

## REPORT

Issue No. 3/2011

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



### Existing data and adequacy of the datasets for the national and local scales analyses for assessing gains in maintaining biodiversity

Graciela M. Rusch (NINA), Daniel Caixeta Andrade (FUNDAG), Ana Cristina Cardoso (CENSE), Fabrice DeClerck (CATIE), Klaus Henle (UFZ), Reinhard Klenke (UFZ), Eeva Primmer (SYKE), Pekka Punttila (SYKE), Anne Sverdrup-Thygeson (NINA), Jorge L. Vivan (REDES)

POLICYMIX Report series brings work in progress to publication. Report results are also summarized in Technical and Policy Briefs. Reports and Briefs are also available online: <http://policymix.nina.no>

**About POLICYMIX.** POLICYMIX focuses on the role of economic instruments for biodiversity conservation and ecosystem services provided by forest ecosystems. POLICYMIX evaluates the cost-effectiveness and benefits of a range of economic versus regulatory instruments in a variety of European and Latin American case studies.

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**FRONT-COVER PHOTO**

Forest conserved on private land under PES contract, Hoja Ancha, Nicoya Peninsula, Costa Rica. Photo by Graciela M. Rusch

**KEY WORDS**

Conservation policy goals, indicators of conservation gains, policy outcomes, administrative levels.

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# 1 Introduction

The objective of POLICYMIX - WP 3 is to provide a methodological framework to quantify gains in terms of conservation produced by the various conservation instruments that will be evaluated in the case studies. A first step to assess conservation gains is to identify the targets against which the results of the conservation actions will be assessed.

The *WP3 Policy outcomes: A guideline to assess biodiversity conservation and ecosystem services provision gains* (Rusch et al. 2011)<sup>1</sup> presents a menu of approaches and methodological tools from which the case studies will select to analyse the outcomes of conservation instruments in policy mixes. The guidelines propose different pathways of analysis according to the data available or intended to be used in the case studies. Various options of analysis are described that fit different research questions (e.g. whether a quantitative analysis of effectiveness and efficiency will be conducted or not), the governance and spatial level of the analysis, and whether spatially explicit analyses of trade-offs and efficiency will be conducted (Fig. 1).

The guidelines also take into account different levels of administration, management and of bio-physical/ecological properties at which conservation gains can be assessed and proposes a series of indicators relevant at each level, namely national/regional, landscape and site/local.

Here we report on the results of a survey that aimed to identify the kind of data available at the cases on which indicators of biodiversity state can be calculated to assess policy impacts (*ex-post* analysis) and to model predicted outcomes (*ex-ante* analysis) at these levels. This report discusses the potential for analysis in each case, as well as the constraints set by the availability of data and their quality. WP3 Policy outcome guidelines aim at providing guidance on how to evaluate different instruments effectiveness in attaining conservation objectives, given the information gaps uncovered in the survey.

The survey collected information about on the relevant policy instruments at various levels of governance, and about the conservation goals set in each case, indicating as well as, how specific the goals have been formulated, which is related to the extent to which goal achievements can be verified. The survey also identified the extent to which indicators were identified and used in the national conservation strategies, and assessed the availability and accessibility of data to support their use (Table 1). An important criterion for the data survey was how the data availability was related to the particular level of governance and ecological structure.

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<sup>1</sup> Rusch G.M., DeClerck F.A.J., Barton D.N., Vivan J., Blumentrath S., Punttila P., Klenke R. & Sobrinho R.P. (2011). *WP3 Policy outcomes: A guideline to assess biodiversity conservation and ecosystem services provision gains*. POLICYMIX Technical Briefs. Norwegian Institute for Nature Research, pp. 64.

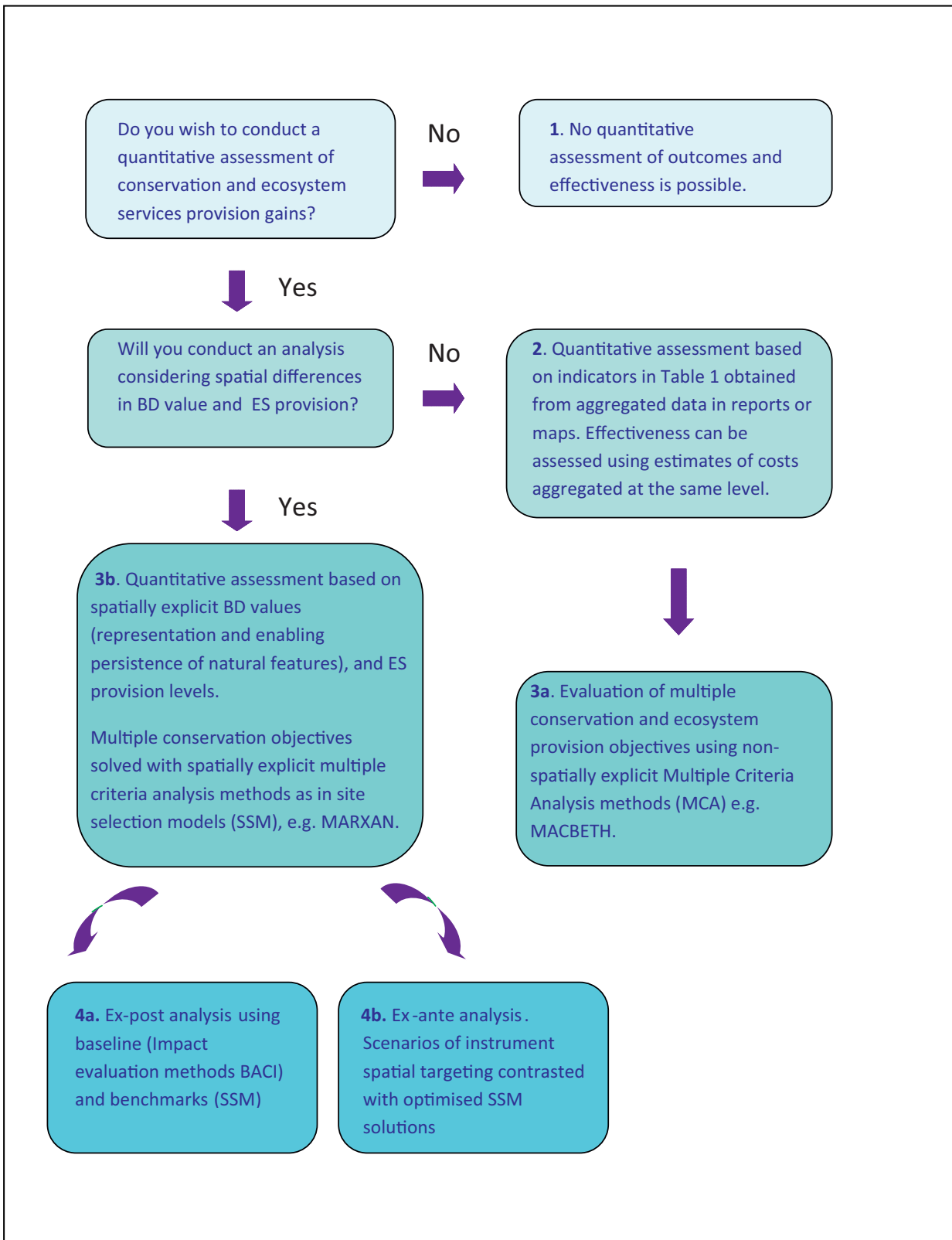


Figure 1: Indicators, methods of assessment and kinds of analysis that can be used to assess gains in conservation and in levels of ecosystem services provision

Table 1: Variables in the survey on data available for assessing nature conservation gains.

