WORK REPORT

Johann Heinrich von Thünen-Institut

Becker, Borchers, Wippel
Gesellschaft d.b.R. für Managementconsulting

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

Project FFH-Impact: Implementing the Habitats Directive in German forests

Executive summary of a case study on the economic and natural impacts on forest enterprises

Bernd Wippel, Gero Becker, Björn Seintsch, Lydia Rosenkranz, Hermann Englert, Matthias Dieter, Bernhard Möhring, Josef Stratmann, Johannes Gerst, Marian Paschke and Daniela Riedinger

Institute of Forest Based Sector Economics in cooperation with Becker, Borchers and Wippel consultancy, the Department for Forest Economics and Forest Inventory of the University of Göttingen and the Faculty of Law of the University of Hamburg.

gefördert durch:
Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz

Zentrum Holzwirtschaft
Universität Hamburg

No. 01/2013

Johann Heinrich von Thuenen-Institute
Institute of Forest Based Sector Economics
Visiting address: Leuschnerstr. 91, 21031 Hamburg, Germany
Postal address: Postfach 80 02 09, 21002 Hamburg, Germany

Tel: 040 / 73962-301
Fax: 040 / 73962-399
Email: oef@vti.bund.de
Internet:http://www.vti.bund.de

Institute of Forest Based Sector Economics

in cooperation with

**Becker, Borchers and Wippel consultancy,
Department of Forest Economics and Forest Management, University of Göttingen and the Faculty of Law, University of Hamburg**

Project FFH-Impact: Executive Summary

by

Bernd Wippel, Gero Becker, Björn Seintsch, Lydia Rosenkranz, Hermann Englert, Matthias Dieter, Bernhard Möhring, Josef Stratmann, Johannes Gerst, Marian Paschke and Daniela Riedinger

Work report by the Institute of Forest Based Sector Economics 2013/1

Hamburg, January 2013

Final report

of the project

Topic:

Joint research project: Impacts of nature protection requirements on forestry and the forest sector;

Sub-project: Economic analyses for implementing the Habitats Directive in forests

Donee:

Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forests and Fisheries – Thuenen Institute of Forest Economics

and

Becker, Borchers, Wippel consultancy – bbw.consult.de

Support code:

22017609 and **22005509**

Contract period:

01.11.09 to **31.05.12**

Date of publication: 31.08.2012

Gefördert durch:

Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz

aufgrund eines Beschlusses des Deutschen Bundestages

The project forming the basis for this report was supported by a decision of the German Bundestag through funds of the Federal Ministry for Food, Agriculture and Consumer Protection (BMELV) via the Agency for Renewable Resources (FNR) as project executing organisation of the BMELV for the support programme on renewable resources. The author is responsible for the content of this publication.

Table of contents

List of tables

List of figures

1 Introduction into the research project

The joint research project „Impacts of nature protection requirements on forestry and the forest sector (FFH-Impact)" was carried out by Becker, Borchers, Wippel (BBW) Consultancy, Freiburg, the Forest Research Institute of Baden-Württemberg (FVA), Freiburg, the Johann Heinrich von Thuenen-Institute (vTi), Hamburg, the Department of Forest Economics and Forest Management of the Georg-August University of Göttingen, the Faculty of Law of the University of Hamburg as well as the Institute for Landscape Ecology and Nature Conservation (ILN), Bühl. The two-year project was supported by the Federal Ministry for Food, Agriculture and Consumer Protection (BMELV) via the Agency for Renewable Resources (FNR) as the project executing organisation.

The objective of the research project was to identify the natural and economic impacts of the Habitats Directive on the forestry and timber industry. Two sub-projects should provide information on an efficient implementation for all participating actors in parallel to the implementation process of the Habitats Directive.

