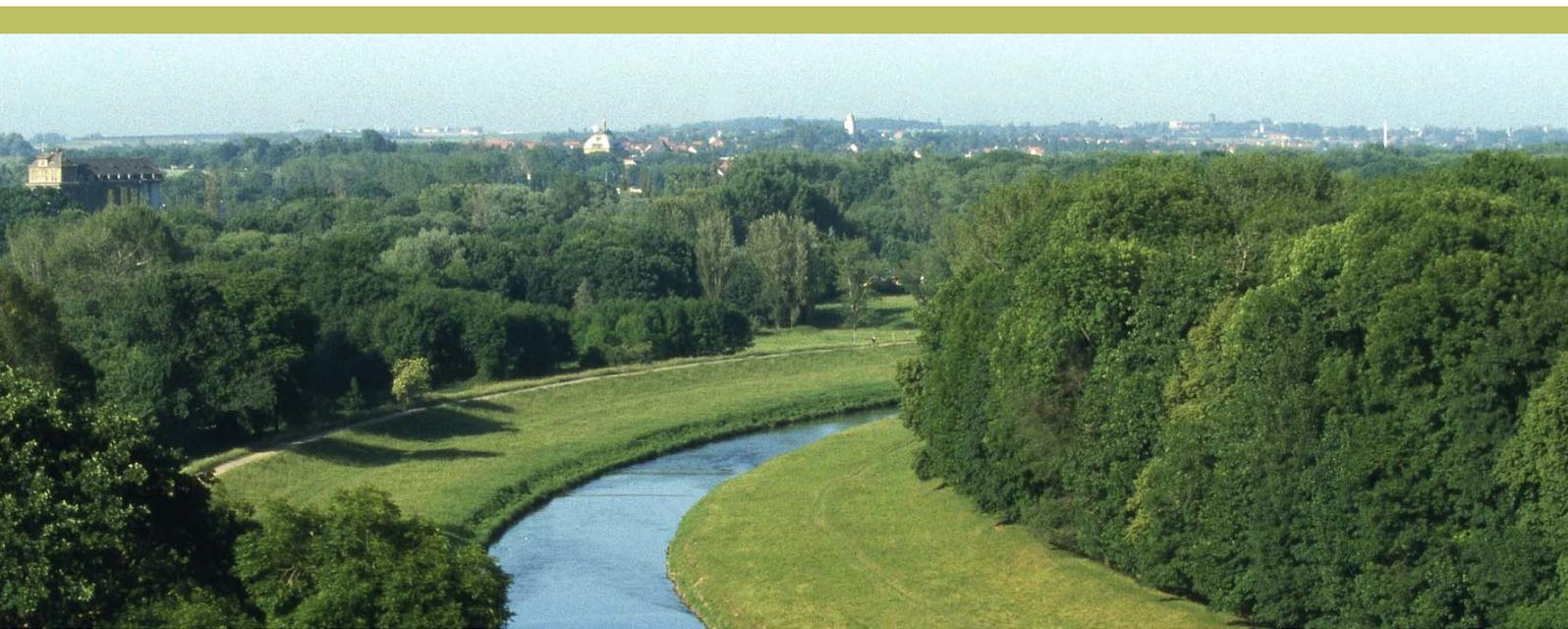# TECHNICAL BRIEF

Issue No. 5

POLICYMIX - Assessing the role of economic instruments in policy mixes
for biodiversity conservation and ecosystem services provision

Recommendations for assessing instruments in policy mixes for biodiversity and ecosystem governance

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Preface

This POLICYMIX Technical Brief summarises the main lessons learned from the international review of policy instruments for biodiversity conservation and ecosystem services provision, as published in POLICYMIX Report Issue No. 2 "Instrument Mixes for Biodiversity Policies" (Ring and Schröter-Schlaack 2011). For a full understanding of the findings of WP2 "Review of instruments and their roles in a policy mix" we refer to this report that provides a detailed review of various frameworks for policy mix analysis (Ring and Schröter-Schlaack 2011) and a more detailed outline of our suggested POLICYMIX framework for the analysis of economic instruments in policy mixes for biodiversity and ecosystem governance (Schröter-Schlaack and Ring 2011). This report also provides thorough reviews of the following policy instruments including first assessments of their roles in a policy mix: direct regulation (Schröter-Schlaack and Blumentrath 2011), offsets, habitat banking and tradable permits (Santos et al. 2011), tax reliefs (Oosterhuis 2011), ecological fiscal transfers (Ring et al. 2011), payments for environmental services (Porras et al. 2011), REDD and REDD+ (Chacón-Cascante et al. 2011) as well as forest certification (Kaechele et al. 2011).

This Technical Brief also represents POLICYMIX Deliverable D2.2 "Recommendations for multi-scale assessments of instruments and their transferability". The recommendations serve as a starting point for the assessment of the transferability of impact assessment methods as developed by WPs 3-6 and policy lessons from the case studies (WPs7-8). Therefore, this Technical Brief tries to go beyond the report mentioned above, and includes a first and rough sketch of possible empirical approaches for assessing instruments in policy mixes (section 5) as well as a short discussion of relevant issues to consider in multi-level assessments of instruments in policy mixes (section 6) as they are currently planned for the POLICYMIX case studies. This latter part of the Technical Brief is clearly work in progress and will be substantially developed as we move ahead with the assessment of existing and proposed policy instruments for biodiversity conservation in the case studies (WP7) and the multi-scale comparative case study analysis and transferability assessment of economic instruments (WP8).

1   Introduction

In most countries, the conservation and sustainable use of biodiversity builds on strategies involving a wide range of policy instruments. Within these policy mixes, the use of economic instruments for biodiversity policies and the provision of ecosystem services gains increasing attention (e.g., McNeely, 1988; Bräuer et al., 2006; EEA, 2006; Ring et al., 2010). Especially in the context of the recent international initiative on The Economics of Ecosystems and Biodiversity (TEEB), economic approaches to biodiversity conservation and ecosystem governance gained momentum (TEEB, 2010a, 2010b, 2010c, 2011). However, there are still many open questions regarding the combination of several instruments in a policy mix. For example, what is the role of economic instruments vis-à-vis regulatory approaches in biodiversity policies? How can the various instruments be assessed in their contribution to conservation objectives, cost-effectiveness, social and distributional impacts as well as institutional requirements, when the focus is on assessing policy mixes rather than single instruments?

This POLICYMIX Technical Brief is a concise summary of POLICYMIX Report No. 2 "Instrument mixes for biodiversity policies". It shortly outlines the challenges involved in assessing the role of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision. For this purpose, we present a pragmatic working definition of the term "policy mix" and apply it to our study focus, the conservation and sustainable use of biodiversity (section 2). In section 3, we very shortly summarise the main findings of the review of available frameworks for policy mix analysis, with a focus on those that have been presented in the context of environmental policies (Gunningham and Grabosky, 1998; Gunningham and Sinclair, 1999; Sorrell, 2003; OECD, 2007) and biodiversity conservation policies (OECD, 1999; Young et al., 1996; Gunningham and Young, 1997).

Building on international experience and literature, we then work our way towards a POLICYMIX approach for assessing instruments in policy mixes (section 4). We suggest a three step and two pathways framework for assessing policy instruments in their role in a policy mix. This assessment of instruments in a policy mix can further be divided into two sub-tasks: a) what is the specific or functional role of the relevant instrument in the mix in terms of synergies, conflicts or temporal sequencing with other instruments? b) what is the additional value of the relevant instrument in the policy mix in terms of outcomes and how can this value be increased or even maximised? With the latter question, more traditional criteria for designing and evaluating policies come into play: one instrument may increase conservation effectiveness, another save costs, yet another contributes to acceptability through more distributive fairness, and finally, some may be required due to legal and institutional requirements in a certain socio-cultural setting.

