

# PROJECT FINAL REPORT



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# 1 Final publishable summary report

## Executive summary

POLICYMIX is contributing to knowledge on the implementation of the EU's Biodiversity Strategy to 2020 (EC 2011). In particular POLICYMIX is conducting assessments of how economic instruments are contributing to:

- enforcing EU laws protecting birds and habitats
- maintaining and improving ecosystems
- getting farming and forestry to help improve biodiversity in the EU and Latin America
- stepping up the EU's contribution to preventing global biodiversity loss

Key findings from POLICYMIX case studies include evaluations of interactions between economic, information and regulatory based instruments and testing of impact evaluation methodologies. Highlights include policy experiences from the implementation of ecological fiscal transfers, agro-environmental measures and payments for ecosystem services in Europe, Brazil and Costa Rica. Broadly speaking, we find that economic instruments need a regulatory home and a family of information instruments. Policymix analysis improves our understanding of how different instruments interact with one another. For example, in Norway we find that voluntary forest conservation agreements have been highly popular among forest owners, but their targeting to forests with higher biodiversity indices can be improved. In Finland, we find that forest owners conserve forest with a mix of emotional bequest, intrinsic, ethical and entrepreneurial self-interested motives. In Portugal, we see that policy mixes can provide wider options and opportunities for decision makers to engage in conservation, but also deal with uncertainties inherent to their economic activities. In Costa Rica, we find that different protection efforts might be complementary, i.e. payments for ecosystem services increasing the effectiveness of buffer zones around protected areas. In Brazil, ecological fiscal transfers from state to municipal level offer compensation for local governments' opportunity costs of conservation. Learning from Portuguese and Brazilian experiences, our German case study has conducted an in-depth appraisal of introducing ecological fiscal transfers. More in-depth findings can be found on policymix publications pages<sup>1</sup>. POLICYMIX complements The Economics of Ecosystems and Biodiversity (TEEB) study<sup>2</sup>, in particular using valuation methods to assess how policy instruments and mixes may be designed to 'capture values'.

Policy mix design recommendations from the project will be a valuable input to the research focus on 'nature-based solutions' in HORIZON 2020. Recognising that 'win-win' solutions in social ecological systems are rare is a starting point for 'nature-based policy mix design. Further research is needed on how policy mixes should build on a multi-level and multi-actor governance perspective with due recognition of the requirements and differences of interest at different governmental levels and of different actor groups. Research on 'nature based' *policyscape* will study how differentiated targeting of the mix of policy instruments to distinct parts of the landscape can minimise conflicts between multiple environmental, social and economic objectives.

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<sup>1</sup> <http://policymix.nina.no/Publications.aspx>

<sup>2</sup> <http://www.teebweb.org/>

## Summary description of project context and objectives

### Project context

Real-life policymaking is seldom a neutral search for the optimal instrument to maximize welfare (Sterner 2003). In no other environmental policy-making field is this more true than biodiversity conservation and ecosystem services provision, due to the need to address multiple objectives in order to deal with the complexity of socio-ecological-systems. Despite this recognition, recommendations for policy mix design in the environmental field have mostly been written based with reference to specific problems, such as pollution, focusing on a limited set of policy design principles that have been amenable to economic modelling (OECD 2007): equating marginal benefit with marginal costs (cost-benefit or **efficiency** criterion), minimizing marginal costs of achieving a given policy objective (**cost-effectiveness** criterion), achieving maximum marginal benefits (**environmental effectiveness** criterion, and fair distribution based on the polluter pays principle). POLICYMIX takes an operational economic approach to policy-making as its starting point, recognizing the above mentioned criteria and considering ecological and social criteria more broadly as well as the institutional conditions for instrument selection and design. The project analyses incentive compatibility, distribution, fairness and equity concerns, administrative feasibility and flexibility.

Instead of examining economic instruments in isolation, POLICYMIX focuses its assessment on the incremental contribution of economic instruments to the existing mix of local, national and international policies for biodiversity conservation and ecosystem service provision. In this sense, POLICYMIX is an attempt to avoid partial design, or panacea (Ostrom 2007). The project conducts holistic analysis of policy mix for biodiversity conservation and ecosystem service provision. POLICYMIX takes a broad approach to the definition of “economic instruments” (see text box), recognizing that economic theory sometimes also stresses the significance of regulatory or informational instruments over economic instruments (Sterner 2003).

POLICYMIX recognizes that instruments for biodiversity conservation must be able to deal with ecological complexity directly. Management interventions in complex systems of diversity and ecosystem function interactions have unpredictable outcomes and make the efficiency criterion and related economic models harder to apply than in some other environmental fields, e.g. air and water pollution or waste management. When **uncertainty** and **risk** are considered, additional policy design criteria such as verifiability, robustness and the precautionary principle must also be considered. The provision of local and global environmental public goods from a single natural area, emphasize the importance of **multi-scale governance** systems within which economic instruments must work. Beyond a comparison of aggregate benefits and costs, political feasibility of an economic instrument depends on the **distribution** of implementation costs and benefits (and when these occur) between stakeholders. POLICYMIX recognizes that the social, institutional and economic context within which instruments are to be applied is often the most important determinant of instrument design and implementation. POLICYMIX assessment of existing economic instruments will consider case-specific stakeholder involvement and perception of fairness (equity) in both policy objectives and organizational process. With the **globalisation of markets**, most local economies must be considered as small and open. POLICYMIX recognizes that global markets (especially agricultural and credit), trade policy, international treaties and multi-lateral mechanism for addressing global ecosystem services (such as UN-REDD, GEF) imply institutional constraints and opportunities that national policy design and local implementation must consider.

### Work performed

POLICYMIX is organised in three phases. In phase I, we conducted a review of international experiences with economic instruments in

### Project objectives

1. Promote **science-policy dialogue** on the use of economic instruments in biodiversity conservation based on the use of policy assessment in collaboration with stakeholders, training and dissemination at local, national and European levels.
2. Review international experiences of most important types of **economic and command-and-control instruments** for the conservation and sustainable use of biodiversity and assess their roles in a policy mix.
3. Select indicators at the appropriate geographical and time scales to assess the **effectiveness** of economic instruments on **biodiversity conservation** and provision of **ecosystem services** against baseline **scenarios**.
4. Improve scale-appropriate **benefit transfer** methods and accounting techniques for policy implementation costs, in order to better assess foregone net benefits of policy inaction.
5. Identify social impacts and factors influencing the implementation and effectiveness of policies; including fair **distribution of impacts** among stakeholders and their participation.
6. Identify legal requirements and institutional contextual factors conditioning the implementation of **economic instruments** in the context of the existing policy mix at **different levels of government**.
7. Assess the inter-dependencies between **multiple policy impact criteria**, and the role of uncertainties due to **global change**, in constraining the selection of cost-efficient first-best combinations of policy instruments **at different levels of government**.
8. Evaluate the **transferability** of case study assessment of economic instruments at different governmental levels between **Europe and Latin America**.
9. Translate the case study results into policy and management recommendations and integrate them into a **web-based support tool kit** (POLICYMIX TOOL) to assist authorities at the European, national and local levels in policy mix assessment, design and planning.

conservation. Besides 'direct regulation' for biodiversity conservation, including e.g. protected areas, management standards in agri- and silviculture and zoning regulation by spatial planning (Schröter-Schlaack and Blumentrath 2011), the instrument reviews focused on incentive-based instruments, such as payments for environmental services at national (PES) (Porras et al. 2011) as well as international level (REDD) (Chacón-Cascante et al. 2011), ecological fiscal transfers (Ring et al. 2011), tax reliefs (Oosterhuis 2011), forest certification (Kaechele et al. 2011) and the extension of offsets in the form of mitigation and habitat banking (Santos et al. 2011). The first phase developed a 'policymix analysis framework' for assessing instruments in policy mixes for biodiversity and ecosystem governance (Schröter-Schlaack and Ring 2011). Analysis of individual instruments in their context concluded that mixing different policies for biodiversity conservation – intended or unintended – is not only a matter of fact in political reality, but can be justifiable from various non-economic perspectives.

In phase I we also developed a series of draft guidelines for evaluating the effectiveness (Rusch et al. 2011), ecosystem service benefits and costs (Brouwer et al. 2011), social and legitimacy impacts (Grieg-Gran et al. 2011) of economic instruments in policy mixes and their institutional and legal enabling conditions (Primmer et al. 2011). Several supporting Technical Briefs and Reports addressing particular issues within the draft guidelines and providing supporting material can be reviewed at <http://policymix.nina.no/Publications.aspx> POLICYMIX work has also been discussed at a number of scientific conferences, notably ESEE 2011 in Istanbul and ISEE 2012 in Rio.

In Phase II of POLICYMIX has carried out case studies in four European and three Latin American case study sites during 2011-2013. Through a coarse grain, mainly federal/national review, followed by fine grain assessments at local level, economic instruments' roles and impacts have been assessed using the draft Guidelines. Draft findings from the case studies are reported in Fine Grain Case study reports, and subsequent to review with stakeholders, will be submitted for peer review in international journals during the final year of the project. POLICYMIX work from phase II has also been discussed at a number of scientific conferences, notably ISEE 2012 in Rio and ESEE 2013 in Lille.

In the last year of the project (Phase III) we conducted a multi-scale comparative analysis of the case studies and evaluate the policy design lessons can be drawn from case studies and the extent to which they can be transferred between Europe and Latin America. We synthesised recommendations including the design of instrument mixes, and policy assessment transferability in Policy and Technical Briefs. The POLICYMIX TOOL provides several different conceptual entry points to policy mix analysis guidelines and case studies (<http://policymix.nina.no/Polycymixtool.aspx>). The POLICYMIX TOOL also contains a POLICYSCAPE agent-based simulation model where users can experiment with different instrument mixes in a synthetic landscape. POLICYMIX work from phase III has also been discussed at a number of scientific conferences, notably ISEE 2012 in Rio, ESEE 2013 in Lille, the Trondheim Conference in 2013, as well as the POLICYMIX Final Conference 2014 in Leipzig. Two special sections/issues in international peer reviewed journals have been agreed for publication after project completion. POLICYMIX has also contributed to the Quito Dialogue on Scaling up Finance for Biodiversity under the CBD, participating in reports<sup>3</sup> evaluating innovative financial mechanisms, and assessing possible problems that could undermine achievement of the Convention's three objectives; conservation, sustainable use and sharing the benefits of genetic resources.