The joint-research project was advised by a consulting committee with representatives from the Federal Ministry for Food, Agriculture and Consumer Protection (BMELV), the Federal Ministry for the Environment, Nature Protection and Nuclear Safety (BMU), the Bund-Laender (federal/state) working partnership on forestry of the Conference of the Agricultural Ministers (FCK), the Bund-Laender (federal/state) working partnership on nature conservation, landscape conservation and recreation of the Conference of the Environmental Ministers (LANA), the Federal Agency for Nature Conservation (BfN), the German Forestry Council (DFWR), the German Timber Industry Council (DHWR), the Federation of German Forest Owner Associations (AGDW), the Joint Forestry Committee „German Communal Forests" within the German Association of Towns and Municipalities (DStGB), the German League for Nature, Animal Protection and Environment (DNR) and the Agency for Renewable Resources (FNR).

Within the sub-project „Restricted Forest Management (ReForMa)" (FVA, ILN), the nationwide impacts of types of restrictions through nature conservation measures were modelled. The model-oriented approach was based on the sampling network of the Federal Forest Inventory. Via the instrument of forest yield science modelling, quantifications for forestry were compiled in a general form (top-down-approach).

Within the sub-project „Economic analysis for the implementation of the Habitats Directive in forests" (BBW, OEF, University of Göttingen, University of Hamburg), the impacts of the implementation of the FFH management planning for concrete case study forest enterprises were assessed. The case study based approach relied on management plans as well as on operational objectives and forest enterprise data (bottom-up approach). The focus of the research was on the habitat types 9110 *Luzulo-Fagetum* beech forests and 9130 *Asperulo-Fagetum* beech forests.

The results of the individual work packages of this sub-project have been published in different scientific work reports. In the „Executive Summary" at hand, the core results of the sub-project „Economic analysis of the implementation of the Habitats Directive in forests" are described in a consolidated form. A more detailed description of the methods and the results can be found in the scientific work reports.

We wish to thank all those who by their support and competent advice contributed to the success of the research project. Special thanks from the partners in the joint research project go to the participating case study forest enterprises for providing operating data; to the Laender- and federal state administrators for information on the Laender-specific implementation status of the Habitats Directive; as well as to the forest enterprises and authorities that participated in our online and telephone consultations. Furthermore we wish to thank the members of the consulting committee of the joint research project for their competent advice. Special thanks from the partners of the joint research project go to the Federal Ministry for Food, Agriculture and Consumer Protection (BMELV) for the financial support and to the Agency for Renewable Resources (FNR), the project executing organisation, for the straightforward project handling.

2 Definition of problem and objective

2.1 Implementation of Habitats Directive in forests

The Council Directive 92/43/EEC of May 21, 1992 on „The conservation of natural habitats and wild flora and fauna" (Fauna-Flora-Habitat Directive or FFH Directive or Habitats Directive), together with the Council Directive 79/409/EEC of 2 April 1979 on „the conservation of wild birds" (Birds Directive), put into effect the coherent Europe-wide network of protected areas Natura 2000. They form a „binding, legal basis for nature conservation in the entire European Union"(SIPPEL 2007:5).

The objective of the Habitats Directive is „to maintain and restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest" (92/43/EEC, Art.2). According to Art.1e) conservation status of a natural habitat means „the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species […]".

Within the European Union the Member States are responsible for the implementation of the Habitats Directive. According to Article 3 of the Habitats Directive, the Member States are obligated to set up a coherent ecological network of Special Areas of Conservation (SAC) for the protection of the natural habitat types and habitats of the species listed in Annex I and II. The network of protected areas includes in addition Special Protection Areas (SPA) classified pursuant to the Birds Directive. „For special areas of conservation Member States shall establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans, and appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites" (92/43/EEC, article 6, EUROPEAN COMMISSION 2000). According to Article 6 of the Habitats Directive, the EU Member States have to take measures that avoid a deterioration of the conservation status of natural habitat types and habitats of species as well as significant disturbance of species in the designated areas. The choice of measures is left to the Member States.

The Habitats Directive became national legislation in 1998 and is anchored in §§32 to 38 in the Federal Law on Nature Protection. The Laender are mainly responsible for the implementation and firm establishment of the measures required by the Habitats Directive. The Laender can establish management plans[1] for the individual FFH areas or other appropriate (statutory, administrative and/or contractual) measures can be taken securing the conservation objectives.