Building on the three steps and two pathways POLICYMIX framework suggested in section 4, section 5 presents possible empirical approaches for assessing instruments in policy mixes in the POLICYMIX case studies. These methodological approaches are presented in a matrix distinguishing between ex ante and ex post analysis pathways. Furthermore, the functional role evaluation of policy instruments (step 2 of the framework) and the more detailed impact and scenario valuation techniques (step 3 of the framework) are substantiated by a number of concrete methods that may be used in the relevant POLICYMIX cases.

Section 6 highlights relevant issues for assessing instruments in a multi-level context, drawing, as far as it is possible at this early state, on some of the case studies instruments and contexts. Finally, section 7 concludes with some words on the way ahead of us in the POLICYMIX project.

2   What is a policy mix?

To provide a more rigorous basis for analysing policy mixes, the following pragmatic working definition is suggested (Ring and Schröter-Schlaack 2011: p. 15):

> A *policy mix* is a combination of policy instruments which has evolved to influence the quantity and quality of biodiversity conservation and ecosystem service provision in public and private sectors.

For the purpose of our analysis in the POLICYMIX project we focus our analysis on those policy instruments that *positively influence* biodiversity conservation objectives or help sustaining the provision of ecosystem services. We can then distinguish two pathways of analysis:

a.   *Ex post analysis:* In a specific context and at a certain point in time, a mix of existing instruments is usually already present. This existing mix can be assessed with a range of evaluation criteria where different instruments contribute to the success or malfunctioning of the overall policy mix in specific ways. To improve the success of the overall policy mix, the focus of analysis may be on (see sections 4 and 5 for further explanations):

- Assessing the overall existing policy mix looking at the roles of several instruments vis-à-vis each other, using a classification of instrument roles.

- Evaluating one selected policy instrument against the background of the other instruments in the policy mix using evaluation criteria for single instrument analysis, as well as using evaluation criteria for analysing policy mixes.

b.   *Ex ante analysis:* A new policy instrument is introduced against a background of already existing instruments. Both the new and the existing instruments form the policy mix. To improve the success of the overall policy mix, the focus of analysis may be on:

- Assessing the overall policy mix including the new instrument looking at the roles of several instruments vis-à-vis each other, using a classification of instrument roles.

- The new policy instrument is assessed or designed against the background of the other instruments in the policy mix using evaluation criteria for single instrument analysis, as well as using evaluation criteria for analysing policy mixes.

The mix of existing and new policy instruments for biodiversity conservation and sustained ecosystem services provision is not to be confounded with the *institutional context* or setting of the policy mix as defined above. The institutional context involves all the remaining institutions of a society, consisting in the formal and informal rules that govern society (economic, political, social institutions). These

institutions typically involve property rights, markets, or political governance systems. Furthermore, the institutional context also relates to the policy instruments and mixes in sectors other than biodiversity conservation. Other sectoral policies, such as agricultural, forestry, fisheries or infrastructure-related policies may strongly influence conservation objectives, although often in a negative way in the form of adverse incentives (e.g., TEEB, 2011). This institutional context (i.e. including policy instruments exerting negative pressure on conservation objectives) will not be ignored in the POLICYMIX case studies, but screened for relevance and studied as part of the institutional options and constraints (see Primmer et al. 2011: WP6.1 Guidelines for the analysis of institutions shaping biodiversity policy instrument applicability).

3   Existing frameworks for policy mix analysis

"To explain the world of interactions and outcomes occurring at multiple levels, we also have to
be willing to deal with complexity instead of rejecting it." (Ostrom 2009 Nobel Prize Lecture)

When analysing problems of institutional choice, so many complex configurations of variables need to be addressed that Ostrom (1990: 214; 2009) presented these variables in a 'framework' rather than a single model, because one model could not grasp the necessary degree of complexity. The same applies to instrument choice and instrument design in a policy mix. Policy mix analysis can easily become extremely complex. Owing to the impact of local political and cultural traits, it is very difficult to arrive at global policy conclusions (Gunningham and Sinclair, 1999). Nevertheless, there are a few frameworks that have been developed for policy mix analysis. Often, the starting point is a sector-specific analysis. Young et al. (1996) present a framework for designing policy mixes in biodiversity conservation building on Australian experience and context, whereas Gunningham and Grabosky (1998) and Gunningham and Sinclair (1999) build their framework on preceding research in the chemical industry and the agricultural sector). Sorrell (2003) and contributors analyse interaction in EU climate policy and from there develop a systematic approach to analyse policy interaction that can be applied in other policy areas. OECD (2007) starts with basic concepts for assessing instrument mixes in environmental policy, while providing lessons drawing on case studies for household waste generation, non-point sources of water pollution, residential energy efficiency, regional air pollution, and emissions of mercury to air. Doremus (2003) focuses on biodiversity protection on private lands to recommend a policy portfolio approach whereas Flanagan et al. (2010) focus on policy mixes in innovation policy.

Pannell (2008) has developed a framework for policy mechanism choice (positive incentives, negative incentives, extension or no action) in the context of land-use change on privately owned land, building on relative levels of private net benefits and public net benefits. Incentives include both financial and regulatory mechanisms in the framework. Although this framework provides a valuable analytical basis for choosing between different policy instruments in relation to a specific project or policy objective, it was not initially conceived as a framework for policy mix analysis. Nevertheless, it represents a valuable approach to evaluate in which landscape locations any individual, specific mechanism may be recommended based on the ratio of public to private net benefits of current land use and a series of

policy "rules for choosing policy mechanisms". Where private and public net benefits are heterogeneous across the landscape, Pannell's framework could in future be used to suggest a mix of different policy mechanisms across the landscape, constituting a spatially explicit policy mix or 'policyscape' (Barton et al., 2011). Pannell's framework does not however, provide any further guidance on how to combine or sequence positive incentives, negative incentives, or extension in a particular location.

Frameworks for policy mix analysis often build on or even include evaluation and design criteria that have been used for single instrument analysis. In general, these analyses have used a single level (hierarchy) of evaluation criteria, rather than a nested approach. Most commonly used criteria include environmental effectiveness, cost-effectiveness, distributional impacts, administrative feasibility and institutional factors. However, for policy mix assessment, these evaluation criteria need to be further developed and additional criteria are required. Looking at policy mixes as a whole, the relationship or interaction between, or functional role of, policy instruments becomes a focus of analysis (Gunningham and Sinclair, 1998; Sorrell, 2003; OECD, 2007; Flanagan et al., 2010). Here, the aim is not to identify the most effective or most efficient instrument compared to another, but to analyse the interaction between two or more instruments under investigation. Authors promoting policy mixes and policy mix analysis put forward that 'single instrument' or 'single strategy' approaches are misguided because all instruments have strengths and weaknesses (Gunningham and Sinclair, 1999). The task is to build on the strengths of individual instruments, while compensating for their weaknesses through additional or complementary instruments.

Complementarity, conflict and sequencing

Gunningham and Sinclair (1998, 1999) developed a principle-based approach to regulatory design and evaluation of environmental policies, strongly suggesting the superiority of instrument mixes over single instrument strategies. When looking at a mix of two instruments belonging to different instrument categories, Gunningham and Sinclair (1998: 423; 1999) distinguish four basic relationships:

1)   Inherently complementary combinations of instruments significantly enhance the outcome. When used together, the instruments increase overall effectiveness or efficiency irrespective of the environmental issue or the political and socio-cultural setting (Gunningham and Sinclair, 1999). The positive interaction between certain types of instruments holds for a wide range of circumstances. Therefore policy makers can be confident to use these instrument combinations without fear of doing harm. Gunningham and Sinclair (1999: 55ff.) present a number of combinations that usually work well together. For example, well-designed informational instruments provide additional value in combination with all other instruments.