**Website:** <http://policymix.nina.no>

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<sup>3</sup> [http://www.dialogueseminars.net/resources/Quito/Literature/CBD-submissions/Can\\_Markets\\_Protect\\_Biodiversity.pdf](http://www.dialogueseminars.net/resources/Quito/Literature/CBD-submissions/Can_Markets_Protect_Biodiversity.pdf)

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## **Main S&T results/foregrounds**

Below we report on key findings from the different research topics by work package in POLICYMIX. We illustrate the relevance of our research results for a research agenda of 'Nature Based Solutions' in Horizon 2020.

Definitions of nature-based solutions in a future research agenda are still being developed by the European Commission, but proposed definitions include:

- "Win-win sustainability measures meeting simultaneously environmental, social and economic objectives.
- Inspired by nature, use nature or are supported by nature.
- Resilient, efficient and locally attuned solutions to societal challenges, that take into account the wider, system context while maintaining our natural capital."

## **Policy instruments and their roles in a policy mix (WP2)**

### **Main findings**

Despite the increasing use of concepts related to policy mixes, clear definitions are often lacking. Therefore, POLICYMIX defined "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." (Ring and Schröter-Schlaack 2011: p. 15). Key lessons could be drawn from the review of policy mix analysis frameworks (Ring and Schröter-Schlaack 2011, Ring and Barton forthcoming): Policy mix analysis does not primarily ask whether one instrument is more effective or efficient than another. The interesting question for policy mix analysis is on interaction between instruments and the roles, individual instruments play in a policy mix. What has been dealt with as the social, political or institutional context in earlier frameworks, seems to become a focus of analysis in later frameworks. Instrument choice and design, as well as policy mix analysis has increasingly 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. Based on the review of these frameworks and the individual policy instrument reviews on regulation and planning, offsets, tax reliefs, ecological fiscal transfers, PES, REDD+, and certification, POLICYMIX has developed a framework for assessing instruments in policy mixes for biodiversity and ecosystem governance (Schröter-Schlaack and Ring 2011, 2013). The 3-step framework guided POLICYMIX case studies in 1) ex post impact assessment of existing instruments or 2) ex ante scenario analysis of instruments to be newly introduced.

### **Future research agenda**

Multiple policy objectives require multiple instruments in policy mixes. Policy mix analysis tells us that "win-win" relationships, i.e. synergistic relationships between instruments, are but one of many relationships in real-world politics. A hypothesis of policy mixes with multiple environmental, social and economic goals is that "win-win" or synergistic relationships between instruments in relation to these goals are the exception rather than the rule. Conflicting, complementary or path-dependent functional roles of instruments in policy mixes and the need for trade-off analysis and multiple-criteria design is a much more relevant situation. However,

environmental policy analysis has thus far mostly focussed on individual instruments for achieving specific environmental objectives. Developing nature-based solutions in a sustainability context needs more studies based on an integrative analysis of various policy sectors, including those already promoting environmentally sound measures and the ones that currently are detrimental with respect to safeguarding our natural capital. Frameworks for designing and implementing such complex analyses need further development, building on earlier frameworks and the work developed by the POLICYMIX project. As nature-based solutions are highly context-related, more case studies are needed that then translate generic findings into locally and nationally adapted solutions.

## **Ecological effectiveness of policy instruments: Gains in biodiversity conservation and ecosystem services provisioning (WP3)**

### **Main findings**

POLICYMIX addressed the question of evaluating the effectiveness and cost-effectiveness of policy instruments for biodiversity conservation. The preparation of the methodological guidelines and the applications in the case studies have provided new insights about the biodiversity conservation problem, on methodological caveats, and about context factors that need to be taken into account when analysing outcomes of conservation policies. The first question we addressed was about conservation goals. All cases, at the national and local levels identified multiple conservation goals that were to a large extent vaguely defined they were seldom operationalized in terms of quantitative indicators and targets, and often indicators of function (such as habitat spatial coherence) were not considered (Rusch et al. 2011a). These deficiencies are due to incomplete information, insufficient knowledge, and to the lack of a common understanding about what is important to protect. In a validation exercise about quantitative conservation targets and the degree of protection provided by non-use and partial use areas (in Schröter et al. forthcoming), there was much uncertainty about appropriate values, particularly in the case of indicators for ecosystem service provision. POLICYMIX cases used a standardized indicator of conservation gains, an overall level of conservation target achievement as a criterion for comparing policy scenarios based on the body of theory of Systematic Conservation Planning (SCP). Since not all conservation features and targets have been made explicit, *ex-post* analysis of conservation policies may unjustly evaluate levels of target achievement. The methodology however, makes the conservation objectives explicit, and in this sense can help to raise awareness about knowledge gaps and the usefulness of more accurately defined objectives.

The analyses in several cases (Barton et al. 2013, Bernasconi et al. (forthcoming), Pinto et al. (forthcoming), Ramos et al (forthcoming), Schröter et al. (forthcoming) and Rusch et al. (2013 & 2014) using SCP tools have shown the importance to acknowledge the spatial structure of the conservation problem to assess instrument cost-effectiveness in a policy scape, i.e. how

biodiversity features are distributed, the spatial variability in conservation costs, and the different levels of threat across the landscape.

The studies that assessed the degree of co-occurrence of conservation features and ecosystem services indicate moderate overlap and demonstrate the existence of trade-offs when implementing policy instruments. Schröter et al. (forthcoming) in Norway and Ramos et al. (forthcoming) in Costa Rica, arrive to similar conclusions regarding the partial spatial overlap among different ecosystem services and biodiversity conservation priority areas. Which ecosystem services are considered seems to be important in determining the degree of spatial congruence. For instance, Schröter et al. (forthcoming) show that while priority areas for biodiversity conservation had high capacity to mitigate carbon emissions, areas with high carbon sequestration and storage capacity had low overlap with conservation priority areas.

### **Future research agenda**

The H2020 Strategy focuses on the importance of incorporating actions within the relevant sectors to achieve environmental sustainability. A conservation 'policyscape' where multiple objectives and pressures need to be addressed calls for a policy mix approach that includes instruments across sectors. Ecological effectiveness of policy mixes is achieved through a mix of policy instruments that are attuned to the heterogeneity of landscape characteristics. Instruments are selected based on locally occurring features of conservation importance, species representation and ecosystem service provision. At any particular location it is not expected that win-win solutions can be achieved because all conservation features do not occur on all land. But in the wider systems context, differentiated targeting of policy instruments to different parts of the landscape in a 'policyscape' can simultaneously achieve multiple environmental objectives.

POLICYMIX has also addressed the question of achieving multiple conservation objectives (including ecosystem services) by including actions in areas with different use intensity (Schröter et al., forthcoming), because some human induced landscapes have the capacity to provide multiple services and ensure some level of persistence of species. However, there is much uncertainty and need for research about how different land-uses (non-use areas of different size and connectivity, multiple use-service areas and areas with potential for biodiversity recovery (enhancing natural capital) and their spatial configuration affect levels of ecosystem service provision and the capacity to maintain biodiversity. Also, knowledge on which factors determine decisions about how to change unsustainable practices is very limited.

## **Economic benefits and costs of economic instruments and their implementation (WP4)**

### **Main findings**

POLICYMIX has identified and analysed key factors that drive and explain the environmental performance of existing payments for watershed services schemes, which focus either on the conservation of forested land or the re-afforestation of deforested land. We have analysed the key factors governing the economic costs of avoided deforestation in developing countries. POLICYMIX has evaluated the opportunity costs of different forest conservation instruments (PES, protected areas) as part of conservation planning analysis. We have also evaluated the influence of institutional design characteristics on the magnitude of transaction costs based on a global assessment of existing PES schemes. POLICYMIX has used choice experiments to assess and inform how effective contract design based on contract theory for agro-ecological measures depends on (1) design characteristics, (2) location characteristics, and (3) farmer characteristics in the Netherlands, Germany and Portugal.

A concise set of guidelines was developed to estimate the economic value of employing economic instruments as part of a policy mix for biodiversity conservation and ecosystem service provision. The main challenge here is twofold. First, to identify and isolate the welfare impacts of an economic instrument in a mix of policy instruments, and second to relate the impact on biodiversity and the ecosystem services involved. A considerable literature exists focusing on the economic value of biodiversity conservation. The value added of the work done in POLICYMIX is found in the assessment of the economic value of biodiversity conservation directly linked to the use of economic instruments and their impacts on ecosystem services. In this context, valuation methods are used principally for the evaluation of instrument characteristics, and in second place for valuation since by varying the institutional framing the value is expected to vary. The POLICYMIX approach differs in this way from TEEB, which focused primarily on ecosystems and their valuation. The focus of WP4 was on the assessment of the value added created by the use of economic instruments in biodiversity conservation and related ecosystem service provision.

The guidelines for assessing costs and benefits of a biodiversity policy mix as developed in WP4 have been applied in several of the POLICYMIX case studies. These applications have led to new insights in, for instance, the size of transaction costs under different instrument mixes and the role of economic considerations in decision making on forest conservation and management.

### **Future research agenda**

Finding locally attuned solutions to societal challenges requires calculating both the private and public benefits and costs of landuse change. Information about the public-private net benefits ratios are used to choose the correct incentive for context, including economic, regulatory and informational instruments. Societal challenges of landuse management include opportunity costs of conservation. The capacity to differentiate the distribution of costs and benefits of landuse

change across landscapes is key to meeting social and economic objectives. Monetary valuation methods are useful in calculating compensation for private benefits foregone due to conservation in the public interest. Monetary assessment of the value of ecosystem services in systematic economic and environmental accounts provide one of several systems level indicators of the state over time of natural capital. A 'value-based policy mix' is inspired by nature because it targets instruments to promote landuse changes that provide private net benefits locally and public net benefits across the landscape. A 'nature-based policy mix' aims at achieving ecosystem services also in degraded landscapes with potential for ecosystem 're-servicing' (enhancing natural capital).