The Laender have chosen differing approaches to secure the FFH areas and measures (cf. Table 1). For the establishment of management plans by the Laender, the conservation purpose and more generally formulated conservation objectives and requirements of the Habitats Directive have to be further concretised in terms of appropriate requirements, prohibitions and measures for the respective FFH area (BNatSchG § 32 (3)). Therefore one can revert to already existing plans, like, e.g., regulations for landscape conservation areas (BNatSchG §32 (5)).

[1] This concerns for example management plans, preservation and development plans, action plans or concepts for immediate action. For simplification these designations are summarised in the following text under the term „management plans" or „FFH management plans".

Table 1: Securing of FFH areas (according to SIPPEL 2007)

Securing of FFH areas	Laender (examples)
Statutory (Designation of nature conservation area or landscape conservation area)	North Rhine-Westphalia, Lower Saxony, Brandenburg, Saxony-Anhalt
Statutory (Inclusion of the conservation category Natura 2000 in the Nature Protection Law on Laender level)	Rhineland-Palatinate, Saarland
Administrative (Management plans)	Baden-Württemberg, Bavaria, Hesse, Mecklenburg-West Pomerania, Saxony (legally binding in state forests, voluntary commitment in communal forests)
Contractual (Contract based nature protection scheme)	Bavaria, Hesse (private and communal forests)
Contractual (Single area payments)	Baden-Württemberg (private forests)

According to the EU, interested parties are to be involved in the planning of the measures as early as possible. Basically the establishment of the FFH management plans is administered by the regional Nature Conservation Authorities. For forest areas the FFH management plans are however partly established by or in cooperation with the forest administrations on Laender level (SIPPEL 2007).

A total of 67% of the forest area in Germany is subject to a conservation category of the Law on Nature Protection. There are numerous overlaps between the different categories of conservation areas. The most prominent category of conservation areas for forests in Germany are landscape conservation areas with 47%, followed by nature parks with 38%. Natura 2000 areas (i.e., FFH areas and bird conservation areas) already rank third with a share of 24% of the entire forest area in Germany. A lesser portion is allocated to categories of conservation areas with intensive conservation status (POLLEY 2009:76).

According to up-to-date data of the FEDERAL AGENCY FOR NATURE CONSERVATION (BFN, 2012) 1.8 mill. ha of the 11 mill. ha of German forest area are designated as FFH areas. A total of 18 different forest habitat types are to be found in Germany. The area specific FFH management planning on the Laender level is still underway and its implementation is at different stages. Whereas the management planning for all FFH areas with forest areas has been (to a large extent) completed in some of the Laender (e.g., Saxony, status: December 2011), to date management planning is only in part available for FFH areas in other Laender. (e.g., Brandenburg or Rhineland-Palatinate, status: December 2011) (ROSENKRANZ et al. 2012: 21ff.).

Around 817,000 ha, respectively 46 % of the FFH forest area were identified as forest habitat types. The remaining 54 % serve as filling area or buffer zone. They feature either no special conservation status or they serve as areas for the protection of specific flora and fauna as well as areas for the protection of other habitat types including wells, rocks and oligotrophic grassland (cf. SIPPEL 2007).
With around 586,000 hectares, the five beech habitat types cover around 72 % of the total forest habitat type area (Table2). The most prominent part is taken by the two habitat types 9110 *Luzulo-Fagetum* beech forests and 9130 *Asperulo-Fagetum* beech forests with around 568,000 ha beech forests allotted to these. Prior to this these managed forests were not subject to a particular conservation status under the Law on Nature Protection. They thus represent, concerning the area, the most important protection entities among the forest habitat types.

According to SIPPEL (2007) around 5 % of the forest area in FFH areas is allotted to federal forest and 46 % to Laender forest. The share of communal forest amounts to 21 % and private forest to 28 %.