2)   Some instruments reduce each other in their efficiency and effectiveness. Irrespective of the context, inherently counterproductive or suboptimal instrument combinations negate or dilute the effect of another instrument (Gunningham and Sinclair, 1999: 61ff.). There are a few combinations that are completely incompatible such as a free market environmentalism/property rights approach in combination with a regulatory command-and-control approach. Other combinations presented by the authors are more complex, such as combining command-and-control regulation with economic instruments which target the same aspect of a problem.

3) Instruments may be incompatible when employed at the same time, but compatible and reinforcing each other when introduced one after the other (Gunningham and Sinclair, 1998: 444ff.). A typical example of time sequencing refers to self-regulation, followed by stricter standards if the first instrument demonstrably fails to meet predetermined performance benchmarks.

4) Gunningham and Sinclair (1999) provide a fourth category of instrument combinations, where the outcome will be context-specific.

Building on their detailed discussion of a mix of two instruments with regard to their four basic relationships as explained above, Gunningham and Sinclair (1999) conclude with two general points on multi-instrument mixes. First, additional synergies can often be derived from complementary instruments in policy mixes with more than two instruments. Second, they emphasise the sequence in which the individual instruments are introduced in policy mixes as a potentially crucial factor to their success.

Although not yet presented in the framework of the above mentioned four abstract categories of instrument combinations, Gunningham and Young (1997) also discuss combinations of two instruments in biodiversity conservation policies and conclude their article with a number of valuable design criteria toward an 'optimal environmental policy' in biodiversity conservation. The authors also provide a long list of design criteria for instrument mixes in environmental policies or biodiversity conservation policies. For biodiversity conservation (Young et al., 1996; Gunningham and Young, 1997), they include among others 'designing for precaution', 'preference for underlying causes', using 'financially attractive instrument mixes', and 'limiting compensation for a transitionary period'.

Policy interaction

Drawing closely on smart regulation theory as presented by Gunningham and Grabosky (1998), Sorrell (2003) and co-authors develop a typology of policy interaction as a basis for policy mix analysis in the context of the EU-funded project "Interaction in EU Climate Policy". They distinguish five types of interaction (Sorrell, 2003: 36), but emphasise that two policies may interact in more than one way:

• Direct interaction involving target groups that are directly affected by two policies and these target groups overlap to some extent.

• Indirect interaction relate to overlapping instruments in terms of the target groups addressed:

  a) a target group directly affected by one policy instrument overlaps with the target group indirectly affected by a second;

  b) a target group indirectly affected by one policy overlaps with the target group indirectly affected by another policy.

• Operational interaction where two policies operate together.

• Sequencing interaction, where one policy instrument is followed in time by another instrument, and both directly affect the same target group.

• Trading interaction, meaning that two policies are linked by the exchange of an environmental trading commodity.

Each type of interaction may have implications for the effectiveness, efficiency, social impacts or political feasibility of the policy mix. "Hence, the extent to which such interactions can be judged as beneficial, neutral or counterproductive requires a careful examination of the nature and consequences of the interaction and an evaluation of those consequences within a multi-criteria framework. This should lead to a judgement as to whether the combination of instruments is useful, redundant or positively harmful." (Sorrell, 2003: 44)

Moving further to analysing policy interaction, three major steps are suggested (Sorrell, 2003: 44):

1. How and why are two policies affecting each other?

2. What are the consequences of this interaction for the target groups, and the organisations involved in implementing the instrument and aiming to achieve the policy objective?

3. Evaluation of the desirability of these consequences against chosen evaluation criteria.

Interaction analysis can focus on existing or proposed instruments, analyse two or more instruments, and finally aims to identify possible conflicts or synergies between these instruments. Systematic interaction analysis requires comparing the scope of the instruments, the nature of the objectives, the timetable of introduction of the instruments, the operation of the instruments, and the process of implementation (Sorrell, 2003: 45). Sorrell (2003) focused on climate policies, where location of carbon emissions is of no importance. In biodiversity policies, however, spatial heterogeneity is crucial, and thus location of policy impacts may also become relevant for systematic interaction analysis.

From policies to governance frameworks

Drawing on the strengths and weaknesses of smart regulation theory that, in the words of Van Gossum et al. (2010: 245), is characterised by "almost infinite 'smart' regulatory options", the concept of "regulatory arrangements" has been put forward. Other authors have also emphasised the multiplicity of instruments operating in a policy setting. Bressers and O'Toole (2005) stress the social and political context of applying instruments and the networked character of implementation contexts. The authors deem it crucial "that instruments be analysed in their mutually reinforcing – or sometimes impeding – combinations" (Bressers and O'Toole, 2005: 134). For effective governance, policy analysis needs to go beyond a perspective focusing on separate and isolated instruments. The authors distinguish several joint forms of influence, or 'confluence', in policy mixes (Bressers and O'Toole, 2005: 137ff.).

Bressers and Kuks (2003) characterise instrument mixes for the purpose to get assistance in analysing policy formulation, implementation and contributing to the effectiveness of instruments in view of the target groups. They introduce 'five multiplicity aspects of governance': Multiple levels of governance, multiple actors in policy networks, a multiplicity of problem definitions and other policy beliefs, multiple other instruments and multiple responsibilities and resources for implementation. Policy analysis is shifting towards governance analysis in a multi-level and multi-actor context, or in the authors' terms a 'networked context'.

In a similar line, Flanagan et al. (2010) analyse policy mixes in innovation policies in a multi-level and multi-actor context. They distinguish between dimensions and forms of interaction, next to possible sources of tension between instruments in a policy mix. The dimensions of policy mix interaction relate to policy space as the abstract space in which different policy domains coexist, the governance level dimension relating to interactions across different hierarchical levels of governance, the geographical dimension, the policy mix interactions in real space, and the time dimension. They use Bressers and O'Toole's (2005) framework as their starting point to build a more sophisticated conceptualisation of interactions, ending up with three kinds of policy mix interaction in the case of unambiguously distinct instruments (Flanagan et al., 2010: 24) that all focus on interactions in relation to the target groups addressed by the instruments under investigation. So, actors and actor groups strongly get into focus.

Concluding remarks on policy mix frameworks

In the light of the frameworks for policy mix analysis as presented above, how do we move forward from here? At this stage, the key lessons may be framed as following:

Policy mix analysis does not primarily ask whether one instrument is more effective or efficient than another, assuming only the more effective instrument should be used. The interesting question for policy mix analysis is on interaction between instruments. Are combinations of instruments complementary to each other, are they mutually reinforcing, do they involve conflicts when present at the same time, or are they suitable to be introduced one after the other in a temporal relationship to increase outcome? Furthermore, there may be many situations where no general recommendation is possible at all, and the outcome completely depends on a unique context.

Positive and negative interaction between instruments may be defined differently for biodiversity conservation policies compared to general environmental policies. Regarding the latter field, OECD (2007) mentions overlap of instruments as a potential source of inefficiency and thus includes overlap in the category of 'negative interactions'. To the contrary, overlap of instruments is even recommended by several authors for biodiversity policies (Gunningham and Young, 1997; OECD, 1999) and thus, subsumed under positive interactions.

What has been dealt with as the social, political or institutional context in earlier frameworks of policy mix analysis, seems to become a focus of analysis in later frameworks. In recent years, instrument choice and design, as well as policy mix analysis has more and more been complemented by governance analysis, as the role of the state has continuously changed, and other actors enter stage, among them non-governmental organisations, businesses, or civil society representatives. Thus one can notice a shift from just looking at policy outcomes to include analysis of policy processes.