## **Social impacts of instruments and enhancing policy legitimacy (WP5)**

### **Main findings**

POLICYMIX guidelines set out a framework for assessing social impacts and legitimacy involving three interlinked elements; first, fairness of process, or procedural justice in the process of decision-making and in design and implementation; second, fairness of outcomes with regard to the distributional impacts and opportunity to participate in the incentives and benefits and third, 'sense of justice' on the part of affected stakeholders. This third element captures the idea that the criteria affected people use to evaluate the fairness of process and outcomes may differ from researcher-led criteria. These three elements may in turn affect conservation cost-effectiveness. POLICYMIX case studies have focused on different elements of the framework as the following examples illustrate. A fine grain case study of ecological fiscal transfers in Mato Grosso, Brazil, examined procedural justice issues, finding that the instrument had been introduced in a highly top-down process with little consultation or provision of information to municipalities. A case study in Costa Rica shows how the opportunity to participate in PES depends on cadastral inconsistencies and a history of overlapping and conflicting institutional objectives. It also addresses issues that affect participation in the programme and distribution of benefits. A case study in Norway has documented how perceptions of the fairness of compensation vary locally across landowners.

### **Future research agenda**

A 'nature-based' perspective is also a 'society-based' perspective when policy design recognises that human-beings have shaped the landscape, and that policy must recognise this path-dependence. Achieving biodiversity conservation and ecosystem services provision includes attuning policy mixes to societal challenges which are local and place-specific.

Horizon 2020 acknowledges the need to combine science with social awareness and responsibility, the need for fair and sustainable instruments (e.g. taxation), and the impact of macroeconomic and social imbalances on economic stability. In the area of conservation, knowledge of opportunity costs must be complemented by knowledge of local interpretations of fairness and

legitimacy of economic incentives for land use change and monetary compensation for foregone opportunities. A societal challenge is designing and implementing policies that are legitimate, fair and appeal to local 'sense of justice'.

Locally attuned policy mixes aim at enhancing local social capital as a means of maintaining and then enhancing natural capital. Information and capacity-building are key instruments in 'nature-based policyscapes' because enhancing local social capitals is a means of enhancing natural capital. 'Legitimate and fair policy mixes' take a social-ecological systems perspective, by targeting policy instruments across the landscape so as to strengthen local community capitals.

## **Institutional and legal options and constraints (WP6)**

### **Main findings**

Institutions play a crucial role in defining what new policy instruments are feasible at different levels of governance. POLICYMIX has analysed institutional conditions and constraints for designing and implementing new economic instruments at a global, national and regional level. The analyses have considered the legal, administrative and organisational aspects of introducing new instruments and paid attention to local customs and social norms. These analyses have also addressed the role of the private sector in conditioning new policies and driving instrument change.

The institutional analyses show that international institutions and national conservation policies influence each other in the way that economic instruments are developed and fitted to the pre-existing instrument mix. In addition to the technical coordination between international and national policy mechanisms, the principles by which instruments are developed are also negotiated at multiple levels. The goals of biodiversity protection and reduction of deforestation are coupled with other substantive and procedural goals, including poverty reduction, participation, fairness, efficiency and open competition (Similä and Primmer, 2012). The ways in which different governance levels interpret and interact in implementing both emerging policies like the REDD+ and established policies, such as the EU biodiversity policies, or state aid policies, eventually reformulate these policies.

In EU member states, the EU law is the key international law that creates opportunities and sets constraints for the development of national economic instruments (Klassert and Möckel, 2012; Raitanen et al., 2012; 2013). The basic notion of the biodiversity conservation policies in Europe is that there are rather few economic instruments of biodiversity policy in use either at the European or at the national level. EU biodiversity law does not forbid the member states to use economic instruments, while selecting sites for domestic conservation purposes. Some member states, like France and Finland, have used this opportunity and rely in their domestic efforts on economic instruments, whereas policy development exceeding the ambition level set by EU has been very slow particularly in eastern and southern member states (Raitanen et al., 2012).

The analyses of REDD+ show that the governance structure and the also political power structures can generate path dependency in the ways in which an internationally devised instrument applied at the

national level (May et al., 2011; Gerbera et al., 2013). Generally, governance arrangements differ in their degree of market and government involvement and control (May et al., 2011; Vatn, 2013).

POLICYMIX has found that at the national level, the pre-existing instrument mix and sequence of policies condition the establishment of new instruments (Primmer et al., 2013). The prior roles of different administrative agencies importantly define how for example payments are implemented (Robalino et al., 2011; Primmer et al., 2013). The implementation of new biodiversity policy is conditioned by professional and administrative practices, across different types of policy instruments (Primmer, 2011; Schröter-Schlaack et al., 2013; Similä et al., 2014). The policies that seemingly take effect through formal regulative institutional changes are conditioned by less explicit normative and cultural-cognitive institutions (Primmer et al., 2013; Similä et al., 2014). Norms are shared among professions, within organisations and in networks (Primmer, 2011). Administrative and professional rigidities can be broken with a light policy experiment, but for longer term governance development, radical institutional changes are necessary. Norms influence the behavior of the ground as well. The case study in Finland found that social and moral norms for conservation among forest-owners were negatively related to conservation contracting (Primmer et al., 2014).

### **Future research agenda**

Regulations and incentives should harness the privately held and socially carried norms that favour biodiversity conservation and sustainable use of ecosystem services. The opportunities to build new policies should be identified with a systematic analysis of the institutional context where the policies would be fitted. The analysis should pay attention to the multilevel character of governance where different institutions are in constant interplay.

Institutional analysis will be required to identify the beneficiaries and losers of new policies, as it pays explicit attention to the different types of rights held by ecosystem service providers, users and managers. The rights of private sector actors operating in the market should be analysed in parallel with those of public sector actors and various intermediaries establishing new rules, implementing policies and brokering knowledge.

The sector specific administrative and organizational practices are well understood outside biodiversity conservation and ecosystem service research. It is high time the conservation agenda makes use of the range of governance studies and approaches in other areas of environmental governance and e.g., agricultural policy, forest policy and business management. The new knowledge systems developed at a high rate should be coupled with empirical analyses of the practices of administrations and corporations as well as managers and resource users.

Incentives for voluntary conservation are a necessary, but not sufficient part of policy mixes for biodiversity conservation and ecosystem services provision. Incentives for landuse management should include economic instruments where they can complement or act in synergy with institutions that are already in place.

A 'nature-based policy development' has a systems perspective because it recognises that an institutional history has shaped and been shaped by a changing landscape and its landusers.

‘Nature-based policy development’ targets (economic) instruments with the aim of complementing and acting in synergy with regulatory and information instruments that are already in place. A ‘nature-based policy design’ is inspired by nature by recognising that sustainable policy instruments must evolve and adapt to the mosaic of landuse interests which are to a certain extent also conditioned by the landscape. ‘Nature-based policyscapes’ recognise that local norms vary with landusers, their dependence on land and its varying characteristics across the landscape. ‘Nature-based policy mixes’ evolve through experiment over many policy cycles in order to adapt to and be adopted by existing institutions.

## **Case studies (WP7)**

The Following provides an overview of the scientific peer review publications and conference papers from the POLICYMIX case studies. These publications and papers provide a brief summary of the results achieved by the case studies within the time frame of the project. Further scientific publications planned for publication after the formal end of the project are shown under WP9 below. For each case study we discuss potential for future research in each case study to follow up POLICYMIX.

### **Norway**

#### **Main findings**

The Norwegian case analyses was geographically located in South- Central Norway, where the richest forest areas currently falling short on biodiversity conservation objectives, are located (see map below). The coarse grain analysis first studied the current biodiversity status in major forest types, biodiversity objectives and conservation goals, and pointed out gaps between ambition and current practice and trends. Further, the case reviewed in particular the voluntary forest conservation program, a PES-like instrument currently the main vehicle for forest conservation in Norway, in combination with direct regulatory and other instruments affecting biodiversity in forests. Potential new instruments briefly reviewed included subsidy reform, ecological fiscal transfers, procurement auctions and biodiversity offsets. Based on this, the fine grain analysis focused on two closely related themes: (1) Spatial analysis of current policy instruments, and (2) Forest owner and public preferences for further (voluntary) forest conservation. The first theme analyses closely how different instruments interact and overlap in the landscape (“Policyscape”), and how to locate areas with both low opportunity costs and relatively high biodiversity values. These would be areas giving the most biodiversity for the buck. The second theme analyses what compensation levels, and other incentives, are required to enroll sufficient forest areas into the voluntary forest conservation program to achieve conservation objectives. Further, it discusses which level of conservation would be socially efficient given costs and benefits. The case provides important findings for improving current and future conservation policies in terms of effectiveness, efficiency, equity and wider legitimacy.

## **Future research agenda**

Further comparative study of different potential sources for forest conservation financing is of interest for further research. Norway has a unique instrument among the case studies in its Forest Fund, which taxes timber sales, the proceeds of which are kept in escrow for the specific forest owner to invest in replanting, infrastructure and forest inventoring. The extent to which such an approach could work in Latin American countries would be of interest, given the continued struggle to identify sources of funding for PES.

The Ministry of Environment halted further applications for voluntary conservation in 2013 and has proposed a budget freeze for 2014 for voluntary conservation. Forest owner association claims that an additional 150 million NOK would be needed to address the backlog of applications from forest owners interested in voluntary conservation. Additional taxation of timber sales for the purposes of financing voluntary conservation could be explored further (pers.com. Arild Vatn).

Currently, biodiversity offsetting is practiced implicitly as part of forest certification, whereby important woodland habitats (IWH) found on highly productive forest land may be dropped in favour of compensating set-asides of IWH in economically marginal forest within the same property. The norm is that landowners should not be required to set aside more than a total of 1% of productive forest. Further research on this implicit set-aside/off-setting practice, compared to a formalised biodiversity offsetting scheme that took advantage of biodiversity and opportunity cost differentials across forest owners could be explored further with the NFI data already available (provided IWH data can be supplemented to this).