Table 2: Forest habitat types in Germany (BFN 2012)

Habitat type-code	Habitat type description	Area in ha	%-share
Sea dunes		**3,565**	**0.4%**
2180	Wooded dunes of the Atlantic, Continental and Boreal region	3.565	0.4%
Beech forests		**585,967**	**71.8%**
9110	*Luzulo-Fagetum beech forests*	240,423	29.4%
9120	Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion roboripetraeae* oder *Ilici-Fagenion*)	481	0.1%
9130	*Asperulo-Fagetum* beech forests	327,514	40.1%
9140	Medio-European subalpine beech woods with *Acer* and *Rumex arifolius*	1,581	0.2%
9150	Medio-European limestone beech forests of the *Cephalanthero-Fagion*	15,968	2.0%
Oak forests		**100,276**	**12.3%**
9160	Sub-Atlantic and medio-European oak or aok-hornbeam forests ot the *Carpinion betuli*	33,557	4.1%
9170	*Galio-Carpinetum* oak-hornbeam forests	49,157	6.0 %
9190	Old acidophilous oak woods with *Quercus robur* on sandy plains	17,462	2.1 %
91G0	Pannonic woods with *Quercus petraea* and *Carpinus betulus*	100	0.0 %
Alluvial forests		**62,537**	**7.7 %**
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)	48,184	5.9 %
91F0	Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia,* along the great rivers (*Ulmenion minoris*)	14,353	1.8 %
Coniferous forests		**24,416**	**3.0 %**
91T0	Central European lichen scots pine forests	0	0.0 %
91U0	Sarmatic steppe pine forests	0	0.0 %
9410	Acidophilous *Picea* forests of the montane to alpine levels (*Vaccinio-Piceetea*)	23,201	2.8 %
9420	Alpine *Larix decidua* and/or *Pinus cembra* forests	1,215	0.1 %
Bog forests		**26,101**	**3.2 %**
91D0	Bog woodland	26,101	3.2 %
Ravine forests		**13,758**	**1.7 %**
9180	*Tilio-Acerion* forests of slopes, screes and ravines	13,758	1.7 %
Total		**816,620**	**100.0 %**

With the completion of FFH management plans, which concretize the abstract conservation and development objectives of the Habitats Directive for the individual objects of protection in the FFH areas in operational plans, the real impacts on forest management and timber buyers are now becoming assessable. Most notably for the forest enterprises that generate the majority of their income by timber use, and for the users of round wood, the natural and economic impacts resulting from the FFH regime for forest management are of interest. Until now, understanding of these factors has been insufficient.

2.2 Objective of the research project

Against this background, the sub-project „Economic analysis for the implementation of the Habitats Directive in forests" pursued the objective, based on a case study approach, to assess the natural and economic impacts of the implementation of the FFH planning of measures in the habitat types 9110 *Luzulo-Fagetum* beech forests and 9130 *Asperulo-Fagetum* beech forests for concrete forest enterprises. Thus, for the first time, reliable information on the impacts can be provided in the ongoing implementation process of the Habitats Directive in forests, aiming at an efficient further implementation. In detail, six main research objectives, respectively work packages, were pursued within the research project:

1. Comparative analysis of the FFH implementation process in the Laender,
2. Comparative analysis of management planning in the Laender,
3. Nationwide overview on how forest owners are affected in FFH areas,
4. Analysis of the natural and economic impacts of the Habitats Directive on the basis of case studies by forest enterprises,
5. Assessment of impacts on the regional supply of round wood users as well as
6. Property rights related assessment of forestry activities/use.

3 Results from the work packages

The main results of these six work packages are listed below:

3.1 Comparative analysis of the FFH implementation process in the Laender

The following objectives were pursued with the work package „Comparative analysis of the FFH implementation process in the Laender":

- Overview on implementation status of the FFH management planning and
- synoptic analysis of the assessment of the conservation status in the Laender.

The competent bodies for the FFH management planning in forests in all Laender were contacted in December 2009 and questioned on the implementation status on the basis of an interview guideline. Based on this information, Laender level profiles on the implementation status were developed. As the implementation of the Habitats Directive is ongoing, the survey was updated in early 2011 and early 2012.

A comprehensive presentation of results of this work package can be found in the work report by ROSENKRANZ et al. (2012).