Variable	Description
Policy instrument	Policy document or sections of policy documents
Conservation goal	1) Conservation goals/aims as defined in the particular policy document or sections of policy document with implementation at local, national and international levels. 2) Key ecosystem services provided in the case studies' area.
Administrative level of implementation	National, state, municipal
Potential for verification	Potential for verification of goal achievements. Describe how precise and quantifiable the goals are, including the degree of association with a particular geographic area/unit (important for spatial targeting of instruments).
Adequate indicators	Describe which would be adequate indicators to verify degree of achievement of the conservation goals as defined in the policy document.
Data available	List data available (inventories, geo-referenced data, maps)
Accessibility of data	For each data set whether it is: I- readily accessible, II - accessible through purchase/agreements, III- extant but not easily accessible
Quality of the data	Describe the suitability of the data set to construct indicators to verify policy goals achievement. Scale, accuracy, resolution, geographic coverage.

## 2 Data available for indicators in POLICYMIX case studies

The recommendations of the CBD are that where possible the specific national sub-targets should be incorporated into the work programmes without modification of those defined in the Annex II to the COP 7 – Decision VII/30 to avoid unnecessary proliferation of targets<sup>2</sup>. Also, it is recommended that the indicators should be identified or developed in such a way that the same indicators may be used at the global, regional, national and local levels. One overarching question relating to each indicator type should be followed by more specific questions relating to the levels of biological organization.

The survey reveals that the definition of targets in national legislations, conservation strategies, and various implementation instruments, is not yet completed. It shows a range of different conservation goals, usually not formulated as specific targets, and if defined, the targets often lack specific indicators of policy progress achievement.

<sup>2</sup> Targets are associated with one or more indicators, drawn from existing data.



The data available for analyses of biodiversity conservation gains in the case studies are summarized in Table 2 (Appendix I, see also Appendices II-VII for the overview at the individual sites). Descriptions of the case study sites can be found at <http://policymix.nina.no>.

## 2.1 Finland – Appendix II

Finland's special characteristic is a high forest cover (over 80%), and forestry is the main economic activity posing the immediate threat to biodiversity by worsening the quality of the forest matrix. The drivers of biodiversity loss are related to the intensification of forestry practices, so increase in the representation of forest types and the conservation of habitats and species threatened by the kind of forestry practice, are the important conservation targets. Lack of coarse woody debris is one indicators of this development, but there are no coherent datasets on coarse woody debris across the landscape.

Some instruments focus on the conservation of particular habitats and they overlap partially in terms of the specific conservation targets, such as the protection of broad-leaf forests and of particular threatened habitats. The coverage of the spatial data varies in terms of the habitat types mapped and the accessibility of the data depends in some cases on the instrument (whether conservation is on public or private land).

A pre-requisite for an analysis of the extent of representation of natural features (the amount and the proportion in which the different features are represented) at national/regional level is that they have coverage on the whole set of areas that is the object of the analysis. A descriptive general analysis based on secondary material (e.g. Moilanen and Lehtomäki's work on conservation area prioritization) will be conducted, and the possibility of a spatial analysis on the achievement of representation target according to biodiversity priority areas will be evaluated.

For the landscape level analysis, there are maps of protected areas, of forest types and geo-referenced inventories of particular valuable habitats and red-listed species, but also with varying coverage. Also, geo-referenced data on amount of wood debris and stand age are available. The coverage may be sufficient for particular comparisons between instruments, but access to habitat records on private land may be limited in some areas. This limitation needs to be taken into account when comparing instruments implemented on public vs. private land. Maps of forest and habitat types could be used to calculate indicators of persistence related to the spatial structure of the landscape (landscape coherence, habitat connectivity).

The level of geo-referencing or GIS-application in the Finnish case is unclear, so the extent that the data will be used for spatially explicit analysis is not defined at the time of the survey. The Finnish POLICYMIX team collaborates with a team that analyzes forest inventory data for conservation prioritizing (on 100m x 100m pixels, and can possibly add layers onto that, depending on the analyses of this team).

## 2.2 Norway – Appendix III

Also in the case of Norway forestry is the main economic activity affecting biodiversity, and particularly practices associated with the intensification of the production (shorter harvest intervals and clear cutting). There is also an underrepresentation of productive forests which are under conservation. Therefore, the increase in the representation of particular forest types and the conservation of habitats and of species threatened by these practices are the important conservation targets.

The use of forest land is regulated mainly by the Nature Conservation Act, the Protected Areas Act and the Forest Act with its amendments. The potential for the evaluation of the impacts of the Nature Conservation Act is low because the act is very recent (2010). The potential for evaluating the impact of the Forest Act is relatively low, but some particular specifications of the law could be evaluated (e.g. the conservation of forest of particular natural value could be evaluated). Specific data related to this law are of restricted access, but access will be explored further during the case study work.

For the analysis at national/regional scale, there are maps of bioregions, climate, coarse geological categories, forest cover maps and maps of protected areas that can be used for analysis at this level.

To prepare indicators of biodiversity representation at level 2, there are maps of protected areas, of forest types and geo-referenced inventories of particular valuable habitats and red-listed species in both the Norwegian and Finnish cases, but with varying coverage. The coverage may be sufficient for particular comparisons between instruments, but access to habitat records on private land may be limited in some areas. This limitation needs to be taken into account when comparing instruments implemented on public vs. private land. Maps of forest and habitat types could be used to calculate indicators of persistence related to the spatial structure of the landscape.

In the Norwegian case, indicators of stand quality can be derived from maps with data on stand age and tree species composition (from forest inventories 'Skogstaksering'), but this data probably would not allow an ex-post analyses and have the constraint of being a snap-shot of the forest cover at the time when the maps were drawn.

Also related to the quality of the forest stand, there are geo-referenced data on threatened species (with descriptions of habitat requirements), amount of wood debris and stand age. The coverage of these data is limited, but ex-post analyses of certain instruments and in some pilot areas may be possible.

## 2.3 Saxony – Appendix IV

At present, the increase of forest cover is not considered as an important factor to halt of the loss of the biodiversity as the increase of the quality of forest remnants. In Germany, area demanding forest dwelling species are already locally extinct. Current threats to forest living species are mainly caused by intensification, segregation and use of tree species which are either not native or not appropriate for the soils where they are planted. We anticipate much more results by changing the forest management and level of intensification than by expanding the forest areas. Most threatened species are bound to old deciduous and coniferous forests with large amount of coarse woody debris. Also the occurrence of the old forests (i.e. more than 300 years old) is important.

