Most worrisome of might be anticipated rises in food prices.

In order to mitigate unintended side-effects, several suggestions were made as part of the assessments. These include the reduction of the VAT for cereals, vegetables and fruits to offset food price increases; and advisory services for farmers to avoid losses resulting from the change to sustainable farming.

The '**metals policy mix**' was assessed to have a positive environmental effect, especially the green fiscal reform instruments will develop a positive effect, if accompanied by supporting instruments in a mix. The support of sharing schemes and product standards are expected to have low quantitative effects. As the mix pushed for a shift in the economic structure (from production to services) the 'soft impact' of sharing systems may nevertheless be important as for people to change their expectations as to how services are provided and with regards to ownership. Research and development was an important support instrument to make the green fiscal reform instruments a success.

The assessment also suggested changes for the policy mix, including: the shift of the economy should be accompanied by skill enhancement measures; communities strongly affected by the shift should receive government support to master the transition period successfully. Redistributive measures need to be applied to balance regressive impacts on the socially vulnerable. Furthermore, it was suggested that the materials tax should differentiate between materials, to mirror their environmental impacts.

The assessments of the '**overarching policy mix**' indicate a positive environmental effect, but mostly likely the instruments would not be sufficient to reach the set targets. Furthermore socio-economic impacts, such as increasing compliance costs for businesses and enforcement efforts for administrations or possible job losses, and a lack of public acceptance were expected to prevent the policy mix from being implemented and/or harm its effectiveness. Also due to the above reasons the political feasibility of the measures was considered a major obstacle.

The suggested revisions after the assessments included suggestions to complement the VAT reductions of the mix with a tax on least efficient products, in order to offset a rebound effect. Furthermore, the instrument should be supported by an information campaign, to create a signalling effect. The 'boosting of EPR schemes' should make easy use for consumers a priority by incentivising product return through money-back schemes and easy availability of returning options.

4 Conclusion

Policy mixing – if applied with a systematic approach including an ex-ante assessment, refinement and subsequent monitoring – is a very promising approach to counter 'wicked problems' such as the reduction of resource use and increasing resource efficiency. In long-term political processes, such as

developing a roadmap for a policy field or as party programme development, the policy mixing process may be applied in a 'textbook' manner. In more short term constellations, policy makers can often influence singular instruments and not a full mix. The knowledge of policy mixing is nevertheless important to evaluate the effectiveness of the instrument and the potential side-effects that might offset the original intentions or lead to a failing policy in other ways and identify those instruments that are necessary to heal these side-effects.

While the policy mixing approach may appear and actually *is* a sophisticated undertaking, the costs of ineffective policies or perverse and unintended side-effects are assumed to be significantly higher than scientifically assessed policy mixes that succeed at reaching the targeted objectives and heal unintended consequences. The assessments of the DYNAMIX policy mixes also showed the importance of supportive instruments, such as long term strategies that provide reliability to all parties or information instruments. Albeit weak on their own terms, they may be necessary preconditions for any ambitious policy instrument to succeed – including receiving the necessary public support.

The biggest challenge to policy mixing is not the mixing process as such, but how it could be applied in the existing policy making process. Policy mixing includes a long-term roadmap and the chance to monitor and adapt the mix in an iterative process. Currently policy making is often limited by election circles and relies on taking short windows of opportunity rather than following a long term perspective. However, wicked problems, such as the reduction of resource use cannot be solved with short term solutions. Luckily, usually important policy fields include a long term perspective. In applying a policy mix a sequencing approach – that starts with those instruments as setting the scene (such as provision of information on a certain challenge) and the less contentious instruments need to pave the way for ambitious instruments. Strong instruments, such as taxes should be implemented gradually, to leave time to adapt. Finally, strong regulatory instruments can be applied.

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