In the POLICYMIX Guidelines for assessing instruments for biodiversity conservation and ecosystem service assessment, both aforementioned approaches have been considered: Policy outcomes are more prominent in POLICYMIX WP3 (Rusch et al., 2011) and WP4 guidelines (Brouwer et al., 2011), whereas the

actor focus and the analysis of the policy processes is emphasised in POLICYMIX WP5 (Grieg-Gran et al. 2011) and WP6 guidelines (Primmer et al. 2011).

Having reviewed and synthesised the literature on policy mix analysis and frameworks, we suggest a first sketch of our own framework for assessing instruments in policy mixes for biodiversity and ecosystem governance in the section to follow. Needless to mention that this framework is subject to development as we move forward with POLICYMIX case studies, guideline refinement and comparative analysis.

We deem it important to start policy mix analysis with a scoping *phase, identifying challenges and context* of the problem at hand and the policy instruments under focus. Second, we summarise basic principles of policy mix analysis, looking at synergies and conflicts between instruments, interaction and governance, *as the evaluation of the functional role of a policy instrument* in an existing or new policy mix. Here, our focus is clearly on instrument interactions. Third, we suggest *a detailed policy evaluation and design analysis*, with an impact evaluation of selected existing instruments and/or a scenario analysis for a selected new instrument, directly building on the POLICYMIX guidelines as developed in WPs 3-6, and considering conservation effectiveness (WP3), costs and benefits of conservation (WP4), social impacts and legitimacy (WP5) as well as the institutional options and constraints (WP6) (available at http://policymix.nina.no)

4 Towards a framework for assessing instruments in policy mixes for biodiversity and ecosystem governance

Building on the review of policy mix frameworks and Schröter-Schlaack and Ring (2011), our suggested framework for assessing instruments in policy mixes for biodiversity and ecosystem governance includes three steps and two pathways:

Step 1. Identifying challenges and context

When it comes to analysing policy mixes, the focus is not on maximising the effectiveness or efficiency of individual policy measures but on the complementarity of the instruments involved, their interplay and the ability of the policy mix to address all drivers of the underlying problem. The appropriate mix of instruments and actors will hence depend upon the nature of the environmental problem, the target groups and wider contextual factors (see Gunningham and Grabosky, 1998).

Against this backdrop, the first step of the proposed framework consists in gaining a thorough understanding of the policy object, i.e. biodiversity conservation and (forest) ecosystem services management. Although we believe the below listed questions to be neither comprehensive nor exclusive, they may cover the most relevant questions to answer. Firstly, what are important characteristics of biodiversity and ecosystems that will influence appropriateness, applicability and success of certain instruments and their combinations? Secondly, what are the policy objectives regarding biodiversity conservation and ecosystem service management? Thirdly, what are the drivers of biodiversity loss and ecosystem degradation? Fourthly, who are the main actors whose behaviour is impacting biodiversity and

influencing ecosystem service provision? And lastly, what are cultural and constitutional constraints (or enabling conditions) that may hamper (or facilitate) the inclusion of certain policy instruments?

Step 2. Functional role evaluation: Identifying gaps and choosing instruments for analysis

There are three main determinants that influence the composition of the mix and that define the functional role of different instruments within the policy mix, namely the performance (and composition) of the existing policy (mix), the context-specific strengths and weaknesses of the individual instruments and lastly the interaction of the instruments within the policy mix.

Firstly, an analysis of the performance of existing policies will point to their shortcomings regarding the challenges of biodiversity conservation and ecosystem service management. Moreover, experience with existing policies in place shape what further instruments can be added more easily.

Secondly, the different strengths and weaknesses of instruments are of different importance for different conservation and management goals. For instance, 'direct regulation' is deemed to be effective in securing a safe minimum standard of biodiversity conservation and critical ecosystem service provision. In contrast, the main argument in favour of economic instruments is that they allow compliance costs borne by policy addressees to be reduced, e.g. in sustaining provision of marketable ecosystem services.

The third determinant for the role of individual instruments is how the additional instrument will interact with existing policies. Each instrument works by a different mechanism, either prescribing certain actions ('direct regulation'), incentivising positive actions (PES, subsidies, tax reliefs, fiscal transfers), penalising negative impacts (offsets, taxes, permit trading) or providing information to stipulate motivation and self-regulation (certification). Some of these mechanisms are deemed to be complementary, e.g. facilitating policy instruments by informative measures. Others are deemed to be counterproductive, e.g. limiting the compliance options of policy addressees by 'direct regulation' may restrict the flexibility inherent to economic instruments and will thus limit the potential cost savings from applying economic instruments. Ultimately, a 'policyscape' depending on the specific characteristics of the landscape, its uses and the associated formal and informal institutions can be drawn.

Hence, depending on these three aspects, instruments will have different roles to play within a policy mix. They may either be the leading approach, often introduced as initial regulatory impulse and amended by other policies to avoid negative side effects. On the contrary, the same instrument may also be applied later to facilitate already existing policies. For example, 'direct regulation' is very often the pioneering approach to reduce environmental loads and to safeguard biodiversity conservation. It may be augmented later by economic instruments to reduce opportunity costs of implementing more ambitious conservation goals or by informative measures to enhance compliance and reduce costs for monitoring and enforcement. Nevertheless, there may be also situations, where economic instruments are the main policy in place, e.g. taxes to correct for externalities in utilising marketable ecosystem services. Later on, the economic instrument may be augmented by 'direct regulation', e.g. zoning, to spatially allocate compliance activities to biodiversity hot spots.

Step 3. Policy evaluation and design

The last step of the proposed framework turns the focus to the evaluation and design of single instruments, i.e. how to improve an existing or design a new instrument so that the additional value of the relevant instrument to the existing policies is maximised? Although there is ample (economic) literature on instrument choice and design, these contributions very often strive towards developing optimal single instrument policies. However, as outlined above, the characteristics of and challenges associated with biodiversity conservation and ecosystem service management will in many instances require the simultaneous use of multiple instruments. And whenever more than one instrument is implemented, the interaction of instruments is of fundamental importance for overall performance of the policy mix. Against this background, the overall aim of instrument evaluation and design is shifted towards the specific role of single measures within a policy mix and how single instruments facilitate the performance of the overall policy mix.

To develop policy recommendations we refer to the traditional evaluation criteria while moving beyond the core criteria of effectiveness and efficiency in economic analyses, and group them into four basic assessment categories: conservation effectiveness, cost-effectiveness, social impacts and policy legitimacy, and institutional aspects. All of these aspects are highly context-specific and so are the methods from various scientific disciplines needed to derive some concrete recommendations. Work packages 3 to 6 of the POLICYMIX project discuss detailed assessment criteria for policy and larger governance analysis and recommendations regarding these aspects, thereby encompassing knowledge and techniques from natural science disciplines, such as biology and landscape ecology, to social sciences, such as economics, sociology and law.

Finally, depending on the policy-relevant outcomes of the evaluation and design of instruments in step 3, it may be necessary to reconsider the original challenges and the context of the conservation problem in relation to the policy instruments analysed (step 1) and/or the functional role of the relevant instruments in the policy mix (step 2).

Linking the three steps to the two pathways of ex post and ex ante analysis

Two different types of policy mix analysis pathways have been proposed in section 2 above: Firstly, ex post analysis and secondly, ex ante analysis. If we combine the three steps with the two different pathways of policy mix analysis, we can specify our POLICYMIX framework for the analysis of instruments in policy mixes in the following way (Figure 1):

a. **Ex post analysis**: In a specific context and at a certain point in time, a mix of existing instruments is usually already present. This existing mix can be assessed with a range of evaluation criteria where different instruments contribute to the success or malfunctioning of the overall policy mix in specific ways. To improve the success of the overall policy mix, the focus of analysis may be on:

2a. **Functional role evaluation:** focus on the overall existing policy mix assessing the roles of several instruments vis-à-vis each other, using the classification of instrument roles (complementarity, redundancy, conflict, sequencing/path dependency, context dependency).