After several decades of publicly initiated protected areas, the Norwegian government has experienced a large demand for voluntary forest conservation by forest owners; so much so that the funds are oversubscribed. The funding of the programme has been subject to year-to-year variations from relatively low levels due to political and other factors. Lessons could be learned from other case studies such as Costa Rica on how to earmark public funding for voluntary conservation to achieve more conservation for lower budgets.

## **Germany**

The following publications and papers provide a brief overview of the results achieved by the German case study during the formal duration of the project.

### **Main findings**

The German case study looked at two promising instruments to complement the policy mix for biodiversity and forest conservation. Firstly, we explored from an ex ante-perspective the potential of integrating ecological indicators in intergovernmental fiscal transfers (EFT) at federal level in Germany; and secondly, we studied in depth the conditions required to encourage

farmers to enroll in PES for afforestation as part of agri-environmental measures (AEM) and thus contribute to the aim to increase forest cover in regions with particularly low shares of forest, such as West Saxony.

Research on EFT focussed on 1) the creation of sound ecological indicators capable of representing the differences in conservation activities among German states, 2) options for their integration into the existing fiscal transfer scheme, and 3) simulation of ecological fiscal transfers as proposed to showcase potential distribution results. Depending on the indicators chosen, ecological fiscal transfers may also facilitate indirect conservation measures such as avoiding further fragmentation of landscapes by traffic infrastructure development or patchy settlement expansion. Furthermore, ecological fiscal transfers may provide the funds necessary to equip support programmes for conservation activities by private land users. From an institutional perspective it is also important to note that implementing ecological fiscal transfers at state level may also provide an impetus for introducing ecological indicators at other levels of intergovernmental transfers, e.g. fiscal equalisation at municipal level, thereby boosting impacts resulting from ecological fiscal transfers at state level. Ecological fiscal transfers build on existing protected area regulation in that they use officially designated protected areas as an indicator to allocate fiscal transfers. Hence, they synergistically complement conservation law with an economic incentive that accounts for state conservation costs and spillover benefits related to these protected areas.

Regarding agri-environmental measures we explore the conditions under which German landowners in regions with limited forest cover would be willing to afforest. We assessed the demand for different contract alternatives and thereby identify the institutional-economic aspects that hamper and/or motivate landowners' to enrol in afforestation schemes. While there is no interest in the existing agri-environmental measure (AEM) for afforestation, a choice experiment reveals considerable interest in afforestation among farmers. According to the CE and qualitative interviews, a number of contract design features other than money are important. Most of these features could be introduced at relatively low cost, thus increasing the efficiency of the scheme. Agri-environmental measures are the only incentive-based policy instrument for afforestation in Saxony, but do not receive attention by landowners. Various other regulatory instruments are in place, but do not lead to afforestation either. AEM are not in conflict with other environmental schemes available to farmers, but the sheer amount of funding opportunities make the AEM less predominant and attractive. We also look at how a new design of the AEM would conform with other policy instruments, such as forest law.

### **Future research agenda**

Building on the work on ecological fiscal transfers (EFT) at state level in Germany done in POLICYMIX, future research may focus on two strands to further promote the concept in Germany. A first research avenue will lead to the identification of additional indicators to measure conservation performance of German states and their use in modelling EFT. Such

indicators may come from, e.g. Germany's national sustainability strategy or Germany's national biodiversity strategy. Moreover, another interesting link to be explored is using ecosystem service indicators currently developed in the course of Germany's contribution towards the European MAES (Mapping and Assessing Ecosystem Services) process. A second research avenue points towards the analysis of different approaches to integrate ecological indicators into the existing fiscal transfer scheme. POLICYMIX research has focused on the most obvious option that is currently used to adjust population-based distribution of fiscal transfers for structural differences in per capita fiscal needs. Nevertheless, there is a range of other options, with some of them being perhaps more suitable to address challenges of biodiversity conservation at state level. Developing and modelling a range of different approaches to integrate a variety of ecological indicators will help raising awareness for this innovative policy mix approach via the ongoing national TEEB-study in Germany, "Naturkapital Deutschland – TEEB DE" (see <http://www.naturkapital-teeb.de/en/about-teeb-de/overview.html>), coordinated by UFZ.

Future research on forest increase is of interest since the failure to reach afforestation aims in forest-scarce areas (e.g. West Saxony) is an ongoing issue among policy-makers and administrators. An exploration of the public demand for more ecological forest would be a useful addition to the investigation of the contract conditions most favoured by landowners. This would provide policy-makers with 1) additional information as to how to adjust existing afforestation schemes and 2) justify additional spending on compensation payments to landowners. One of the main findings of our research on the agri-environmental scheme for afforestation was that farmers very much value the opportunity to return to other land uses after the afforestation contract ends. This finding clashes with forest law prohibiting forests to be cut. Since flexibility in changing land uses would significantly increase the likelihood that landowners enrol in the afforestation scheme, it would be worthwhile to look into the transaction costs that would arise from changing forest law.

## **Portugal**

### **Main findings**

The analysis of the Portuguese conservation policy mix focused on two particular economic instruments: agri-environmental measures (AEM), which are financial incentives designed to encourage farmers to protect the environment on their farmland (specifically directed to private actors); and Ecological Fiscal Transfers (EFT), which since 2007 integrate the annual transfers from the national general budget to the municipalities in order to compensate them for land-use restrictions imposed by protected areas (specifically directed to local public actors).

The effectiveness of EFT is difficult to assess due to the changes that were simultaneously introduced in other funds and allocation criteria in the 2007 amendments of the Local Finances Law. Crossover effects that arise as a result of the different changes, the introduction of smoothing rules to avoid drastic fluctuations and the small magnitude of the ecological

component, contribute to hide the financial incentive offered to municipalities by the ecological signal. Although the ecological component positively discriminates municipalities with high percentages of classified areas, its introduction was not sufficient to counterbalance other effects and to provide a greater incentive to those municipalities with a larger proportion of conservation areas. Another important conclusion is that the current ecological criterion used for fund allocation, based on a single indicator - quantity of classified areas - does not compensate all municipalities that may have a positive contribution to the protection and conservation of biodiversity and ES.

The implementation levels of agri-environmental measures in Portugal are far from the established targets, both in number of contracts and committed area. The ProDer program defined indicators to assess environmental impacts of existing AEM, however, the data available has not allowed yet the assessment of AEM outcomes. A case study approach allowed a more thorough analysis of the instruments in conservation mix, particularly, on AEM implementation and the underlying causes for its success or failure. In a selected area, the Left Margin of Guadiana River in the southeast of Portugal, AEM followed the national trend of low implementation levels. The Integrated Territorial Interventions (ITI), an innovative measure using a local-based approach to address Moura Mourão Barrancos Natura 2000 area, had only four applications submitted, which are still to be implemented, no positive impacts are therefore expected. Four main factors explain this outcome: low incentives, poor participation of relevant stakeholders in the decision making process, lack of information provided to farmers and constraining institutions.

The review of the current ProDer program in 2015 provides an opportunity for improving ITI design. Research then focused on contributing to improve this measure, using site selection models for AEM spatial targeting and choice experiment to assess the terms and conditions under which farmers were willing to enter into a contractual agreement with the government to maintain and enhance the *montados* ecosystem on their land. Based on the spatial distribution of the conservation features identified by the nature conservation authorities as relevant for that ecosystem (e.g. species distribution), as well as on the map of estimated opportunity costs, MARXAN with Zones provided the best set of areas to apply this measure, maximizing cost-effectiveness. The design of the choice experiment was based on existing contracts. It was found that there is interest in this type of measure inside and outside the Moura Mourão Barrancos Natura 2000 area, and there exist clear trade-offs between willingness to accept financial compensation and opportunity costs, measured through varying cattle and endemic tree density levels. Contract duration also plays a significant role. Minimum willingness to accept financial compensation for the currently fixed contract is a factor six higher than current pay-out levels.

### **Future research agenda**

1. Improving EFTs in the scope of the Green Fiscal reform

The Portuguese Ecological Fiscal Transfers scheme, a recent and innovative approach in the EU, as most EFT schemes are based on a simple set of indicators of ecological quantity, not taking into account the quality or level of protection of different categories of protected areas or the ecological goods and services provided by areas not included in nature conservation networks. In the scope of the Green Fiscal reform currently debated in Portugal, EFTs can be reinforced and upgraded, namely by introducing changes to the indicators used for resource allocation (e.g. ecological quality or ecosystem services provision) to improve the effectiveness of the scheme, as well as its performance regarding other relevant policy instruments. Lessons can be learned from the Brazilian experience (ICMS-Ecológico) where some states have already introduced ecological quality indicators.

## 2. Improving AEM for the next ProDer

Consistently implemented in Portugal for the last decades, agri-environmental schemes currently provide measures targeting biodiversity conservation, using both national and local based approaches. Participation and outcomes of such measures, still limited, can be improved through further research on instrument's design (e.g. compensation levels and restrictions imposed to landowner) and its spatial targeting. This work can support policy makers in revising the measures for the new Portuguese rural development program (to be implemented in 2015), to compensate landowners for the opportunity costs while ensuring an effective protection and maintenance of biodiversity and ecosystem services.

## 3. Linking the policymix

In Portugal the policy instruments acting in the conservation mix have been traditionally implemented with little integration and linkages between them. In this context, promoting the articulation and alignment of incentives between local public and private actors, through ecological fiscal transfers and agri-environmental schemes, respectively, can increase effectiveness of the policy mix and provide a new spirit of collaboration and partnership between two main actor groups that influence the success of biodiversity conservation.

# Finland

## Main findings

The Finnish case study has analysed policy instruments in a context where forest owners are relatively powerful as a collective but as individual decision-makers they are heavily reliant on expert advice (Primmer, 2011; Borg, in review). Through a governance system relying on forestry administration and professional expert services, forest owners are steered to support centrally designed policy and also law enforcement is entangled with the expert advice in the forestry administration and compliance is at a high level (Similä et al, 2014). New instruments are generally planned well in advance and their implementation is carried through the pre-existing

relatively stable governance structures. The PES system breaks the institutionalized setup where land-owners would be steered, as it places high emphasis on voluntariness. Although the change is radical in that nature conservation is marketed and made an attractive alternative for forest owners, the forestry administration and environmental administration carry out forest biodiversity conservation relying on their traditional skills and roles (Primmer et al., 2013a). Additionally, the feasibility of the policy depends on higher level regulations (Raitanen et al., 2014) and local level norms (Primmer et al., 2014).