At level 1 the best indicator of biodiversity conservation is the area of old grown forests with high amount of woody debris – this means protected areas within forest sites with a long history (e.g. protected forests since 50 or 100 years, age and area of such forest patches). There is good documentation in forest-related databases and statistics in various reports at national level about ecosystem and habitat type coverage and representation of red-listed species. To conduct such analysis, the information in these regularly produced reports has to be linked to the introduction of a particular instrument or instruments.

Some indicators of sustainable use at national level are available. Regarding forests only one is related directly: Sustainability indicator for bird species diversity. Some information can be probably used also about endangered species (impact), Conservation status of Habitats Directive habitat types and species (state), size of strictly protected areas (response), Natura 2000 area designations, dissection of the landscape (pressure) and proportion of certified forest land in Germany (response). Some information may be retrieved from reports about changes in the amount of land used for human settlements, transport infrastructure and urban sprawl (pressures).

At level 2, maps and descriptions of protected areas, and aggregated data at state and protected area level of protection of threatened habitats and selected species are available. These data can be used for an assessment of increments in habitat representation, to evaluate instruments directed to this kind of measures (habitat protection) and in degree of persistence (habitat quality, i.e. breeding birds populations, habitat viability). Geo-referencing of protected areas would enable estimations of the landscape spatial structure, one of the persistence criteria at level-2 level.

Other indicators at the State level will be explored with the state forest administration. “Pristine forest patches” and also the protected areas have specific monitoring programs in some states conducted by the administration of the National Parks and Biosphere Reserves, but not for the managed state or private owned forests. There is still a big lack of information and documentation in the management and monitoring instruments. Monitoring of economic and management related parameters, as well for the health status is only done regularly in state owned forests, but not for most of the biodiversity related parameters. Data for larger private owned forests which are not managed by the state owned company (other than a larger proportion of very small private owned patches = result of the GDR “Bodenreform” of 1945) are not available for the public.

At Level 3, data in official standardized reports on forest function, and environmental load, and conservation status and size of protected areas can be used as an indicator of persistence (quality). Important descriptors of forest quality are stand age, structural composition, amount of woody debris, standing death wood, number of old trees, number of special structures like tree holes, dichotomous trees, broken branches, chinks/fissures, etc. Some of this information is monitored at specific sites (e.g. “Naturwaldzellen” = “pristine forest patches). At this time there are only 8 pristine forest patches with a total area of 303 ha. That is 0,06% of the whole forest area in Saxony; the lowest proportion of all federal states in Germany. 77% of the pristine patch area is covered by beech forests, which contrasts with the main proportion of forest area in Saxony that is covered by coniferous trees.

Also in this case, ex-ante analyses require data about the time when the instrument(s) was introduced coupled to the reporting period.

The Saxony (and other European) case has access to some data on drivers and pressures of biodiversity loss, but access will likely be to a very limited set of selected information and specific data lacking.

## **2.4 Portugal – Appendix V**

At the national level, conservation is regulated by the National Nature Conservation and Biodiversity Strategy. There are data from reports, monitoring programmes and other sources that can be used for evaluation of particular actions using indirect indicators (not direct biodiversity conservation state).

The case study in Portugal encompasses a landscape mosaic with patches of different vegetation types and land-uses. For analyses at level 2, land use maps are available, and can be used to assess the extent of representation of different patches. Targets about the area of the different patch classes are not set, but landscape structure metrics to assess habitat coherence for target species can be calculated. Maps at different times would be necessary for ex-post analyses, synchronic with the introduction of conservation measures.

Data to assess the quality of the landscape mosaic consist of population viability analyses of selected species, habitat viability and selected species population trends. Also assessment of landscape patch quality can be done based on areas currently or potentially occupied by selected species (Iberian Lynx and one of most important preys, rabbits).

## **2.5 Mato Grosso – Appendix VI**

The main target of conservation actions is to reduce deforestation and to promote reforestation.

At level 1, consortium of municipalities, data are available from published studies about agroforestry systems (AFS) and reforestation. The data on forest cover are of variable coverage, high for protected areas and indigenous lands, but lower in private land, although relatively better data on a set of registered farms. Differences in coverage will constrain the kind of comparisons that can be made.

At level 2 (municipality), there are data available for indicators of biodiversity persistence. High quality data at landscape and farm level on degree of fragmentation /connectivity, linked to data on landscape level processes such as seed production and pollination. Data about the forest structure and composition (functional diversity) are of lower quality.

## **2.6 Mata Atlântica – Appendix VII**

The State of São Paulo has set a target of forest cover restoration (23%), gains in forest cover can be used as an indicator of gains. These data are readily available. State reports of forest covers are available, they need to be linked to the time when the different instruments started to be implemented or in areas of the State differing in the kind of instruments that are implemented are needed for an assessment of conservation gains.

The BIOTA program has produced data to characterize the biodiversity of the State of São Paulo and to understand the processes that generate and maintain biodiversity. The data are geo-referenced, including

a map of land cover of the State of São Paulo, in a 1:50.000. The digital atlas is an assemblage of the 416 cartographic charts from the 1972 IBGE (Instituto Brasileiro de Geografia e Estatística <http://www.ibge.gov.br>) map of São Paulo State, updated with Landsat 5 or 7 satellite images from 1998/99.

These data could be used in an ex-post analyses of representation of natural features and landscape structure at state and municipal scales if available from different periods or for comparison of areas with different instruments.

## 2.7 Costa Rica – Chorotega Biological Corridor

The Costa Rica case study is unique in several ways. First, Chorotega (Hojancha) has garnered national and international attention as a location with tremendous advances in reforestation over the past 50 year. In the 1960's the site was notable for the dominance of pasture systems, with less than 10% forest cover. Today, the site contains greater than 55% tree cover and there are signs that wild biodiversity is recovering. Second, the area does not contain any national parks per se, and reforestation had been achieved through a complex mixtures of local and national incentives largely revolving around the provisioning of ecosystem services.

The important point here is that the area holds no national parks with protected forest cover consisting of Matambu Indigenous area and the Nosara Protected area. A significant portion of the remaining forest cover has been partially funded by payments of ecosystem services targeting forest conservation and forest restoration. The driving factor for much of this forest conservation is conservation of hydrological services rather than biodiversity conservation per se.

**Level 1:** At the national level, the percent forest cover has been used as the primary indicator of biodiversity conservation. Not however, that analysis at this scale does not distinguish between plantations and natural forest.

**Level 2:** Will be the focal scale of analysis for the Hojancha study. For this landscape scale analysis, good, medium resolution maps of forest cover at the national level exist as do maps of the distribution of forest types, soils, floristic life zones and land-use. These include maps from several sources such as the Ministry Agriculture and the Environment, a land-use map developed by TNC, and both a 1990 and 2000 land-use map developed by CATIE and the US Environmental Protection Agency. Sufficient cover and previous studies exist at the national level to verify that 10% of the variability in natural areas is contained within the protected areas.