3.1.1 Implementation status of the FFH management planning in forests

The implementation status of the FFH management planning in forests differed significantly in the Laender at the time of the last survey. Only Saxony has concluded nearly all planning. For forests owners, however, only the completion of the management planning will show the exact location and size of the habitat types and species distribution and thus the security in regard to avoiding a deterioration of the conservation status. In addition, the exact knowledge of the location of the habitat type area is required in some Laender for the application of compensation measures.

The management plans in the Laender differ concerning their availability, their level of completion and their binding character for the different types of forest ownership. Even the compensation instruments differ significantly between the Laender. Thus, forest owners with areas in several Laender must attune to different systems of FFH management planning.

There is a different level of accessibility of the management planning in the Laender. The extremes lie between a complete disclosure of management plans and cartographical

material in the Internet (e.g., Baden-Württemberg) on the one hand, and the complete lack of accessibility for third parties (e.g., Schleswig-Holstein) on the other hand.

Also, the safe-guarding of the FFH areas and the binding character of the management planning are administered differently in the Laender and have different levels of transparency. From this, different legal framework conditions for forest management in FFH areas in the individual Laender can be derived (cf. Chapter 3.7).

Furthermore there are considerable differences in the methods for the assessment of the conservation status. In some Laender no on-site visit is required. The assessment of the conservation status is carried out on the basis of existing data in forest inventories or of the mapping of forest biotopes.

The compensation payments for management restrictions are administered very differently and are to some extent not completely developed. Depending on the Bundesland, the support schemes for the implementation of conservation and development measures are voluntary (contract based nature protection scheme, e.g., Hesse) or based on obligation and compensation (lump-sum compensation per hectare, e.g., Baden-Württemberg). With regard to the support for FHH measures, some of the Laender draw on the co-financing of the EU. These support schemes are limited by contract period constraints and minimum application periods; the support periods can be limited to five years. Alternative compensation instruments for a contract based nature protection scheme envisage, for instance, the permanent acquisition of standing or fallen dead wood via a one-time payment.

The obligation of management plans is a challenge for forest owners. Some Laender make the management plans and the therein formulated measures as compulsory also for private forest owners. In a number of Laender, however, only public forests are obligated. The management plans provide little assistance for assessing the legal obligation for a concrete area.

3.1.2 Assessment of the conservation status of forest habitat types

The nature protection measures in the FFH management plans, which can cause natural and economic impacts on forest management, are determined based on the assessment schemes of the conservation status. Because of the significance of the assessment of the conservation status, the assessment matrices of the Laender were compared synoptically for the habitat types 9110 *Luzulo-Fagetum* beech forests and 9130 *Asperulo-Fagetum* beech forests within the research project.

Via the Bund-Laender working partnership „FFH obligation to report: Forest" trans-regional recommendations for the implementation of the Habitats Directive in forests have been developed on the basis of the „General Assessment Scheme on the Conservation Status of Habitat Types" of LANA and after consultation with the working partnership on forestry of the Conference of the Agricultural Ministers (FCK[2]). Some of these recommendations cover assessment schemes for the forest habitat types of Annex I of the Habitats Directive.[3] The FCK/LANA-recommendations on the assessment of the conservation status of the FFH habitat types 9110 *Luzulo-Fagetum* beech forests and 9130 *Asperulo-Fagetum* beech forests are described in Table 3 (BFN 2006).

The assessment of the conservation status of forest habitat types takes place in a two step process (cf. Table 3). At first the three criteria „habitat structures", „habitat typical species inventory" and „disturbances" are assessed individually with the values A,B or C on the basis of the conservation status of their respective parameters. The assessment of the three equivalent criteria will then be summarised to one total value (BURKHARDT et al. 2004). The total value A indicates a very good conservation status, B indicates a good conservation status and C indicates a medium to bad conservation status.