3a. **Impact evaluation:** one selected policy instrument is evaluated against the background of the other instruments in the policy mix using evaluation criteria for single instrument analysis as well as using evaluation criteria for analysing policy mixes.

b. **Ex ante analysis:** A new policy instrument is introduced against a background of already existing instruments. Both the new and the existing instruments form the policy mix. To improve the success of the overall policy mix, the focus of analysis may be on:

2b. **Prospective functional role analysis:** assessing the overall policy mix including the new instrument looking at the roles of several instruments vis-à-vis each other, using the classification of instrument roles (see above).

3b. **Scenario analysis:** the new policy instrument is evaluated or designed against the background of the other instruments in the policy mix using evaluation criteria for single instrument analysis as well as using evaluation criteria for analysing policy mixes.
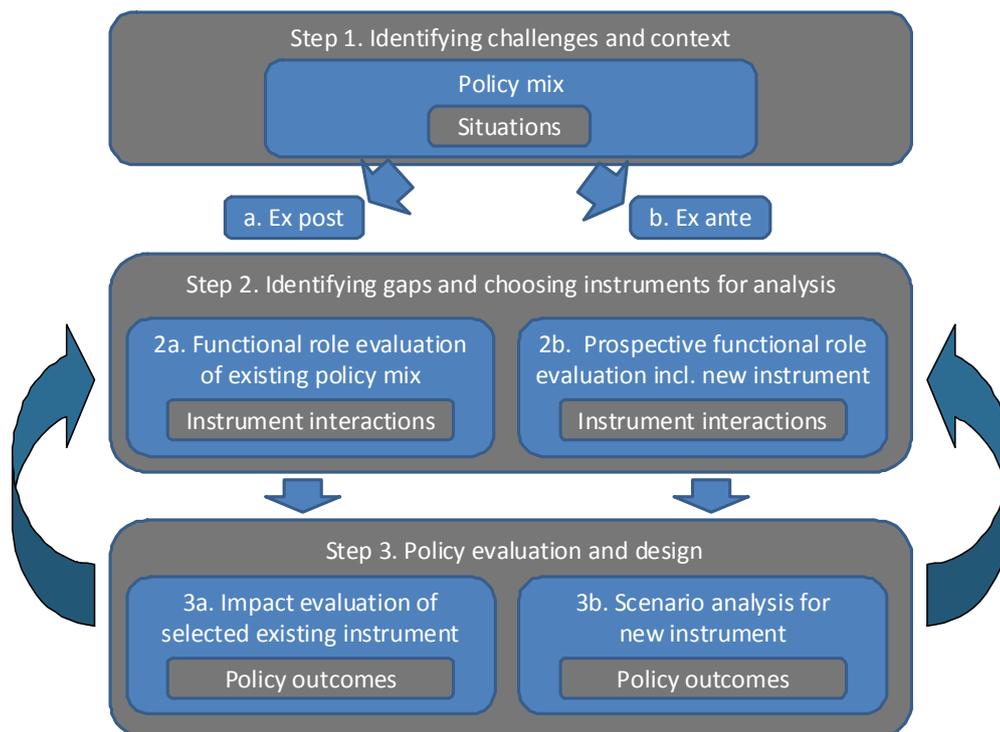
Figure 1: Policy mix analysis framework and pathways

The impact evaluation and scenario evaluation in step 3 place emphasis on evaluating a single instrument taking other instruments as a context of opportunities and constraints on implementation. Further work is needed on both policy mix analysis pathways and the elaboration of the different steps. These approaches will be developed in much more detail as part of the development of the guidelines of work packages 3-6.

5   Methodological approaches for assessing instruments in policy mixes

The discussion in the previous sections identified analysis steps and pathways according to a number of criteria: major characteristics, including strengths and weaknesses of instruments under evaluation; whether the policy mix context/background is considered; whether the analysis is descriptive of an existing situation, or evaluation of a proposed change; ex ante or ex post. Based on these analysis criteria a number of analysis options in the case studies could be drawn up, each with a particular set of methods that would be applicable. An example is given in Table 1 below.

Table 1: Policy mix analysis pathways and possible empirical approaches

Policy instruments for biodiversity conservation and ecosystem service provision:	1. Single economic instrument	2. Single instrument in the context of a policy mix	3. Two or more instruments in the context of a policy mix
2a. Functional role evaluation (ex post)	2a.1 Description major characteristics	2a.2 One way description of functional roles of the instrument	2a.3 Matrix of functional roles of the instruments
2b. Prospective functional role evaluation (ex ante)	2b.1 Description major characteristics	2b.2 One way description of functional roles of the instrument	2b.3 Matrix of functional roles of the instruments
3a. Impact evaluation (ex post)	3a.1 BACI impact evaluation, without policy mix confounding variables	3a.2 BACI impact evaluation considering existing policy mix as confounding variables & optimal reserve site selection	3a.3 BACI impact evaluation defining 'treatment' as a 'hybrid' instrument combination
3b. Scenario evaluation (ex ante)	3b.1 BCA using valuation methods; CE of instrument design	3b.2 Optimal reserve site selection models; cross case common design CE	3b.3 CEA, MCA of alternatives; or redefine combination as a single 'hybrid treatment'

Possible empirical approaches refer to the cells in Table 1:

2a/2b. Functional role evaluation (ex ante/ex post)

2a.1/2b.1) case studies would focus on descriptions of the major characteristics of economic instruments, using as a starting point the Instrument Review (WP2), WP6 Guidelines, with additional classification using for example strengths and weaknesses of instrument categories according to existing literature on policy instruments and mixes for biodiversity conservation (e.g., OECD, 1999; Gunningham and Young, 1997; Schröter-Schlaack and Ring, 2011) or Ostrom's institutional analysis and design criteria (Ostrom, 2005).

2a.2/2b.2) by one-way we mean that a single instrument is in conflict or complementary to a number of *individual* institutional characteristics of the existing policy mix (see example box 1/figure 2).

2a.3/2b.3) a policy mix matrix shows complementarities/conflicts between multiple instruments and their characteristics (see example box 2/figure 3).

Box 1: One-way functional role analysis

Figure 2 Example of a one-way functional role analysis where the effects of the policy mix context is evaluated 'one-way' for their effect on economic instruments focused on in POLICYMIX

Policy	Effectiveness of forest conservation	Direct costs of policy (efficiency)	Effect on inequality of poverty	Political viability
1. Reduce (extensive) agriculture rent				
Depress agricultural prices	High	Negative	Negative	Low
Create off-farm opportunities	High	Medium-high	Neutral - postive	High
Support intensive agricultural sector	Moderate - high	High	Uncertain	High
Selectively support extensive agriculture	Uncertain - moderate	High	Positive	Moderate
Ignore extensive road building	High	Negative	Negative	Low-moderate
Secure property rights	Uncertain	Medium	Uncertain	Moderate - high
2. Increase forest rent and its capture	WP 3	WP 4	WP 5	WP 6
Higher prices for forest products	Moderate	Low	Positive - uncertain	Moderate
Community forest mgt. - capture local public goods	Moderate	Low - medium	Positive	Moderate
Payments for ES - capture global public goods	Potentially high	Medium - high	Uncertain - positive	Moderate - high
3. Protected areas	Moderate - high	Medium	Uncertain	Moderate
4. Cross cutting policies				
Good governance	Low – moderate direct effects	Low or even negative	Positive	High
Decentralisation	Low – moderate direct effects	Low - medium	Positive	High

Source: adapted from (Angelsen 2009). Deforestation and REDD literature indicates a number regulatory and economic instruments in the agricultural sector which could interact with economic instruments for conservation. A 'one-way functional role analysis' of POLICYMIX selected 'economic instruments' looks at whether the economic instrument increases forest rent and capture, subject to individual influences from separate policies which make up the instruments institutional context. Have these policies complemented or competed with the economic instrument (or vice versa)? Complementarity or conflict is evaluated in terms of the outcomes: effectiveness, efficiency, equity and fairness criteria.