The Finnish case study demonstrates how the policy sequence is important in conditioning the new instruments (Primmer et al., 2013). Previous policies, administrative practices and shared meanings set the scene for a new policy instrument. However, even when a new policy is introduced, its implementation rests on the administrative practices and norms (Primmer, 2011; Primmer et al., 2013; Similä et al., 2014). The policies that seemingly take effect through formal regulative institutional changes are conditioned by less explicit normative and cultural-cognitive institutions.

The different policy instruments in the current policy mix complement each other by potentially attracting different types of forest-owners (Primmer et al., 2013b); more preservation oriented owners will choose a permanent private protected area and more forestry income oriented ones will choose the fixed-term PES contract. Fixed-term contracts have functioned as a gateway for forest-owners to enter a conservation contract, attracting them to consider also permanent conservation. The conservation programmes preceding the METSO era provide motivation for taking up less restrictive instruments, by posing a regulatory threat (Primmer et al., 2013a).

To further analyse the interaction between the different instruments, the case study conducted a spatially referenced multi-criteria analysis (MCA) of policy instrument mix scenarios (Sironen et al., manuscript). The analysed instrument mixes constructed with stakeholders representing multiple governance levels were realistic extensions of the current forest biodiversity conservation instrument mix in Finland. The MCA revealed only slight differences between these realistic instrument mixes when measuring the differences by aggregated total utility indices. The analysis of the coherence of the instruments enhancing forest climate change mitigating ecosystem services showed that instruments with seemingly similar general aims also contribute to tradeoffs and are not in coherence (Makkonen et al., submitted).

### **Future research agenda**

Looking to the future research agenda, the policies for enhancing biodiversity conservation, ecosystem service provision and green economy in industrial countries with strong natural resource dependence and land-owner advocacies should be analysed with a special focus on how different actors and politics contribute to trade-offs and incoherence in policies. This is particularly important for understanding and governing the emergence of new uses for forest biomass for energy and new products as well as new ways of perceiving the immaterial benefits

of forest nature. To support a sustainable transition to green economy, policy should be based on an understanding of which uses are in conflict and who have the rights to those uses. To serve this end, the existing rights to ecosystem benefits that can be identified should be analysed so that the new benefits are identified, extracted and reallocated in an informed fashion.

## **Costa Rica**

### **Main findings**

The Costa Rican case study focused in Hojancha, a region located in the Nicoya Peninsula, in the northwestern are of Costa Rica. The region comprises dry and moist forest ecosystems, the latter is considered one of the most threatened forests in the world. In Central America cover loss of this ecosystem is evident, only 1.7% of its original extent currently remains.

The case study contributed to fulfill some of the research gaps related to effectiveness, cost efficiency and legitimacy of the PES program, given special attention to its interactions with other existing instruments. The case study contemplated several research questions in topics related to opportunity and transaction cost modeling (cost efficiency); path dependency of the development and evolution of the PES program and instrument design (social and political legitimacy); and, ecological effectiveness of the program. Besides PES, three more policy instruments were included in the analysis: certification, protected areas and Forest Law.

The analysis of transaction and compliance cost relative to the payment level of PSA indicate that reforestation contracts have on average transaction and compliance costs of 91,8% in total. This suggests that PES payments for reforestation are quite well calibrated as compensation for the additional costs of participation. In terms of financial incentives 'PES for reforestation' is similar to a forestry subsidy, with little additional payment for any provision of ecosystem services. Expected plantation timber sales are meant to cover opportunity costs of alternative land-uses. The transaction and compliance costs of forest protection contracts were on average of 24,2% of the PSA payment. In this case payments are (partial) compensation for opportunity costs of alternative land-uses and therefore, compensate landowners for cover at least part of the ecosystems provided. Differences in transaction and compliance costs between forest conservation and reforestation incentives suggest that it is useful to distinguish deforestation and reforestation incentives in the public private benefits approach we used to frame the analysis of transaction costs. instruments were assessed: protected areas, forest certification and direct regulations.

Evaluation of socio-economic impact of reforestation and forest plantations show no socio-economic impact of PES on socio economic indicators, which goes in line with previous findings. We claim for a better social targeting based on farm wealth would perform better in terms of poverty reduction as it would increase the likelihood of less well-endowed farmers to enrol in the programme.

Analysis of instrument interaction makes evident that Costa Rica's biodiversity conservations and ecosystem services (ES) provision instruments indeed interact in many ways. Some of these interactions are regarded as complementary while other are self-defeating. From the analysis of the interaction between PES and protected areas, it was concluded that both instruments are perfect substitutes. This because their effectiveness levels, measured as avoided deforestation, decrease when both instruments

are placed together. Contrary to this, analysis of the interaction between PES and forest law (ban on forest land use change) shows how a ban on forest conversion, along with incentives can be interpreted as synergistic with PES, rather than redundant or conflicting.

The following publications and papers provide a brief overview of the results achieved by the Costa Rican case study during the formal duration of the project.

### **Future research agenda**

Future research should make emphasis on the interaction between different policy instruments. The Costa Rican case study focused on the interaction between protected areas and PES. Interaction between other instruments was not deeply evaluated. This analysis is important to ensure cost efficiency of the different instruments.

## **São Paulo, Brazil**

### **Main Findings**

Our study in São Paulo State confirmed the important role that Trade Development Rights (TDR) can play in the policy-mix for conservation. The ex-ante analysis performed showed potential for cost-effectiveness of TDR instrument. There was a very high potential to both reduce the compliance costs and improve the ecological effectiveness of the Forest Reserve compliance. The analysis was conducted at State scale due to the methodological challenge in addressing the impact of an economic instrument that involves trade at this wide scale. As for the local analysis in the Cantareira Mantiqueira Corridor Region, our fine grain study has indicated that this region presents a unique case within the whole state of São Paulo for a classic Payment for Ecosystem Services (PES) scheme: (i) on the one hand a high priced ecosystem service to be provided by forest recovery at a low opportunity cost, fresh water for the macro-metropolitan region of São Paulo and Campinas and, (ii) a huge market for it, where previous studies already revealed a willingness to pay up to four dollars per month per household during ten years, which is significant. However, these pre-requisites do not seem to be sufficient for an effective PES in this region. Our study has indicated some bottlenecks that should be addressed in order to facilitate policy implementation in this region: (i) high level of economic heterogeneity among farmers; (ii) overlapping of institutions working on the region; (iii) lack of consensus among stakeholders about the best way to cope with their environmental problems. This apparent paradox underpins one important point raised during the POLICYMIX project: single economic instruments should not be considered panaceas, and even when one can verify the existence of pre-conditions prescribed by the conventional literature (mainly the orthodox economic theory on PES) the actual implementation requires a much more complex scientific and policy dialogue among experts and stakeholders.

## **Future research agenda**

Regarding a future research agenda, POLICYMIX has indicated the need for further study in the Corridor Cantareira-Mantiqueira region. The main question to be answered is as follows: despite the ideal conditions for the implementation of a policy of PES, why has such a policy not been effective in this region? The São Paulo metropolitan region is experiencing an inadequate and insufficient water supply. This situation has been caused by the loss of water-related ecosystem services. In this context, a natural follow-up for FUNDAG's team is to develop further and deeper studies in this region in order to provide inputs for the implementation of effective environmental policies to ensure the ecosystem services provision. Future research will also comprise adjacent regions in the São Paulo metropolitan area. As for the case of São Paulo state, FUNDAG's team will continue monitoring the market for Forest Reserves as it is foreseen by the Brazilian Forest Code. The research at the state level should focus on the ex-post analysis of ecological and economic effectiveness of TDR in São Paulo as our study has demonstrated this instrument may be suitable for wider implementation in the state.

## **Mato Grosso**

The following publications and papers provide a brief overview of the results achieved by the Mato Grosso case study during the formal duration of the project.

### **Main findings**

The Brazilian Forest Code requires that private landowners in the Amazon biome protect at least 80% of remaining forests. The same law was recently revised to permit landowners within the same biome and state to trade surplus or deficit reserves among themselves, through a TDR mechanism called Environmental Reserve Quotas (CRA). We found that surplus forests on lands held in Cotriguaçu, a municipality in Northwest Mato Grosso, were sufficient for all local landowners to achieve environmental compliance, thus facilitating local trades. Local governance capacity needs to be significantly enhanced so that such trading may optimise biodiversity conservation values.

The "Ecological ICMS" (ICMS-E) – a state-to-municipal level Ecological Fiscal Transfer (EFT) instrument in operation for over 20 years in Brazil – has been considered a valid instrument to promote additional conservation. However, despite contributing revenues superior to predominant forest destructive land use practices (beef cattle pastures and predatory timber extraction), the ICMS-E has not stimulated additional biodiversity protection in NW Mato Grosso. Increased protection can be attained by promoting local institutional innovation, to encourage the allocation of additional ICMS-E revenues to strengthen municipal environmental governance and proactive private land use practices in a mosaic of protected areas, indigenous reserves and productive lands.

Integrated conservation and development pilot projects (ICDPs), were implemented over a 15-year period to promote biodiversity conservation on family farms in northwest Mato Grosso. We compared forest cover dynamics among three land reform settlements in the region, which indicated that more forest area was conserved in agrarian reform settlements (landscape scale) and on individual farm lots with sustained exposure to ICDP interventions. Environmental licensing and sustainable forest product marketing outcomes supportive of local livelihoods were achieved by integrating social organization with support for material and institutional infrastructure. Agroforestry farm rents were considerably enhanced in comparison to a smallholder farm baseline of mixed beef and dairy.