Because of the focus on ecosystem services is central to biodiversity conservation in this region, we will also be producing maps of the spatial distribution of these services including, but not limited to functional connectivity for species of conservation concern, erosion hotspots, carbon, and scenic value. FONAFIFO, the Costa Rican national fund for payment of ecosystem services pays for 4 services including (1) biodiversity conservation, (2) climate mitigation (carbon), (3) hydrological services, and (4) scenic value. One of the primary questions of PolicyMix in this landscape is whether investments in these services in Hojancha has led to a concomitant increase in biodiversity (See figure 3 in the case study description). In addition to the afore mentioned measures, Hojancha served as a central case study for a Dutch project on "How do biodiversity and poverty relate". Within this study, which included more than a dozen case

studies globally, Hojanca emerged as the only site where biodiversity increased while poverty decreased. The projects measure of biodiversity was defined as the remaining original species and their abundances. It is measured as the mean species abundance of a characteristic selection of the original species (MSA) compared with the natural or low-impacted state (Alkemade et al., 2009, Netherlands Environmental Assessment Agency (2010)<sup>4</sup>. The process of homogenization of biodiversity is when the original species that are typical for certain ecosystems, and depend on conditions that are specific for this system, decline in number and eventually become extinct. Simultaneously, a limited number of common species that are adjusted to manmade conditions flourish.

In practice, little data are frequently available on the change of abundance of a representative set of species. Therefore, in the Dutch example, monitoring data on changes in species abundance, where available, were used in combination with the 'modelled biodiversity loss'. This modelled 'Mean Species Abundance' (MSA) indicator was used for all terrestrial ecosystems. As a substitute for trends in monitored species abundance and distribution, use was made of data on pressures that have an impact on biodiversity. The pressure–effect relationships were derived from the GLOBIO3 model (Alkemade et al., 2009) and the impact expressed as the change in Mean Species Abundance (MSA) over a certain period. The input used for the calculation of the change in MSA was conversion of land-use types into other types.

Data from this MSA analysis extend from 1970 to 2000. Data exist to repeat this analysis for 2010 at the landscape scale and would serve to support of refute the notion that policy mixes in the region are contributing to biodiversity conservation.

Another key biodiversity indicator in fragmented landscapes is the degree of connectivity between forest patches. Sufficient data for the region exist to not only consider the quality of forest patches, but their degree of isolation (level 3) and connectivity between patches.

Level 3: Limited data currently exists at the patch scale, multiple metrics from landscape ecology can be applied in the area to provide patch based statistics including patch size, shape and degree of isolation. Remote sensing metrics such as NDVI and Tassle Cap have successfully been used and correlated to forest structure and diversity. Using available imagery, patch structure and quality could be quantified. Of primary interest in this particular region is the dynamic between forest patches that are actually comprised of monocultures of exotic timber species, but which count as reforestation, and forests patches consisting of a diversity of native species.

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<sup>3</sup> Alkemade, R., Van Oorschot, M., Miles, L., Nellemann, C., Bakkens, M., Ten Brink, B. (2009). *GLOBIO3: a framework to investigate options for reducing global terrestrial biodiversity loss*. *Ecosystems* 12: 374-390

<sup>4</sup> Netherlands Environmental Assessment Agency (2010) *Rethinking Global Biodiversity Strategies: Exploring structural changes in production and consumption to reduce biodiversity loss*.

### **3 Appendices**

Appendix I – Table 2

Appendix II – Case study Finland

Appendix III – Case study Norway

Appendix IV – Case study Saxony, Germany

Appendix V – Case study Portugal

Appendix VI – Case study Mato Grosso

Appendix VII – Case study Mata Atlântica

**Appendix I - Table 2**

<b>Level of analysis</b>	<b>Case study</b>	<b>Predominant economic activity</b>	<b>Menu of conservation gain indicators</b>	<b>Data available</b>
1st - State/ Regional / National	NO, FI	Forestry	1) Level of achievement of representation target, 2) Nr and area of types represented 3) evenness	<b>Norway:</b> Maps of forest classes, biogeographical regions, climate.
	Saxony, Mata Atlantica, Mato Grosso (part)	Agriculture	1) Level of achievement of forest cover target, 2) area of forest cover	to be verified in coarse grain /national level case study
	Saxony, Mata Atlantica, Mato Grosso (part)	Agriculture, non-timber products (indigenous forest reserves)	1) Level of achievement of representation target, 2) Nr and area of types represented 3) evenness	<b>Mata Atlântica:</b> Vegetation/forest types maps, geo-referenced data on taxonomic groups at State level. <b>Saxony:</b> 1) protected areas maps 2) reports coverage on ecosystem, habitats, red-list species, etc in SEBI2010)
2nd - Landscape	NO, FI	Forestry	1)Level of achievement of representation target, 2) nr and frequency (or area) of habitats represented, 3) nr and frequency of taxonomic groups represented	<b>Finland &amp; Norway:</b> 1) Maps of protected areas, 2)Maps of forest types, 3) geo-referenced inventories of habitats and red-list species (in some cases). <b>Norway:</b> 1) Aggregated CHI data readily available
	NO, FI	Forestry	Degree of isolation or spatial aggregation of forest type patches	1) Maps of forest types and of protected areas
	Saxony, Mata Atlantica, Mato Grosso (part)	Agriculture, agroforestry, NTFP	1) Distance to representation target, 2) nr (or evenness )of habitats represented, 3) nr (and evenness) of taxonomic groups represented	<b>Mata Atlântica:</b> Vegetation/forest types maps, geo-referenced data on taxonomic groups. <b>Saxony:</b> 1) protected areas maps 2) reports coverage on ecosystem, habitats, red-list species
	Saxony, Mata Atlantica, Mato Grosso (part)	Agriculture, agroforestry, NTFP	Degree of isolation or spatial aggregation of forest (or habitat type) patches	<b>Mata Atlântica:</b> Vegetation/forest types maps, <b>Saxony:</b> protected areas maps, <b>Mato Grosso:</b> landscape connectivity, processes related to seed production and pollination.
	Saxony, Portugal		Quality of landscape mosaic	Species population viability, habitat viability, species population trends



Level of analysis	Case study	Predominant economic activity	Menu of conservation gain indicators	Data available
	Portugal	Forest - pastureland - crop mosaic	Distance to patch cover target	Land use map
	Portugal	Forest - pastureland - crop mosaic	1)Area occupied by wild rabbit, 2) area for potential distribution of Iberian Lynx, target species, 3) area of riverine forest, 4) population	Maps, monitoring data, species distribution maps.
3rd - Local - stand level	NO, FI	Forestry	Degree of complementarity to existing protected area network	to be verified in local level case study
	NO, FI		1) size and shape of forest/habitat patch , 2) quality of the stand (age class, amount of wood debris, 3) Nr endangered taxa/priority species.	<b>Norway:</b> 1) Geo-referenced CHI/habitat types data (partial), 2) geo-referenced red-list species (partial) (NO), 3) maps of forest stand age.
	Mato Grosso	Agroforestry system	Functional diversity	Collection of data to assess functional diversity ongoing
	Mato Grosso	NTFP - indigenous forest	1) size of forest patch, 2) quality of the patch (species & functional richness)	to be verified in local level case study
	Mato Grosso	Agriculture	??	
	Mata Atlântica		1) size of forest patch, 2) quality of the patch (species richness, density of endangered species)?	to be verified in local level case study, data from the BIOTA project
	Saxony	Agriculture	1) Biotope area, conservation status, 2) stand quality (in ICP monitoring areas)	to be verified in local level case study