3a. Impact evaluation (ex post)

3a.1-3a.2) Before-after-control-intervention (BACI) impact evaluation methods, possible with instruments that have a longish history (e.g. PES in Costa Rica) or where survey data can be collected (large sample method). Policy mix considered as criteria for matching control and intervention groups, or as confounding variables in regression analysis. Optimal reserve site selection methods can be used to assess ex post how far the actual geographical distribution of contracts was from the cost-effective optimal solution (see WP3 Guidelines).

Box 2: Matrix / multi-way functional role analysis

Figure 3 Example of a 'multi-way' policy mix matrix showing simple conflict and complementarity between multiple instruments

Example of empirical results from a case study: Observed complementarity: at local level case study

Yes, observed working together ? possible, but no data No, not observed working together N.R. nor relevant	PES national and local	Trading schemes, habitat banking and offsets	Tax reliefs for biodiversity conservation	Voluntary mechanisms and forest certification schemes	Regulation: National parks and biological reserves	Regulation: mixed use reserves	Ecological fiscal transfers to municipalities	REDD and REDD+: CDM & ICDPs	Others: community based forest management	Other: infrastructure projects
PES: national and local	▓	no	no	no	no	yes	no	n.r.		
Trading schemes, habitat banking and offsets		▓	yes	yes	no	yes	n.r.	n.r.		
Tax reliefs for biodiversity conservation			▓	yes	no	yes	no	n.r.		
Voluntary mechanisms and forest certification schemes				▓	no	yes	yes	yes		
Regulation: National parks and biological reserves					▓	n.r.	yes	no		
Regulation: mixed use reserve						▓	yes	yes		
Ecological fiscal transfers to municipalities							▓	?		
REDD and REDD+: CDM & ICDPs								▓		
Other: e.g. community based forest management									▓	
Other: infrastructure projects										▓

Colour coding of matrices could provide a quick comparison of similarities between policy mixes across case studies.

The instrument complementarity/conflict matrix could be based on observed coincidence of instruments in any one location (based on GIS and survey data) or used as a visualization tool for dialogue with key stakeholders regarding current and future feasibility of policy mixes. Some instruments are not relevant at property scale, or municipal scale unless redefined (e.g. REDD funding for Integrated Conservation and Development (ICDP) or Clean Development Mechanism (CDM) projects within which landowners can participate; or ecological fiscal transfers to municipalities are not directly accessible by landowners unless municipalities earmark part of funds for private conservation initiatives).

3a.3) BACI possible in principle, but unlikely to find cases where two economic instruments have been applied simultaneously in the same area on the same type of land users. If this is the case the combination of instruments could be defined and analysed as a single 'hybrid treatment'.

The impact evaluation criteria in the different work package (WP) Guidelines in POLICYMIX – effectiveness, efficiency, equity and fairness can be applied ex ante for scenario or prospective analysis.

3b. Scenario evaluation (ex ante)

3b.1) benefit-cost analysis (BCA) of impacts of a single policy instrument in a given area. Choice experiment (CE) of different combination of instrument characteristics, and cost and effect of outcomes.

3b.2) Optimal reserve site selection models can simulate optimal targeting of e.g. PES using e.g. other land-use regulation as optimization constraints; a single instrument's characteristics could be evaluated in different case studies using a common choice experiment design (see WP3 Guidelines).

3b.3) Cost-effectiveness analysis (CEA) or 'discrete' multiple criteria analysis (MCA) of alternative instruments proposed for the same area/land use. Spatially explicit MCA using GIS platform or optimal reserve site selection model (see WP3 Guidelines).

Some observations

A starting hypothesis of a 'policyscape' approach is that outcomes of a mix of instruments are spatially explicit (Barton et al., 2011). It is an empirical question for the case studies whether the functional roles of different instruments can be evaluated generically, or whether they are conditional on specifics of location (e.g. type of property and land use); whether policy design without reference to location can identify commonly applicable 'design principles'.

Further classification of different 'roles' may be needed to make this policy mix analysis pathway non-trivial. For an evaluation of functional roles further guidance may also be needed on distinguishing instruments from one another. Instruments share a number of characteristics. At first sight shared roles may make instruments seem superficially redundant, such as common property rights definitions, while they are in fact complementary in a few key characteristics, and at specific spatial scales e.g. varying in usufruct rights. An instrument's role relative to another cannot be further analysed without a decomposition of the instrument into characteristics. What characteristics are key to describing an instrument and how should they be classified?[1]

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[1] See future POLICYMIX Technical Briefs for development and discussion.

6   Issues in multi-level assessments of instruments in policy mixes

In a policy mix instrument analysis, it is essential to perceive that there are different scales of policy effectiveness to be appraised for biodiversity conservation results, corresponding to distinct levels or spheres of governance. Instruments can set the framework for regulation at an international or national scale, but their effectiveness depends upon the context in which they will be implemented at a subnational level (local, national state or regional scales). Box 3 exemplifies these relationships in the context of REDD+. It is the objective of this research to provide relevant indicators and research frameworks for analysis of policy effectiveness at different scales, to clarify the prospects for multi-level governance. At the same time, it should be possible to adjust policy instruments to circumvent barriers to their effectiveness in a given sub-national setting. However, this first entails that instruments possess the necessary flexibility in their legislative formulation and procedural characteristics to permit differential implementation in different local settings.

Box 3: REDD+ from global to local scales (and back again)

A good example of this multi-scale analysis refers to the appraisal of appropriate instruments to combat deforestation. At a global level, parties to the climate accords have agreed that reduced deforestation is an important part of efforts to mitigate carbon emissions, and individual states have made commitments to achieve certain targets in a tangible time frame. Mechanisms for transfer of resources to reward those parties which have shown progress toward these targets have been established on a pilot basis, and financing committed by selected donors. At a national level in countries such as Brazil and Costa Rica, beyond the commitments in international forums, strategies for REDD+ have been enunciated and, where not already in place, new legal frameworks proposed. A mix of policy instruments has been put into play to contribute toward the overall framework addressed in national strategy, including a combination of command and control (zoning, land use restrictions) and incentives (payments for environmental services, subsidized credit for best practices, etc.). Revenue generation instruments or budget allocations to finance such actions are adopted. At a state and local level, however, these instruments must be adjusted to subnational implementation capacity, including enforcement powers to make land use codes stick, as well as means to monitor actual deforestation processes to withhold payments or incentives from those who have not complied (unless the instruments for avoided deforestation are to be considered simply entitlements such as the "*bolsa floresta*"). A combination of political will, stakeholder engagement and procedural justice, and the right fit of instruments in the toolbox to suit local perceptions of rights and responsibilities can then emerge.

But it is conceivable that despite all good intentions and rational instrument design starting at the global level, the sharing of benefits among land users is not perceived as equitable. Nor are the instruments necessarily capable of going beyond what proprietors were already doing given the relative prices prevailing for e.g. beef, soybeans or coffee. Deforestation rates may be changing for reasons unrelated to the effectiveness of policy instruments, or may be associated more with progress on resolving tenure disputes than with opportunity costs. This reality check at the scale of local implementation is then needed to feed back up to the state and national level, to seek means to adjust the mix of instruments at the disposal of managers.