Economic losses associated with spittlebugs – the primary pest affecting pasture grasses in Tropical America – seriously threaten cattle ranching profitability in the Amazon. The planned maintenance of forest patches within pasture dominant landscapes could effectively control spittlebug populations and thereby enhance farm incomes. We estimated the cost-effectiveness of biodiversity conservation strategies within the productive landscape, compared with the opportunity cost of conserving the remaining forest. It was found that biological control was optimized within a matrix including a series of forest patches of different sizes, with good connectivity to allow the movement of spittlebugs' natural enemies in the landscape.

### **Future research agenda**

Continuing research based on policy mix analysis in NW Mato Grosso and indeed Brazil as a whole will necessarily involve itself with the effectiveness of incentive elements contained or referenced within the new Brazilian Forest Code. One potentially fruitful avenue for policy simulation would focus on the implementation of the TDR mechanism on Legal Reserve transfers between properties with forest in excess of the biome-specific legal requirement, and those with a deficit, in order to achieve overall compliance in a bioregional landscape. The geographic constraints on transactions (or lack of same) will be a crucial aspect of the effectiveness of this instrument in actually generating demand. In most parts of the Amazon region, there is still sufficient intact forest to create what some have here termed “hot air” in the potential Environmental Reserve Quota market, thus deflating its value and effectiveness. Another critical aspect of the same instrument is the institutional complexity of the rules that are laid out for registration of lands available for trades, which will add multiple layers of transactions costs that could easily stifle the instrument.

The Brazilian PES law, which is still under debate in the Congress, will be another fruitful area for further comparative policy mix analysis, benefiting from the work already conducted under FP7 initiatives. An ongoing European Community – Brazil Sectoral Policy Dialog in support of PES implementation has been complemented by results of the POLICYMIX project<sup>4</sup>. Two of our

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<sup>4</sup> Santos, R., Vivan, J.L. Pagamento por serviços ecossistêmicos em perspectiva comparada: recomendações para tomada de decisão. “Diálogo Brasil-União Europeia sobre Pagamento por Serviços Ecossistêmicos”. Ministério do Meio Ambiente/ DG do Meio Ambiente da Comissão Europeia, 2012.

researchers (Jorge Vivan and Rui Santos) have made significant contributions to both processes. A large number of existing PES experiences, with little assessment of biodiversity or other ecosystem service benefits or implementation costs, would benefit from lessons learned on effectiveness, efficiency, equity and institutional outcomes for PES in the policyscape.

Finally, the global REDD+ process, that is evolving as part of the UN climate accords, is a policy arena for which a policy mix approach is increasingly demanded. Research undertaken through POLICYMIX in NW Mato Grosso contributes directly to research by CIFOR on the “3E’s” associated with REDD+ implementation (Cotriguaçu is one of CIFOR’s field sites for its Global Comparative Study on REDD+). Participants in POLICYMIX are actively pursuing further research on REDD+ implementation strategy at the municipal level in the state of Mato Grosso and the Amazon region in general, with the backdrop of the POLICYMIX framework. Effective REDD+ strategy in land reform settlements will require a combination of the lot- and landscape scale analysis conducted by Vivan et al. (2013) for POLICYMIX.

## **Multi-scale comparative case study analysis and transferability assessment of economic instruments (WP8)**

### **Main findings**

POLICYMIX has developed a comparative synthesis of the results of seven national and subnational Latin American and European case studies undertaken as part of the project, focusing on functional roles, impact evaluation and scenario analysis across the cases (steps 2 and 3 of the POLICYMIX framework). Lessons learned for design, implementation and evaluation of policy mixes associated with i) Payments for Environmental Services (PES), ii) Agro-Environmental Measures (AEM) and iii) Ecological Fiscal Transfers (EFT) have been identified and the extent to which the inherited wisdom from high-level policy analysis holds true in these cases has been analysed. We also appraised the prospects for transfer of instruments and lessons between the Latin American and European contexts.

Multiple policy objectives require multiple instruments in policy mixes, but the interactions and functional roles of economic instruments vis a vis the policy mix vary across contexts. POLICYMIX analysis tells us that “win-win” – synergistic - relationships between instruments are only one of many functional roles that they can take. A hypothesis associated with policy mixes having multiple environmental, social and economic goals is that synergistic relationships between instruments in relation to these goals are the exception rather than the rule. Conflicting functional roles of instruments and the need for trade-off analysis and multiple-criteria design is a much more observed and relevant outcome, requiring in-depth policy mix analysis.

However, in the wider nature-based systems context, differentiated targeting of policy instruments to different parts of the landscape in a ‘policyscape’ can simultaneously achieve multiple environmental objectives. The POLICYMIX framework adopted for evaluating the

functional roles of economic instruments in policy mixes, responds to different landscape characteristics. POLICYMIX has documented, for example, how the policy mix in Costa Rica has evolved to fit the landscape mosaic characteristics of different stages of the forest transition. In WP8, POLICYMIX also conducted a comparative analysis of the mix of 'rules-in-use' characterising PES in Costa Rica, Finland and Norway. We document many similarities, but significant differences that, we hypothesize, can in part be explained by the differences in land use change history. An agent-based model – policy mix tool – was developed in sequence (WP9) after the comparative analysis to demonstrate the path dependence of the polycscape on landscape characteristics.

POLICYMIX review has shown how conservation cost-effectiveness depends on perceived fairness, legitimacy and 'sense of justice' of participating landowners. A case study in Norway has documented how perceptions of the fairness of compensation vary locally across landowners. A case study in Costa Rica shows how eligibility of PES depends on cadastral inconsistencies and a history of overlapping and conflicting institutional objectives.

Experience with AEM in Portugal and Germany has not overall been favourable. AEM appear to represent a policy mix in their own right, causing additional complexity in administration. In all cases, the factors that appear most important to successful implementation of AEM include participatory design and continuous technical support to disentangle the complexity of multiple land use incentives and practices. This is particularly true in a policy environment in which changes are introduced erratically over time, and discontinuities in funding prevail, provoking uncertainty and unwillingness to adopt permanent measures. In both Germany and Portugal, the introduction of instrument modifications (e.g., contract options, spatial targeting) have the potential to make AEM both more cost effective and attractive to farmers. In Brazil, the adequate integration in a policy mix of common property forest reserves, certification and market development for non-timber forest products, including guaranteed institutional purchasing, reduced biodiversity losses significantly over regional trends

EFT experience reviewed by POLICYMIX case studies in Brazil and Portugal suggests that although this compensation can serve as a stimulus to proactive local conservation policies, a range of factors affect the expansion in the protected area system. Design of the EFT allocation system can be a point of departure for improvements in such schemes. In some cases, the quality of local productive land use management can achieve synergies with protected areas, thereby generating greater amounts in revenue sharing, in turn reinforcing proactive management efforts. However, introduction of additional criteria for distribution can face political resistance from local governments that are already losers in the initial framing of EFT allocation, and the lack of earmarking for use of additional resources can backfire when revenues are used for activities that provoke further biodiversity loss (e.g., road building in the Amazon).

## **Future research agenda**

Several topics for future research agenda on comparability of policy mixes analysis have emerged in POLICYMIX, with a relevant potential to be linked with the “nature based solutions” research concept:

The POLICYMIX approach is couched in a comparable conceptual footing, which permits suitable lessons being learned from comparison among case studies developed across different social-ecological systems that may be ripe for transfer, with the usual though necessary precautions regarding context specificity. However, the recognition that correlations between biodiversity and different ecosystem services change across social-ecological systems and their landscapes reinforces the need for more research on how differentiated targeting of policy instruments to different parts of the landscape in a ‘policyscape’ can simultaneously achieve multiple environmental objectives and find locally attuned solutions to societal challenges.

Recognising that ‘nature-based policyscapes’ are attuned to the mosaic of land use interests and landscape characteristics, recognises that the performance of economic instruments cannot be extrapolated beyond the policy mix within which it has evolved. Nevertheless, the suitability of adapting a specific instrument to a new setting can be recommended, based on the process developed for policy mix analysis, establishing the ex ante conditions for cost-effective performance in each distinct setting. Such conditions are often institutional in character, and derive from capacity to integrate and orchestrate the fit of new instruments into an existing policy mix. For example, our case studies in Portugal and Saxony focused on the replicability of the Brazilian fiscal transfer experience to their specific fiscal governance structures, and recommended that one of the principal barriers found to effectiveness of EFTs in Brazil - absence of environmental earmarking on additional funds transferred due to biodiversity criteria - be rectified as part of such schemes in other settings. It may thus be recommended that further research be conducted on the institutional conditions for transfer of policy instruments between countries.

POLICYMIX analysis recognises that institutional jurisdictions exist at varying spatial scales and are spatially overlapping. It recognises that this is a policy response to externalities which are caused by the correlations between biodiversity and ecosystem services occurring at different spatial scales. Therefore, the development of a nature-based policy mix (solutions) analysis is a promising approach to deal with multi-scale issues.

The interactions and functional roles of economic instruments vis a vis the policy mix change across contexts. (Nature-based) multi-scale policy mix analysis teaches us cautions against the transfer of win-win policy anecdotes between contexts. Yet, positive results may arise from adapting instruments to work at different scales. For example, participants in the project assessed the feasibility and necessary policy interactions associated with adapting the concept of ecological fiscal transfer from a state-to-local, to a federal-to-state scale. Future research should consider more options for scalability.

Future research on the effectiveness of PES and AEM instruments should delve further into the relationship between expected results based on the institutional dimensions of resource management derived from the IAD literature, and what is actually found to work on the ground. The hypothesis that such differences between expectations and outcomes is due to differences in the processes of land use change should be further tested in different contexts.