Appendix II - Case study: Finland

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data
<p><b>Permanent public:</b> Public/state owned protected areas: national parks; strict nature reserves, and other nature reserves. Ecosystem service: biodiversity conservation, perhaps carbon capture</p>	<p><b>To:1) maintain biological diversity;</b> <b>2) conserve nature's beauty and scenic value;</b> <b>3) promote the sustainable use of natural resources and the natural environment;</b> <b>4) promote awareness and general interest in nature; and</b> <b>5) promote scientific research.</b> (Nature Conservation Act §1)</p>	<p><b>Design: national at the Ministry of the Environment; implementation: regional at the Centre for Economic Development, Transport and the Environment; (previously Regional Environment Centre); management: national (in regional offices) by Forest and Park Service METsähallitus</b></p>	<p>Very difficult to evaluate such general targets. Area (and percentage of total land area) is illustrative: protected area in South-Western Finland is 15 000 hectares. Biodiversity conservation is in theory successful, as the land is preserved.</p>	<p>Possibly: Stands of old age, habitat type, coarse woody debris.</p>	<p>Stand data on tree-stand characteristics, habitat types and coarse woody debris. Data cover most of Southern Finland and much of Lapland. (OUR ANALYSES WILL LIKELY NOT UTILISE THESE DATA)</p>	<p>Accessible. Originally from the SUTI-GIS-database of Metsähallitus/NHS</p>
<p><b>Obligatory set-aside on private land:</b> Nature protection Act habitats; Ecosystem service: biodiversity conservation</p>	<p>Nature Conservation Act goals, and preservation of 1) wild woods rich in broad-leafed deciduous species; 2) hazel woods; 3) common alder woods</p>	<p>Implementation: regional at the Centre for Economic Development, Transport and the Environment; (previously Regional Environment Centre); management: national (in regional offices) by Forest and Park Service METsähallitus</p>	<p>Evaluation difficult.</p>	<p>Possibly: habitat type, old age of stand, habitat type, coarse woody debris.</p>	<p>GIS-data on boundaries. Also characteristics, e.g. mean height of trees, and dead wood</p>	<p>In SYKE</p>

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data
Obligatory conservation sites on private land: Forest Act habitats; Ecosystem service: biodiversity conservation	To Conserve forest biodiversity; preserve characteristics of habitats of particular importance must be preserved (Forest Act §10): (1) Immediate surroundings of springs (2) Brooks and rivulets (3) Small lakes (4) Grass and herb-rich hardwood-spruce swamps (5) Eutrophic fens located south of Lapland (6) Fertile patches of herb-rich forests (7) Heathland forests on undrained peatland (8) Gorges and ravines (9) Cliffs and underlying forest stands (10) Sandy soils (11) Exposed bedrock and boulder fields (12) Sparsely forested mires (13) Alluvial forests	Regional Forestry Centre	Forest Act habitat inventories have been evaluated with a conclusion that all habitats are not captured by the inventory (Kotiaho and Selonen, 2006; Pykälä, 2007). According to audits, habitats are conserved in forestry operations somewhat successfully (Tapio).	Possibly: habitat type, old age of stand, habitat type, coarse woody debris.	No, might be possible to access some.	Forestry Centres hold stand-level data of soil and tree characteristics, possibly also dead wood. Difficult if not impossible to access due to land-owner privacy policy.
Permanent private: Private protected area prior to 2002	Nature Conservation Act goals	Regional Environment Centre (currently Centre for Economic Development, Transport and the Environment)				
Voluntary permanent: METSO voluntary private protected areas; Ecosystem service: biodiversity conservation	To conserve forest biodiversity in Southern Finland; to preserve and improve biodiversity in areas used commercially (Government decision 2002); "to protect sites permanently or indefinitely so as to preserve or increase their permanent or slowly evolving natural values" (Government resolution 2008)	Centre for Economic Development, Transport and the Environment		Possibly: habitat type, tree species, age, volume (coarse woody debris)	(on existing sites: Stand-compartment-wise data on tree-stand characteristics, habitat types and coarse woody debris; on the rest of the forest matrix, age, volume, tree species, habitat).	Existing sites available from the YSA-GIS database at Metsähallitus, the forest matrix from a concurrent analysis utilizing forest inventory data)

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data
Voluntary PES: METSO-pilot voluntary fixed-term contracts; Ecosystem service: biodiversity conservation	To halt the ongoing decline in forest biotopes and species and establish stable favourable trends in forest biodiversity by 2016 (Government decision 2002, Government Resolution 2008)	Regional forestry Centre		Possibly: habitat type, tree species, age, volume (coarse woody debris)		Existing sites available from the YSA-GIS database at Metsähallitus, the forest matrix from a concurrent analysis utilizing forest inventory data)
Compensation: METSO New voluntary private environmental support contracts: fixed-term	Conservation of biodiversity	Regional Forestry Centre		Possibly: habitat type, tree species, age, volume (coarse woody debris)		Forestry Centres hold stand-level data of soil and tree characteristics, possibly also dead wood. Difficult if not impossible to access due to land-owner privacy policy.
Compensation: Forest Act habitat environmental support fixed-term; Ecosystem service: biodiversity conservation	Conservation of biodiversity	Regional Forestry Centre		Possibly: habitat type, tree species, age, volume (coarse woody debris)		Forestry Centres hold stand-level data of soil and tree characteristics, possibly also dead wood. Difficult if not impossible to access due to land-owner privacy policy.