On examination of the multi-scale analyses being addressed by the POLICYMIX project case studies, we discern the following strategy for policy assessment. In the first place, all case studies have both a national and local or subnational component for addressing policy frameworks and their respective implementation (sometimes the same instrument/policy mix is assessed at different levels). This course grain/fine grain perspective is pursued regardless of whether the specific policy mix under consideration is being assessed from an *ex ante* or *ex post* perspective. Secondly, all case studies consider the interplay between the national or international enabling framework and local or subnational implementation as one of the bases for assessment of efficacy of instruments whether stand alone or in a mix.

For example, in the cases under study in Finland and Norway of ecosystem services incentives to private landowners, the enabling fiscal framework is established by EU and national directives, but their effectiveness depends on the willingness of private landowners to dedicate forests in perpetuity to conservation purposes. In different sociocultural contexts, the response to voluntary contracts depends on the extent to which local norms and customs favour preservation of natural values (since CAP or PES compensation amounts address opportunity costs). In contrast, land banking arrangements under trial within the Brazilian Forest Code revision will likely have distinct results should the national framework provide for fungibility of legal reserves at a biome rather than watershed level. In this policy setting, the biome refers to general characteristics at a multi-state scale, such as the Mata Atlântica or Amazon forest as a whole while basin level refers to watersheds whose characteristics are more uniform and where trades would imply lesser biodiversity loss. Tradable development rights would then gravitate to those lands attributed with lower value for agriculture, leaving high intensity agricultures occupying a greater share of land than would be beneficial for ecosystem services and biodiversity conservation at a fine grain level.

Ecological fiscal transfers (EFT), in the form enacted in Brazil (as distinct from the Portuguese case), permit states to adapt their own weighting schemes to the allocation of a similar proportionate share of value added revenues. Some states have given equal or greater emphasis in these weights to improvement of performance on basic sanitation investment and water quality indices than to biodiversity conservation, which reflect state and local spending priorities. The result may therefore be a lesser overall stimulus by the instrument toward biodiversity conservation. The feasibility and potential effectiveness of introducing additional economic instruments in the local mix, or adjusting EFT weighting criteria as proposed in Mato Grosso to reflect avoided deforestation on private lands licensed for environmental quality characteristics, will very likely reflect similar priorities. These priorities can be evaluated in fine grain-/state-to-municipal level case study analysis. In Portugal, in contrast, EFT are decided at the national level, as part of the total transfers from central government to the local authorities, independent of local conditions and the natural values present. However, the effectiveness of this incentive at the local level (municipalities) depends on several aspects, like the dependence on fiscal transfers, the proportion of total municipal area dedicated to designated conservation areas, local development pressures and the role of other instruments, among others. It is important to be attentive to these aspects in the analysis and to study potential adjustments in the incentive to specific local conditions and means to attend to ecological quality criteria.

These were just a few exemplary thoughts relating to the instruments under investigation in some of the POLICYMIX case studies. It will be the task of WP8 to develop a framework and guidelines to conduct integrated multi-scale policy assessments and conduct a comparative analysis of policy mix experiences across countries to identify important lessons for the transferability of instruments.

7   The way forward

This Technical Brief summarised the main lessons learned from POLICYMIX Report No. 2 "Instrument mixes for Biodiversity Policies". We provided a first, pragmatic working definition of what constitutes a policy mix in the context of our project, proposed a two pathways and three step POLICYMIX framework for assessing instruments in policy mixes for biodiversity and ecosystem governance, followed by the presentation of methodological approaches to empirically assess instruments in such policy mixes in the POLICYMIX case studies. Last, but not least we stressed the importance of examining different levels of government, as well as spheres of governance when analysing instruments in policy mixes.

A few issues for further work and reflection as the project moves into case studies are discussed below.

The evaluation of the role of an instrument in step 2 in the POLICYMIX framework needs to be defined in relation to specific policy outcomes. Whether economic instruments have a formally specified objective or not, the aim of step 3 is to evaluate the hypothesis ex ante or ex post that the instrument has a conservation incentive effect. This means that the two steps of analysis should converge, but from different starting points.

Further guidelines and examples are needed for how to go about a functional role analysis. The functional roles discussed above – 'complementarity', 'mutual reinforcement', 'conflict', and 'sequenced' – are results of such an analysis, but we are also in need of a list of instrument characteristics that explain these roles. One avenue is to extend WP6 Guidelines, using strengths and weaknesses of instrument categories according to existing literature on policy instruments and mixes for biodiversity conservation (e.g., OECD, 1999; Gunningham and Young, 1997; Schröter-Schlaack and Ring, 2011). Another complementary approach is to evaluate whether Ostrom's institutional analysis and design (IAD) focus on the 'rules' that describe common property resource management institutions might be adapted to explain institutions at other constitutional levels, including instruments (Ostrom, 2005).

A further challenge for the case study comparability is a priori identifying other situation variables – in addition to legal and institutional context discussed above – that we expect influence the policy mix in place, and the feasibility of proposed instruments. A broad approach might select context variables from the range of resource system, resource unit, user and governance system variables suggested in Ostrom's social-ecological systems framework (Ostrom, 2007). While the framework provides a number of options for more focused analysis, it is not prescriptive in which variables to choose in which situations.

For example, Pannell (2008) framework proposes rules for choosing policy mechanisms depending on the configuration of public and private net benefits of an intervention/project at a specific location. When

private and public net benefits are heterogeneous the framework could be used as a normative approach to targeting different incentives and extension across a landscape. Further work could explore the caveats to this approach. The Pannell framework assumes that net benefits are known with certainty. In the presence of uncertainty targeting of one instrument may overlap another – does this lead to redundancy or complementarity? Does the framework apply when only partial valuation of net public benefits is possible, given large costs in valuing all ecosystem services of land-use change? What are the institutional assumptions of the "rules for choosing policy mechanisms"? Could the framework be adapted to look at combinations of instruments on the same locations? Further theoretical clarification of the 'policyscape' concept is needed and must be followed by more concrete proposals for empirical methods (Barton et al., 2011).

It follows that the selection of context variables by case studies will be based on particular theories about cause and effect in relation to conservation policy objectives. It will be hard to prescribe a common set of context variables across case studies. By identifying clusters of case studies wishing to test the same theory using the same methodology –'methodology clusters' – POLICYMIX can strive to achieve a measure of comparability, despite huge variation in context within and between Europe and Latin America. The POLICYMIX analysis framework provides a common reference for concepts in the POLICYMIX project and a basis for defining common elements that will make cross-case comparison more meaningful. It remains to be tested in the case studies.

References

Angelsen, A. with Brockhaus, M., Kanninen, M., Sills, E., Sunderlin, W. D. and Wertz-Kanounnikoff, S. (Eds.) 2009 Realising REDD+: National strategy and policy options. CIFOR, Bogor, Indonesia.

Barton, D., Primmer, E., Ring, I., Adamowicz, V., Robalino, J., Blumentratz, S., Rusch, G., 2011. Empirical analysis of policymixes in biodiversity conservation – spatially explicit 'policyscape' approaches. Paper presented at the 9th International Conference of the European Society for Ecological Economics, June 14-17, 2011, Istanbul.

Bräuer, I., Müssner, R., Marsden, K., Oosterhuis, F., Rayment, M., Miller, C., Dodoková, A., 2006. The Use of Market Incentives to Preserve Biodiversity. Ecologic, Berlin.

Bressers, H.T.A., Kuks, S.M., 2003. What does governance mean? From concept to elaboration, in: Bressers, H.T.A., Rosenbaum, W.A. (Eds.), Achieving Sustainable Development: The challenge of Governance Across Social Scales. Praeger, Westport, CT, pp. 65-88.