## **Methodological synthesis and policy recommendations (WP9)**

### **Main findings**

Policymix analysis is a stepwise structuring of information on the context, gaps, evaluation and design of conservation instruments. Policymix analysis is multiscale in nature and has the following broad characteristics:

- Is inspired by social-ecological systems variables
- ask how policies define the landscape(deductive), as well as the likelihood that landscape and landowner characteristics define the mix of policies observed in the landscape(inductive)
- provides concepts for understanding multiple overlapping jurisdictions and governance levels in the landscape and how they determine externalities
- considers the policy-cycle and causes of path-dependency of individual instruments
- aims at classifying the functional roles of instruments in the mix
- considers mixes of formal and informal rules-in-use
- considers how normative recommendations for policy design must be made specific to the landscape development context
- defines the concept of a 'policyscape' to help managers visualize spatially explicit policymixes across the landscape
- combines ex ante, in media res, and ex post empirical methods at landscape and household level
- places normative policy design recommendations in a policyscape mosaic and in a social ecological system, helping to avoid 'panacea proposals' for conservation policy

Sweeping policy conclusions across multiple economic instruments and case studies runs counter to the place-based approach of policyscape analysis. However, POLICYMIX project reviews, theoretical work and case studies have addressed a number contested policy propositions that are common in the conservation debate.

### **Proposition: combining economic instruments and other conservation policies is inefficient.**

The 'Tinbergen rule' argues for one instrument per policy objective. The spatial overlap of instruments is cited by the OECD as a potential source of inefficiency and defined as 'negative interactions'. However, instrument outcome and process legitimacy need to be evaluated together. For example, while the marginal effect of the economic instrument on conservation

outcomes at a particular site may be small payments may be necessary to increase process legitimacy and set the policy in a new path.

**Proposition: market-based instruments are more efficient than command-and-control instruments for biodiversity conservation.** International guidelines for monitoring additionality and conditionality of PES schemes are lacking, and cross case conclusions on the effectiveness of existing schemes are currently very difficult. Due to problems in demarcating biodiversity and ecosystem services into tradable commodities, costs are high to identify and enforce 'transactions' in biodiversity. Public authorities do not 'leave the problem' to markets. Market creation and regulation entail high transaction costs that are often not considered when evaluation the efficiency of offsets or PES individually.

**Proposition: payments for ecosystem services is a market-based instrument.** PES encompasses voluntary and mandatory schemes, community and individual based contracts. PES schemes are predominantly established and financed by the public sector, even more so in Europe, than in developing countries.

**Proposition: Halting biodiversity loss relies on increasing the amount of protected area and/or ensuring compliance to protection regulations.** Biodiversity and the level of ecosystem service provision is unevenly distributed in the landscape, as is the level of conflict with resource use and impact. A mix of complementary instruments is needed to address both different levels of conflict, and objectives of ecological representation and biodiversity persistence.

**Proposition: avoided deforestation is a cost-effective means to address global climate change.** Avoided deforestation is economically competitive because no new technology is required to facilitate action and opportunity costs are likely to be low since deforestation occurs mainly in tropical developing countries. However, the economic costs depend on alternative land uses, beneficiaries and cost and carbon accounting methodologies. Co-benefits like biodiversity conservation are furthermore typically excluded from economic cost estimation procedures.

To develop further policymix hypotheses POLICYMIX has developed the POLICYSCAPE agent-based model to conduct virtual experiments on the path dependence of the policyscape on landscape characteristics (<http://policymix.nina.no/Polycymixtool/Instrumentpublic-privatebenefits.aspx>).

Two special issues are planned after project final reporting May 2014 to further disseminate the project findings and support the future research agenda.

**1. Alignment of policy mixes for forest biodiversity conservation and ecosystem service provision (Eds. David N. Barton, Graciela Rusch, Irene Ring )**

The special issue will include theoretical and empirical papers on the *joint interaction of multiple policy instruments* for biodiversity conservation, with a focus on forest social-ecological systems. Theoretical papers will discuss concepts useful for structuring policy mix analysis. Empirical applications include the evaluation of instrument interactions with respect to effectiveness, efficiency and equity considerations. Papers evaluate how policy instrument interactions determine the effectiveness for biodiversity conservation and ecosystem service provision from forests. Papers also demonstrate how the social impact, fairness and legitimacy of economic instruments depend on other instruments in the policy mix. The special issue includes papers assessing how to conduct institutional analysis of individual instruments in policy mixes, in particular how institutions enable and constrain policy instrument interactions.

Accepted: Environmental Policy & Governance

**2. Spatial approaches for policy mix impact assessment (Eds. Graciela Rusch; Stefan Blumentrath, David N. Barton)**

The special issue includes theoretical and empirical papers covering various methodological approaches and criteria for the analysis of the impact of policy mixes for biodiversity and ecosystem service protection. A common theme across the studies is that they address the importance of spatially explicit analysis to assess the effectiveness of conservation policy. The studies cover themes such as spatial econometrics and matching methods (BACI-methods), spatially explicit multiple-criteria-analysis, spatially explicit agent-based models and methods for systematic conservation planning as tools for conservation policy analysis. The introductory paper will review the methods, compare them and draw lessons from the applications in the particular cases.

Accepted: AMBIO and Environmental Conservation. Also submitted to: PLoS ONE

**Future research agenda**

A future research agenda for H2020 to follow-up POLICYMIX results could be linked to the concept of a 'nature-based policyscape'. These are policy mixes that are adapted to landscape social-ecological context in a spatially explicit and complementary way. Differentiated targeting of a mix of policy instruments to different parts of the landscape aimed at optimising the trade-off between multiple environmental objectives can be defined as a 'nature-based policyscape' approach. A nature-based policyscape achieves biodiversity conservation and ecosystem service provision through policy mix design and targeting attuned to local environmental, social and economic conditions across the landscape. Policy design as part of 'nature-based solutions'

should aim for more than maintaining natural capital. Resilient, efficient and locally attuned solutions to societal challenges should aim to enhance social capital as a precondition for maintaining and then enhancing natural capital. Therefore, research on 'nature-based policyscapes' would also aim at finding ways of enhancing local social capital as a means of enhancing natural capital. This can be both empirical and experimental work.

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Ring, Irene, David N. Barton, Graciela Rusch, Peter May, Herwig Unnerstall, Rui Santos, Paula Antunes, Roy Brouwer, Maryanne Grieg-Gran, Jukka Similä, Eeva Primmer, Ademar Romeiro, Fabrice DeClerck, Muhammad Ibrahim: Assessing the role of economic instruments in a policy mix for biodiversity conservation and ecosystem services provision: A review of some methodological challenges. Paper presented at the GovernNat Conference “Governance of Natural Resources in a Multi-Level Context”, 19-22 Jan. 2010, Leipzig

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Santos, R., Antunes, P., Clemente, P., Schröter-Schlaack, C., Ring, I. (2011): Reviewing the role of offsets, habitat banking and tradable permits in conservation policies. Paper presented at the 9th International Conference of the European Society for Ecological Economics, June 14-17, 2011, Istanbul

Santos, R.; Ring, I.; Antunes, P.; Clemente, P.; Pacheco, D. (2012). Ecological fiscal transfers: the redistributive and incentive impacts of the new Portuguese Finances Law, Planet under Pressure Conference, London, March 26-29, 2012.

Santos, R., I. Ring, P. Antunes, P. Clemente, (2012). Ecological fiscal Transfers in Portugal: their role and incentive in the policy mix for biodiversity conservation - Special pre-organised Session “The role of economic instruments in the conservation policy mix”. 12th Biennial Conference of the International Society for Ecological Economics (ISEE 2012) - Ecological Economics and Rio+20 contributions and challenges for a green economy. Rio de Janeiro, Brazil, 16-19 June, 2012 in Rio de Janeiro, Brazil.

Schröter-Schlaack, C., Ring, I., Möckel, S., Schulz-Zunkel, C., Lienhoop, N., Klenke, R., Henle, K., and Lenk, T. (2012): Ecological fiscal transfers in Germany and their role in the policy mix for biodiversity conservation, Special Session on "The role of economic instruments in the conservation policy mix", June 17 2012, ISEE Conference 2012, Rio de Janeiro, Brasil

Vivan, J.L. Characterization and Potential of Environmental Services provided by Agroforestry Systems. Symposium to be held at VIII Brazilian Congress on Agroforestry (Belém, Pará, 21 to 25 November 2011).

## Discussion papers

Barton, D. N. et al. (2010) Assessing the Role of Economic Instruments in a Policy Mix for Biodiversity Conservation and Ecosystem Services Provision: A Review of Some Methodological Challenges. Discussion Paper 1-2010

## **2 Final use and dissemination**

See Deliverables D10.2.3.and D10.3.

### 3 Report on societal implications

Replies to the following questions will assist the Commission to obtain statistics and indicators on societal and socio-economic issues addressed by projects. The questions are arranged in a number of key themes. As well as producing certain statistics, the replies will also help identify those projects that have shown a real engagement with wider societal issues, and thereby identify interesting approaches to these issues and best practices. The replies for individual projects will not be made public.

#### **A General Information** *(completed automatically when Grant Agreement number is entered.*

Grant Agreement Number:

Title of Project:

Name and Title of Coordinator:

#### **B Ethics**

##### 1. Did your project undergo an Ethics Review (and/or Screening)?

\* If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports?

*No*

Special Reminder: the progress of compliance with the Ethics Review/Screening Requirements should be described in the Period/Final Project Reports under the Section 3.2.2 'Work Progress and Achievements'

##### 2. Please indicate whether your project involved any of the following issues (tick box) :

*YES*

##### RESEARCH ON HUMANS

- \* Did the project involve children?
- \* Did the project involve patients?
- \* Did the project involve persons not able to give consent?
- \* Did the project involve adult healthy volunteers?
- \* Did the project involve Human genetic material?
- Did the project involve Human biological samples?
- Did the project involve Human data collection?

##### RESEARCH ON HUMAN EMBRYO/FOETUS

- \* Did the project involve Human Embryos?
- \* Did the project involve Human Foetal Tissue / Cells?
- \* Did the project involve Human Embryonic Stem Cells (hESCs)?
- \* Did the project on human Embryonic Stem Cells involve cells in culture?
- \* Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?

##### PRIVACY

- \* Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?
- \* Did the project involve tracking the location or observation of people?

##### RESEARCH ON ANIMALS

- \* Did the project involve research on animals?
- \* Were those animals transgenic small laboratory animals?
- \* Were those animals transgenic farm animals?
- \* Were those animals cloned farm animals?
- \* Were those animals non-human primates?