### Appendix III - Norway

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Data available	Accessibility of data	Quality of the data
<b>Nature Conservation Act</b>	The purpose of the act is that the biological, landscape and geological diversity, and ecological processes are preserved by sustainable use and conservation, in order to ensure the sustenance of human activities, culture, health and well-being, now and in the future, and including the basis for Lappish culture.	National	Low, due to the generality of the goal			
<b>Nature reserves, National Parks, Landscape Conservation Areas</b>	Protected areas on land, water-courses and bodies will according to this chapter contribute to the protection of a) the variety of natural types and landscapes, b) species and genetic diversity, c) threatened nature and ecologically functional areas for priority species, d) larger intact ecosystems, which can be accessible for specific recreational purposes, e) areas with particular natural heritage values, f) nature shaped by use through time (cultural landscapes) or which have cultural heritage values, incl. favouring management practices that contribute to maintain the natural values, g) ecological and landscape connectivity at the national level and across borders, or h) reference areas to monitor changes in nature.	National	Medium. Several evaluations have been conducted on National level		Good	Good

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Data available	Accessibility of data	Quality of the data
- <b>"Priority Species"</b>	Insure the protection of species and their genetic diversity	Regional/local	Low, both because of the generality and because the law is new			
- <b>"Selected Habitat Types"</b>	Avoid the reduction of habitat distribution ranges and the deterioration of ecological state	Regional/local	Low, both because of the generality and because the law is new			
<b>Voluntary Conservation</b>		National (Directorate for Nature Management, The Norwegian Forest Owners' Federation), regional, local	Medium. An evaluation has been conducted on Ntl level			
<b>Forestry Act and Amendments (esp. FOR 2006-96-97 nr 593: Forskrift om berekraftig skogbruk)</b>	Promote a sustainable management of the forest resources with an aim to favour local and national economies and secure the maintenance of biodiveristy, taking into consideration the landscape, recreational and cultural values in the forest.	National (Norwegian Ministry of Agriculture)	On the general level: low. More specific requirements in the Act, like the requirement to conserve forest of special environmental value, could be evaluated (medium potential)	Data on environmental values in forest, in the form of CHI, are avaiabel (see CHI). Data on "Protection Forest" also available, but not easily accessible.	CHI: see this. "Protection Forest": unsure, must contact county administrations.	CHI: see this. "Protection Forest": unsure, probably well defined on maps and probably also digitized.

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Data available	Accessibility of data	Quality of the data
	<p>"Protection Forest" (Norw.: Vernskog) is not protected, but subject to special management because it serves to shelter other forest, mainly as a buffer zone bordering mountainous areas. Also, the authorities can regulate for more strict restrictions on the management of forest areas with particular natural values related to biodiversity, landscape, recreation and cultural heritage than the regulations in the act, when forest management can result in considerable damage of or disadvantage for these values.</p> <p><a href="http://www.lovddata.no/all/tl-20050527-031-003.html#12">http://www.lovddata.no/all/tl-20050527-031-003.html#12</a></p>					
<b>Act of Nature Areas around Oslo and surrounding municipalities (Markaloven)</b>		National and local (municipality)				
<b>Mapping of Nature Types according to method by Directorate for Nature Management</b>		National and local (municipality)		Available on the internet: <a href="http://dnweb12.dirnat.no/nbinsyn/NB3_viewer.asp">http://dnweb12.dirnat.no/nbinsyn/NB3_viewer.asp</a> and as WMS for use in a GIS		Mediocre (see evaluation by Gaarder et al 2008)

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Data available	Accessibility of data	Quality of the data
<b>Complementary Hotspot Inventory (CHI) [MIS in Norwegian]</b>	Departementet kan ved forskrift leggje strengare restriksjonar på skogbehandlinga i skogområde av særleg miljøverdi knytt til biologisk mangfald, landskap, friluftsliv eller kulturminne enn det lova elles gir heimel for når skogbehandlinga kan føre til vesentleg skade eller ulempe for desse verdiane.	CHI inventory is integrated in the forest resource inventory that constitutes the basis of forestry planning. The CHI inventories cover most forest owners because a WKH inventory is requirement for forest certification, and CHI is the dominant method used.		Publicly available, but only in an aggregated form, on Internet ( <a href="http://www.skogoglandskap.no/">http://www.skogoglandskap.no/</a> ). Access to complete environmental data requires permission and can only be accessed for single municipalities, by inquiry to the private companies that have carried out the resource mapping for forest owners		
<b>Forest Certification Schemes.</b> Organisation (ISO 14001) combined with national environmental standards for sustainable forestry (the Living Forests standards). It is associated with the PEFC international framework for mutual recognition of national forest certification schemes.		Certified Forest Associations (approx. 13 stakeholders on a national, regional or local level are certified in Norway, most in the form of group certification.)				
<b>Fiscal ecological transfers in the form of local development funds</b> (Only applied in one case; Trillemarka reserve in Buskerud County)		Local (municipality)				



## Appendix IV - Saxony (Germany)

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Immediate conservation objective - tier	Data available	Accessibility of data	Quality of the data
Agri-environmental Measures and Forest Area Growth [Förderrichtlinie "Agrarumweltmaßnahmen und Waldmehrung (RL AuW/2007)]	Forest Area Growth	state, municipal	high	New established forest area	Representation -1 - 2	official reports	unknown	still unknown
Natural Heritage [Förderrichtlinie Natürliches Erbe (RL NE/2007)]	Halting the loss of biodiversity	state, municipal	medium	Biotop design (Area)	Representation - 1-2	official and unofficial reports, financial reports	unknown	still unknown
				Grove establishment (Area, Length, Number)	Representation - 1-2	official and unofficial reports, financial reports	unknown	still unknown
				Species conservation measures (Type, Number)	Indirect	official and unofficial reports, financial reports	unknown	still unknown
				Conservation consulting (?)	Indirect	official and unofficial reports, financial reports	unknown	still unknown
				Public relation (Number of Actions, Visitors)	Indirect	official and unofficial reports, financial reports	unknown	still unknown
				Complex projects (Type, Money used)	Indirect	official and unofficial reports, financial reports	unknown	still unknown
				Habitat management (Type, Number of actions)	Indirect	official and unofficial reports, financial reports	unknown	still unknown
Wood and Forest Management [Förderichtlinie Wald- und Forstwirtschaft (RL WuF/2007)]	Introduction of habitat specific native trees	protected areas (National Park, FFH, Biosphere Reserves etc.)	medium to low	Forest structure (Species composition, before-after)	Quality 3	databases, reports	selectetd information probably accessible	partially unknown, probably good

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Immediate conservation objective - tier	Data available	Accessibility of data	Quality of the data
	Improvement of structural diversity and natural (plant) species composition		medium to low	Number and Function of special Biotopes (before-after)	Quality 3	databases, reports	selectetd information probably accessible	partially unknown, probably good
	Habitat improvement		medium to low	Number of old Trees	Quality 3	databases, reports	selectetd information probably accessible	partially unknown, probably good
				Percentage/Amount of woody debris	Quality 3	databases, reports	selectetd information probably accessible	partially unknown, probably good
				Number of planted trees / species	Quality 3	financial reports	selectetd information probably accessible	partially unknown, probably good
				Number and type of Management actions	Quality 3	financial reports	selectetd information probably accessible	unknown
<b>Compensation Measures [Förderrichtlinie Ausgleichszulage (RL AZL/2007)]</b>	Preservation of countryside and sustainable use	municipal	medium to low	?		financial reports	?	?
<b>Integrated Rural Development (Förderrichtlinie Integrierte Ländliche Entwicklung - RL ILE/2007)</b>		municipal	medium to low	?		financial reports	?	?
<b>Saxon Forest Law</b>	Visualisation and control of forest	state owned forest	high	forest function	Quality 3	official standardised reports	officially available	Maps, plans, official documents
	Visualisation and control of forest environmental load	state owned forest	high	environmental load	Quality 3	official standardised reports	officially available	Maps, verified data, plans, official documents
	Area protection	protected areas	high	Area, Conservation status	Representation 1 - 2	official reports	officially available	Maps, detailed descriptions, management plans