Bressers, H.T.A., O'Toole Jr., L.J., 2005. Instrument selection and implementation in a networked context, in: Eliadis, P., Hill, M.M., Howlett, M. (Eds.), Designing Government: From Instruments to Governance. McGill-Queen's University Press, Montreal, pp. 132-153.

Brouwer, R., Oosterhuis, F.H., Ansink, J.H., Barton, D.N., Lienhoop, N., 2011. Guidelines for estimating costs and benefits of policy instruments for biodiversity conservation. POLICYMIX Technical Brief (in preparation).

Chácon-Cascante, A., Robalino, J., Muñoz Brenes, C.L., Grieg-Gran, M., 2011. Reduced Emissions due to Reduced Deforestation and Forest Degradation (REDD and REDD+), in: Ring, I., Schröter-Schlaack, C. (Eds.), Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 145-161.

Doremus, H., 2003. A policy portfolio approach to biodiversity protection on private lands. Environmental Science & Policy 6, 217-232.

EEA (European Environment Agency), 2006. Using the market for cost-effective environmental policy. Market-based instruments in Europe. EEA Report No. 1/2006, Copenhagen.

Flanagan, K., Uyarra, E., Laranja, M., 2010. The 'policy mix' for innovation: rethinking innovation policy in a multi-level, multi-actor context. Manchester Business School Working Paper 599, Manchester.

Gunningham, N., Grabosky, P., 1998. Smart Regulation: Designing Environmental Policy. Oxford University Press, New York.

Gunningham, N., Sinclair, D., 1998. Designing Environmental Policy, in: Gunningham, N., Grabosky, P. (Eds.), Smart Regulation: Designing Environmental Policy. Oxford University Press, New York, pp. 375-453.

Gunningham, N., Sinclair, D., 1999. Regulatory Pluralism: Designing Policy Mixes for Environmental Protection. Law & Policy 21, 49-76.

Gunningham, N., Young, M.D., 1997. Toward Optimal Environmental Policy: The Case of Biodiversity Conservation. Ecology Law Quarterly 24, 243-298.

Grieg-Gran, M., Porras, I., Paloniemi, R., Ludwig, G., Svarstad, H., Ibrahim, M., 2011. POLICYMIX WP5 Guidelines for Assessing Social Impacts and Legitimacy in Conservation. POLICYMIX Technical Brief No. 1, available at http://policymix.nina.no

Kaechele, K., May, P., Primmer, E., Ludwig, G., 2011. Forest Certification: A Voluntary Instrument for Environmental Governance, in: Ring, I., Schröter-Schlaack, C. (Eds.), Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 162-174.

McNeely, J.A., 1988. Economics and Biological Diversity: Developing and Using Economic Incentives to Conserve Biological Resources. IUCN, Gland, Switzerland.

OECD, 1999. Handbook of Incentive Measures for Biodiversity. OECD, Paris.

OECD, 2007. Instrument Mixes for Environmental Policy. OECD, Paris.

Oosterhuis, F., 2011. Tax Reliefs for Biodiversity Conservation, in: Ring, I., Schröter-Schlaack, C. (Eds.), Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 89-97.

Ostrom, E., 1990. Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press, Cambridge.

Ostrom, E. (Ed.) 2005. Understanding Institutional Diversity. Princeton University Press, Princeton, NJ.

Ostrom, E. (2007). A diagnostic approach for going beyond panaceas. PNAS 104(39): 15181-15187.

Ostrom, E., 2009. Beyond Markets and States: Polycentric Governance of Complex Economic Systems, Nobel Prize Lecture, December 8, 2009.

Pannell, D.J. 2008. Public benefits, private benefits, and policy mechanism choice for land-use change for environmental benefits. Land Economics 84(2): 225-240.

Porras, I., Chacón-Cascante, A., Robalino, J., Oosterhuis, F., 2011. PES and other Economic Beasts: Assessing PES within a Policy Mix in Conservation, in: Ring, I., Schröter-Schlaack, C. (Eds.), Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 119-144.

Primmer, E., Similä, J., Barton, D.N., Schröter-Schlaack, C., 2011. POLICYMIX WP6.1 Guidelines for the analysis of institutions shaping biodiversity policy instrument applicability. POLICYMIX Technical Brief No. 2, available at http://policymix.nina.no

Ring, I., Drechsler, M., van Teeffelen, A.J.A., Irawan, S., Venter, O., 2010. Biodiversity conservation and climate mitigation: what role can economic instruments play? Current Opinion in Environmental Sustainability 2, 50-58.

Ring, I., May, P., Loureiro, W., Santos, R., Antunes, P., Clemente, P., 2011. Ecological fiscal transfers, in: Ring, I., Schröter-Schlaack, C. (Eds.), Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 98-118.

Ring, I., Schröter-Schlaack, C. (Eds.) 2011. Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, available at http://www.policymix.nina.no

Ring, I., Schröter-Schlaack, C., 2011. Justifying and assessing policy mixes for biodiversity and ecosystem governance, in: Ring, I., Schröter-Schlaack, C. (Eds.), Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 14-35.

Rusch, G.M., DeClerck, F.A.J., Barton, D.N., Vivan, J., Blumentrath, S., Punttila, P., Klenke, R., Sobrinho, R.P., 2011. WP3 Policy outcomes: A guideline to assess biodiversity conservation and ecosystem services provision gains. POLICYMIX Technical Brief No. 3, available at http://policymix.nina.no

Santos, R., Clemente, P., Antunes, P., Schröter-Schlaack, C., Ring, I., 2011. Offsets, habitat banking and tradable permits for biodiversity conservation, in: Ring, I., Schröter-Schlaack, C. (Eds.) (2011): Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 59-88.

Schröter-Schlaack, C., Blumentrath, S., 2011. Direct Regulation for Biodiversity Conservation, in: Ring, I., Schröter-Schlaack, C. (Eds.), Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 36-58.

Schröter-Schlaack, C., Ring, I., 2011. Towards a framework for assessing instruments in policy mixes for biodiversity and ecosystem governance, in: Ring, I., Schröter-Schlaack, C. (Eds.), Instrument Mixes for Biodiversity Policies. POLICYMIX Report No. 2/2011, pp. 175-208.

Sorrell, S. (Ed.) 2003. Interaction in EU climate policy, Final Report, Project No.: EVK2-CT-2000-0067. University of Sussex, Sussex.

TEEB (The Economics of Ecosystems and Biodiversity), 2010a. Mainstreaming the Economics of Nature. A Synthesis of the Approach, Conclusions and Recommendations of TEEB. Available at www.teebweb.org, accessed 18 February 2011.

TEEB (The Economics of Ecosystems and Biodiversity), 2010b. The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations. Edited by P. Kumar. Earthscan, London.

TEEB (The Economics of Ecosystems and Biodiversity), 2010c. The Economics of Ecosystems and Biodiversity for Local and Regional Policy Makers. Available at www.teebweb.org, accessed 9 January 2011.

TEEB (The Economics of Ecosystems and Biodiversity), 2011. The Economics of Ecosystems and Biodiversity in National and International Policy Making. Edited by P. ten Brink. Earthscan, London.

Van Gossum, P., Arts, B., Verheyen, K., 2010. From "smart regulation" to "regulatory arrangements". Policy Sciences 43, 245-261.

Young, M.D., Gunningham, N., Elix, J., Lambert, J., Howard, B., Grabosky, P., McCrone, E., 1996. Reimbursing the future: an evaluation of motivational, voluntary, price-based, property-right, and regulatory incentives for the conservation of biodiversity. Biodiversity Series, Paper No. 9. CSIRO Division of Wildlife and Ecology, the Australian Centre for Environmental Law, and Community Solutions, Biodiversity Unit, Department of the Environment, Sport and Territories, Canberra.