<b>RESEARCH INVOLVING DEVELOPING COUNTRIES</b>	
* Did the project involve the use of local resources (genetic, animal, plant etc)?	
* Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	YES
<b>DUAL USE</b>	
• Research having direct military use	No
* Research having the potential for terrorist abuse	No

### **C Workforce Statistics**

**3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).**

<b>Type of Position</b>	<b>Number of Women</b>	<b>Number of Men</b>
Scientific Coordinator and Co-coordinators	2	1
Work package leaders	5	5
Experienced researchers (i.e. PhD holders)	16	19
PhD Students	1	3
Other (MSc Students)	5	2

<b>4. How many additional researchers (in companies and universities) were recruited specifically for this project?</b>	
Of which, indicate the number of men:	0

## D Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project?  Yes  
 No

6. Which of the following actions did you carry out and how effective were they?

	Not effective	at	all	Very effective
<input type="checkbox"/> Design and implement an equal opportunity policy			<input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	
<input type="checkbox"/> Set targets to achieve a gender balance in the workforce			<input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	
<input type="checkbox"/> Organise conferences and workshops on gender			<input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	
<input type="checkbox"/> Actions to improve work-life balance			<input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	
<input type="radio"/> Other:	<input type="text"/>			

No 7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?

Yes- please specify : research on female participation in payment for ecosystem services schemes  
 No

## E Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?

Yes- please specify

No

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?

Yes- please specify : Web-site and POLICYMIX TOOL <http://policymix.nina.no/Policymixtool.aspx>

No

## F Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

Main discipline<sup>5</sup>: ecology, economics, sociology, political science

Associated discipline<sup>5</sup>:  |  Associated discipline<sup>5</sup>:

## G Engaging with Civil society and policy makers

11a Did your project engage with societal actors beyond the research community? (if 'No', go to Question 14)  Yes  
 No

11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?

No

Yes- in determining what research should be performed

Yes - in implementing the research

Yes, in communicating /disseminating / using the results of the project

<sup>5</sup> Insert number from list below (Frascati Manual).

<b>11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?</b>	<input type="radio"/> <input checked="" type="radio"/>	Yes No
<b>12. Did you engage with government / public bodies or policy makers (including international organisations)</b>		
<input type="radio"/> No <input type="radio"/> Yes- in framing the research agenda <input type="radio"/> Yes - in implementing the research agenda <input checked="" type="radio"/> Yes, in communicating /disseminating / using the results of the project		
<b>13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?</b> <input checked="" type="radio"/> Yes – as a <b>primary</b> objective (please indicate areas below- multiple answers possible) <input type="radio"/> Yes – as a <b>secondary</b> objective (please indicate areas below - multiple answer possible) <input type="radio"/> No		
<b>13b If Yes, in which fields?</b>		
X Agriculture Audiovisual and Media Budget Competition Consumers Culture Customs X Development Economic and Monetary Affairs Education, Training, Youth Employment and Social Affairs	Energy Enlargement Enterprise X Environment External Relations External Trade Fisheries and Maritime Affairs Food Safety Foreign and Security Policy Fraud Humanitarian aid	X Human rights Information Society X Institutional affairs Internal Market Justice, freedom and security Public Health X Regional Policy Research and Innovation Space X Taxation Transport

<b>13c If Yes, at which level?</b>		
<input checked="" type="checkbox"/>	Local / regional levels	
<input checked="" type="checkbox"/>	National level	
<input checked="" type="checkbox"/>	European level	
<input checked="" type="checkbox"/>	International level	
<b>H Use and dissemination</b>		
<b>14. How many Articles were published/accepted for publication in peer-reviewed journals?</b>		18 (per 31.5.2014)
<b>To how many of these is open access<sup>6</sup> provided?</b>		
<b>How many of these are published in open access journals?</b>		<b>0</b>
<b>How many of these are published in open repositories?</b>		<b>0</b>
<b>To how many of these is open access not provided?</b>		<b>18</b>
<b>Please check all applicable reasons for not providing open access:</b>		
<input checked="" type="checkbox"/> publisher's licensing agreement would not permit publishing in a repository <input type="checkbox"/> no suitable repository available <input checked="" type="checkbox"/> no suitable open access journal available <input checked="" type="checkbox"/> no funds available to publish in an open access journal (after project completion) <input type="checkbox"/> lack of time and resources <input type="checkbox"/> lack of information on open access <input type="checkbox"/> other <sup>7</sup> : .....		
<b>15. How many new patent applications ('priority filings') have been made?</b> <i>("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).</i>		<b>0</b>
<b>16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).</b>	Trademark	<b>0</b>
	Registered design	<b>0</b>
	Other	<b>0</b>
<b>17. How many spin-off companies were created / are planned as a direct result of the project?</b>		<b>0</b>
<i>Indicate the approximate number of additional jobs in these companies:</i>		
<b>18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:</b>		
<input type="checkbox"/> Increase in employment, or	<input type="checkbox"/> In small & medium-sized enterprises	
<input type="checkbox"/> Safeguard employment, or	<input type="checkbox"/> In large companies	
<input type="checkbox"/> Decrease in employment,	<input checked="" type="checkbox"/> None of the above / not relevant to the project	
<input checked="" type="checkbox"/> Difficult to estimate / not possible to quantify		
<b>19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:</b>		<i>Indicate figure:</i> 31

<sup>6</sup> Open Access is defined as free of charge access for anyone via Internet.

<sup>7</sup> For instance: classification for security project.

Difficult to estimate / not possible to quantify	<input type="checkbox"/>
<b>I Media and Communication to the general public</b>	
<b>20. As part of the project, were any of the beneficiaries professionals in communication or media relations?</b>	
<input type="radio"/> Yes	<input checked="" type="radio"/> No
<b>21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?</b>	
<input checked="" type="radio"/> Yes	<input type="radio"/> No
<b>22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?</b>	
<input checked="" type="checkbox"/> Press Release	<input checked="" type="checkbox"/> Coverage in specialist press
<input type="checkbox"/> Media briefing	<input type="checkbox"/> Coverage in general (non-specialist) press
<input type="checkbox"/> TV coverage / report	<input type="checkbox"/> Coverage in national press
<input type="checkbox"/> Radio coverage / report	<input type="checkbox"/> Coverage in international press
<input checked="" type="checkbox"/> Brochures /posters / flyers	<input checked="" type="checkbox"/> Website for the general public / internet
<input checked="" type="checkbox"/> DVD /Film /Multimedia	<input checked="" type="checkbox"/> Event targeting general public (festival, conference, exhibition, science café)
<b>23 In which languages are the information products for the general public produced?</b>	
<input type="checkbox"/> Language of the coordinator	<input checked="" type="checkbox"/> English
<input type="checkbox"/> Other language(s)	

**Question F-10:** Classification of Scientific Disciplines according to the Frascati Manual 2002 (Proposed Standard Practice for Surveys on Research and Experimental Development, OECD 2002):

## FIELDS OF SCIENCE AND TECHNOLOGY

### 1. NATURAL SCIENCES

- 1.1 Mathematics and computer sciences [mathematics and other allied fields: computer sciences and other allied subjects (software development only; hardware development should be classified in the engineering fields)]
- 1.2 Physical sciences (astronomy and space sciences, physics and other allied subjects)
- 1.3 Chemical sciences (chemistry, other allied subjects)
- 1.4 Earth and related environmental sciences (geology, geophysics, mineralogy, physical geography and other geosciences, meteorology and other atmospheric sciences including climatic research, oceanography, vulcanology, palaeoecology, other allied sciences)
- 1.5 Biological sciences (biology, botany, bacteriology, microbiology, zoology, entomology, genetics, biochemistry, biophysics, other allied sciences, excluding clinical and veterinary sciences)

### 2. ENGINEERING AND TECHNOLOGY

- 2.1 Civil engineering (architecture engineering, building science and engineering, construction engineering, municipal and structural engineering and other allied subjects)
- 2.2 Electrical engineering, electronics [electrical engineering, electronics, communication engineering and systems, computer engineering (hardware only) and other allied subjects]
- 2.3. Other engineering sciences (such as chemical, aeronautical and space, mechanical, metallurgical and materials engineering, and their specialised subdivisions; forest products; applied sciences such as

geodesy, industrial chemistry, etc.; the science and technology of food production; specialised technologies of interdisciplinary fields, e.g. systems analysis, metallurgy, mining, textile technology and other applied subjects)

### 3. MEDICAL SCIENCES

- 3.1 Basic medicine (anatomy, cytology, physiology, genetics, pharmacy, pharmacology, toxicology, immunology and immunohaematology, clinical chemistry, clinical microbiology, pathology)
- 3.2 Clinical medicine (anaesthesiology, paediatrics, obstetrics and gynaecology, internal medicine, surgery, dentistry, neurology, psychiatry, radiology, therapeutics, otorhinolaryngology, ophthalmology)
- 3.3 Health sciences (public health services, social medicine, hygiene, nursing, epidemiology)

### 4. AGRICULTURAL SCIENCES

- 4.1 Agriculture, forestry, fisheries and allied sciences (agronomy, animal husbandry, fisheries, forestry, horticulture, other allied subjects)
- 4.2 Veterinary medicine

### 5. SOCIAL SCIENCES

- 5.1 Psychology
- 5.2 Economics
- 5.3 Educational sciences (education and training and other allied subjects)
- 5.4 Other social sciences [anthropology (social and cultural) and ethnology, demography, geography (human, economic and social), town and country planning, management, law, linguistics, political sciences, sociology, organisation and methods, miscellaneous social sciences and interdisciplinary, methodological and historical SIT activities relating to subjects in this group. Physical anthropology, physical geography and psychophysiology should normally be classified with the natural sciences].

### 6. HUMANITIES

- 6.1 History (history, prehistory and history, together with auxiliary historical disciplines such as archaeology, numismatics, palaeography, genealogy, etc.)
- 6.2 Languages and literature (ancient and modern)
- 6.3 Other humanities [philosophy (including the history of science and technology) arts, history of art, art criticism, painting, sculpture, musicology, dramatic art excluding artistic "research" of any kind, religion, theology, other fields and subjects pertaining to the humanities, methodological, historical and other SIT activities relating to the subjects in this group]