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Immediate conservation objective - tier	Data available	Accessibility of data	Quality of the data
<b>ICP Forest Monitoring</b>	Forest Health	international, country, state, special monitoring sites / plots	high	Crown conditionForest	Quality (restricted to monitoring areas, to what degree can the data be extrapolated to new areas? Ex-post)	official report	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
<b>Level I</b>				Pressures (damage causes)		official report	officially available	Maps, verified data, plans, official documents. also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
				Forest Soil condition		official report	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
				Forest Foliar Survey		official report	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
				<b>additionally to Level I:</b>				
<b>Level II</b>	Forest Health			Deposition		Data have to be submitted to JRC in Ispra, official Executive and Technical Reports	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
	Biodiversity			Ambient Air Quality		Data have to be submitted to JRC in Ispra, official Executive and Technical Reports	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Immediate conservation objective - tier	Data available	Accessibility of data	Quality of the data
				Metereology		Data have to be submitted to JRC in Ispra, official Executive and Technical Reports	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
				Foprest Growth		Data have to be submitted to JRC in Ispra, official Executive and Technical Reports	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
				Ground Vegetation		Data have to be submitted to JRC in Ispra, official Executive and Technical Reports	officially available	Maps, verified data, plans, official documents
				Phenology		Data have to be submitted to JRC in Ispra, official Executive and Technical Reports	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
				Litterfall		Data have to be submitted to JRC in Ispra, official Executive and Technical Reports	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
				Remote Sensing		Data have to be submitted to JRC in Ispra, official Executive and Technical Reports	officially available	Maps, verified data, plans, official documents. Also available from Internet at <a href="http://www.icp-forests.org">www.icp-forests.org</a>
<b>SCALES Project</b>	Drivers	all levels of NUTS for Europe	high	Drivers of biodiversity loss		Project deliverables	available	Reports (Deliverables), Maps, Tables

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Immediate conservation objective - tier	Data available	Accessibility of data	Quality of the data
	Pressures			Pressures of biodiversity loss		Project deliverables	available	Reports (Deliverables), Maps, Tables
<b>SEBI2010 - Streamlining European 2010 Biodiversity Indicators</b>	Biodiversity Indicators to assess and inform about progress towards the European 2010 targets.	international, country	high	Abundance and distribution of selected species	Representation and quality 1 - 2	reports	available	Lists and descriptions of indicators, <a href="http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995/foI591978/SEBI_2010_indicators_from_EEA_Tech_Report_11_2007_.pdf">http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995/foI591978/SEBI_2010_indicators_from_EEA_Tech_Report_11_2007_.pdf</a>
				Red List Index for European species	representation 1 - 2	reports	available	Lists and descriptions of indicators
				Species of European interest	representation 1 - 2	reports	available	Lists and descriptions of indicators
				Ecosystem coverage	representation 1 - 2	reports	available	Lists and descriptions of indicators
				Habitats of European interest	representation 1 - 2	reports	available	Lists and descriptions of indicators
				Nationally designated protected areas	representation 1 - 2	reports	available	Lists and descriptions of indicators
				Sites designated under the EU Habitats and Birds Directives	representation 1 - 2	reports	available	Lists and descriptions of indicators
				Critical load exceedance for nitrogen	quality 1 - 2 not related to forestry?	reports	available	Lists and descriptions of indicators
				Occurrence of temperature-sensitive species	representation 1 - 2	reports	available	Lists and descriptions of indicators
				Fragmentation of natural and seminatural areas	persistence 2	reports	available	Lists and descriptions of indicators
<b>Protected areas</b>	Amount, types, and distribution of protected areas	country, state	high	Amount, types, and distribution of protected areas	representation 1-2	GIS data	available	Maps, deliverables, GIS data
<b>Fauna-Flora-Habitat Directive</b>	Species protection	country, state, protected areas	high	Species population viability	quality 1-2	reports, databases	officially available	Verified Data, Maps, Detailed Descriptions
				Breeding Birds Population Trends	quality 1-2	special publications, databases	officially available	Verified Data, Maps, Detailed Descriptions

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Immediate conservation objective - tier	Data available	Accessibility of data	Quality of the data
	Habitat protection	country, state, protected areas	high	Habitat viability	quality 1-2	reports, databases	officially available	Verified Data, Maps, Detailed Descriptions

## Appendix V - Portugal

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data
<b>National Nature Conservation and Biodiversity Strategy</b>	1) Promoting scientific research and knowledge about the natural heritage as well as monitoring species, habitats and ecosystems	National/local	The conservation goals are possible to quantifie and relate to the case study	Number of studies conducted at the study site; Number of indicators for monitoring the evolving situation of species or habitats; Number of monitoring actions	Inventories	III - extant but not easily accessible, it involves a search of information or compilation of information
	2) Ensure the conservation and enhancement of natural heritage Site of Community Interest and Special Protection Areas into the process of Natura 2000	National/Local		Number of specific actions for nature conservation and biodiversity, taking into account the knowledge, monitoring, protection, management and enhancement of habitats and species present in the case study		
	3) Develop throughout the country specific actions for the conservation and management of species and habitats	National/Local		Number of protection measures and habitat restoration; Number of existing agri-environmental measures for biodiversity conservation in the case-study;		
	5) Provide information, awareness and public participation, as well as mobilize and encourage civil society	National/local		Number of initiatives, information campaigns, awareness and educational materials published		
<b>Natura 2000 Network Sectorial Plan</b>		National				
MB Site of Community Interest	1) Maintain mosaic of habitats, based on the maintenance and recovery of <b>montado</b> and <b>natural areas of cork trees and holm oak</b> , interspersed with thickets and extensive cereal production	Local	The conservation goals are possible to quantifie and relate to the case study	Area occupied by each habitat; age structure of forest and montado patches	Data available from COS'90 Map of Land Use	I- readily accessible; There is no information about the age structure

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data
	2) create conditions for the recovery of the Iberian lynx			Area of potential habitat for Iberian Lynx; Area occupied by wild rabbit	Geo-referenced data	I- readily accessible
	3) Conservation of riverside vegetation and water quality			Area occupied by riverside vegetation; Ecological status of the main water lines under the Water Framework Directive;		There isn't cartography of the riverside vegetation, just for the main rivers; The ecological status is not yet defined, maybe on late 2011
MMB Birds Special Protection Area	1) Conservation of steppe birds, the crane, birds of prey and forest birds;	Local	The conservation goals are possible to quantifie and relate to the case study	Population abundance of each target specie; Range of each target specie	Data available for the eight main species: Geo-referenced data; Reports	I- readily accessible
	2) Maintenance of extensive cereal production in the open area based on crop rotation, maintenance of traditional olive groves and the <b>maintenance and recovery of natural forest and montado of cork oak and holm oak</b>	Local	The conservation goals are possible to quantifie and relate to the case study	Area occupied by each habitat; age structure of forest and montado patches	Data available from COS'90 Map of Land Use	I- readily accessible
	3) To ensure improved water quality	Local	The conservation goals are possible to quantifie and relate to the case study	Ecological status of the main water lines under the Water Framework Directive;		The ecological status is not yet defined, maybe on late 2011
<b>Regulation of cork and hoalm oaks</b>	Protection of cork and holm oak stands	National/Local	The conservation goals are possible to quantifie and relate to the case study	Area occupied; age structure of forest and montado patches	Data available from COS'90 Map of Land Use;	I- readily accessible; There is no information about the age structure



Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data
<b>Action Plan for the conservation of Iberian Lynx</b>	1) To conserve habitats favorable to the species and the wild rabbit ( <i>Oryctolagus cuniculus</i> ), maintaining and recovering areas for future action to strengthen population and reintroduction	National/Local	The conservation goals are possible to quantifie and relate to the case study	Area of potential habitat for Iberian Lynx; Area occupied by riverside vegetation; Area occupied by wild rabbit	Geo-referenced data	I- readily accessible, excpet for riverside vegetation
	2) Contributing to the increased populations of rabbit, by carrying out appropriate management practices and integrated into the performances of the Permanent Recovery of Populations of wild rabbits (PRECOB).	National/Local	The conservation goals are possible to quantifie and relate to the case study	Census data of the wild rabbit; Number of management actions	Geo-referenced data; Reports	I- readily accessible, just for MB Site of Community Interest
<b>Municipality ecological fiscal transfers - The Portuguese Local Finances Law</b>		National				
<b>Certification schemes</b>		Local????				
Forestry Stewardship Council	promote responsible management, safeguarding the economic, environmental and social forest areas	Local		Area occupied by cork oak; age structure of forest and montado patches		
WildLife Estates	aims to establish a network of exemplary properties where the management of hunting / fishing have principles of wildlife conservation across Europe	Local		Census data of the wild rabbit; Number of management actions; Number of endangered species		

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data
Market-based instruments directly targeted to land-owners, tenants and land managers (e.g. PES)		Local				
Management Plan	It doesn't exist yet	Local				
Agri-environmental measure	conservation of natural resources through the maintenance of agricultural and forestry systems related to them	Local	The conservation goals are possible to quantifie and relate to the case study	Area occupied by each habitat (extensive cereal, extensive pasture, new "stands"of Quercus sp., riverside vegetation, <i>montado</i> , <i>Quercus forest</i> and mediterranean thicket)	Data available from COS'90 Map of Land Use;	I- readily accessible
				Population abundance of each target specie of Natura 2000; Range of each target specie; Potential area for lynx	Data available for the main species: Geo-referenced data; Reports	I- readily accessible

#### Main ecosystem services under evaluation

- CO2 sequestration
- Soil formation and erosion control
- Water cycling
- Nutrient cycling
- Production of Food (animal and human consumption)
- Cultural services (Spiritual, aesthetic , science and education)
- Provision of habitat

Refuge of biodiversity

## Appendix VI - Northwest Mato Grosso

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data	Quality of the data
				RU1- Resource unit mobility	not applicable		
<p>1) GEF/UNDP Project (stimulating alternative land use systems to compose buffer zones). The project takes advantage of a package of Federal and State bound programs: Anticipated Acquisition Program, by the Ministry of Agriculture, with great impacts on the economic value for Brazil nut, rubber, heart of palm and a set of agroforestry originated products (fruit, fruit pulp, vegetables, small animals products); Rural Sustainable Development Program/Banco do Brasil: funding for AFS and NTFP productive chains.</p>	<p>(1) To reduce deforestation by making NTFP and AFS products competitive against cattle ranching, the major vector for deforestation in the NW Mato Grosso; (2) To increase reforestation using biodiverse, ecologically functional tree assemblages.</p>	<p>UNDP/Mato Grosso State Level (State Environment Secretary)-1st tier; Consortium of municipalities of the Juruena River Valley) 2nd tier; 3tier Municipality and base movements' level (indigenous people, small farmer's syndicates, organizations -NGO's and cooperatives)</p>	<p>High for landscape level (forest remnants in both Protected - Conservation Unist, Indigenous Lands); medium for private areas (lacking registering of owners/land titles still a problem in this region). Better for a significant % of farms already registered at the SLAPR (Environmental License System for Rural Properties); medium to high for AFS systems and restoration areas, as we finished a 63 farms evaluation - a base line for AFS and forest remnants. All data is georeferenced and compatible with the MT State monitoring system.</p>	RU2- Growth or replacement	<p>Available for For AFS and reforestation efforts, considering small farms and their forest remnants. Published sources: Gonçalves et al., 2009; Gonçalves et al., 2010 in prep.</p>	I	<p>Scale: for land use and forest competing activities (e.g. cattle ranching) 60 farms in the 10-150ha range were evaluated in the case study region; high accuracy for Biomass and C estimates; medium resolution (only above ground C measures), covering all the region profile (from near towns to 80km far).</p>
				RU3- Interaction among resources	<p>Criteria for this indicator are connectivity and faunal sighting (qualitative data). More connectivity and less fragmentation is proving to provide "spill over" effects on restoration initiatives, including plant and faunal genetic resources (seeds, polinators, AFS being used as habitat). Also, more quantitative data has been produced (but not totally available) for fauna monitoring in corporation's farms</p>	II	<p>Scale: in process for landscape and farm level; high accuracy for connectivity and fragmentation; medium to low for composition and structure of forests; focused on the proposed buffer zones in private lands, and available for all Indigenous Lands and Conservation Units</p>

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Conservation indicators /SES Resource units	Data available	Accessibility of data	Quality of the data
				RU4- Economic value	Criteria: Cost of opportunity for different land uses considering Gross Income, Demand for Human Labour, Area.		Good quality primary data for a fair sample (60 cases); average to low quality secondary data for the region as a whole; fair to medium accuracy for the samples, medium to low for the secondary data, which covers
				RU5- Size	GIS based data for the evaluation		Good quality primary and secondary data; fair to high accuracy, covers the entire NW MT region.
				RU6- Distinctive markings	?		
				RU7- Spatial & temporal dynamics	GIS based data for land use		The same for the RU5.

1: Program created by the Brazilian Ministry of Agriculture, National Committee of Supply (CONAB). It buys goods from smallholders and extrativists in advance, to rescue the values after the sales are effectuated. It provides cash flow and is responsible for keeping a steady flow of AFS and homegarden goods to public schools and other institutional markets.

## Appendix VII - Mata Atlântica

Policy instrument	Conservation goal	Administrative level of implementation	Potential for verification	Data available	Accessibility of data	Quality of the data
eco-zoning PES squemes	<p>Recovering of 23% of the São Paulo State area</p> <p>Improve the protection of parks and reserves amounting to 7% of the State area</p>	State level	high	<p>BIOTA Program and State Florestal Services reports on the quality of the natural cover of the State</p>	Easy	Good