[2] Members: representative of the Supreme Forest Authorities of the Laender
[3] cf. see also: www.bfn.de/0316_bewertungsschemata.html and www.bfn.de/0316_akwald.html

Table 3: FCK/LANA-recommendation on the assessment of the conservation status of the FFH habitat types 9110 *Luzulo-Fagetum* beech forests and 9130 *Asperulo-Fagetum* beech forests (translation from BFN 2006)

Criteria/parameters	A	B	C
Habitat structures	**Excellent occurrence, i.e.,**	**Good occurrence, i.e.,**	**Medium to bad occurrence, i.e.,**
• **Forest development phases/ spatial pattern**	Many forest development phases (>3); occurrence of the maturity stage on a minimum percentage of the area of the assessment unit as determined by the Laender	Minimum 2 forest development phases; occurrence of the maturity stage on a minimum percentage of the area of the assessment unit as determined by the Laender	In case A or B do not apply
• **Biotope- and old growth trees**	> = 6 pieces per ha	> = 3 pieces per ha	< 3 pieces per ha
• **Dead wood**	> 3 pieces per ha of fallen and standing dead wood	> 1 piece per ha of fallen or standing dead wood	< = 1 piece per ha of fallen or standing dead wood
Habitat typical species inventory	**Existent, i.e.,**	**Widely existent, i.e.,**	**Only in parts existent, i.e.,**
• **woody species**	Percentage of habitat typical woody species > = 90%	Percentage of habitat typical woody species > = 80%	Percentage of habitat typical woody species > = 70%
• **ground vegetation layer** (incl. cryptogams)	Species combination in the ground vegetation layer is typical for the habitat	Habitat typical species combination in the ground vegetation layer is slightly changed	Habitat typical species combination in the ground vegetation layer is strongly changed
• **Fauna**	The occurrence of valuable species can lead to an upgrading		
Disturbances	**Low, i.e.,**	**Medium, i.e.,**	**Strong, i.e.,**
• **damage to soil and water balance** • **damage to forest vegetation and structure** • **occurrence of habitat atypical indicator species** • **fragmentation and disturbance**	No identifiable changes in the habitat typical soil conditions, structures and species composition	No substantial changes in the habitat typical soil conditions, structures and species composition	Substantial changes in the habitat typical soil conditions, structures and species composition

The differences in the definition and determination of the threshold values at the assessment of the conservation status in the individual Laender reflect, as much as the management planning and its implementation, the federal system in Germany.

It must be challenged why, among the Laender, considerably different threshold values exist in some of the parameters for the same conservation object, leading most probably to differing impacts on the forest enterprises (e.g., beech habitat type: conservation status A: dead wood threshold in Saxony >3 pieces per hectare vs. Brandenburg > 40m³ dead wood per hectare). Concerning dead wood the requirements may tend to be higher in Laender with specifications in cubic metres than in Laender with a certain number of trees (e.g., threshold value A in Bavaria: more than 3 pieces fallen or standing dead

wood per hectare vs. threshold value A in Hesse: more than 15 m³ per hectare or Brandenburg: more than 40 m³ per hectare). In the Laender with a high level of detail in the assessment parameters it is in addition questionable whether they can be collected at a justifiable cost (e.g., disturbance by „pollution (oil, PAH[4], carbon black, dusts, PPA[5], salts)").

As a main result of this work step it can be observed that the assessment schemes and threshold values for both of the beech habitat types differ considerably between the Laender and thus identical habitats could be assessed with a differing conservation status. Forest owners with areas in different Laender consequently need to be prepared not only for different systems concerning FFH management planning but also for differing requirements for ensuring the conservation status.

3.2 Comparative analysis of management planning in the Laender

Numerous planning measures in FFH areas can be theoretically derived based on the assessment matrices of the Laender for both habitat types 9110 *Luzulo-Fagetum* beech forests and 9130 *Asperulo-Fagetum* beech forests, which in turn can have natural and economic impacts on forest enterprises. Against this background the work package „comparative analysis of FFH management planning in the Laender" pursued the following objective:

- To obtain an overview from the Laender on the actual FFH management planning in both 9110 *Luzulo-Fagetum* and 9130 *Asperulo-Fagetum* beech forests and
- To facilitate a classification of the FFH planning of measures in the case study forest enterprises (cf. Chapter 3.4).

For this work step up to five „typical" FFH management plans with planning of measures for 9110 *Luzulo-Fagetum* and 9130 *Asperulo-Fagetum* beech forests were requested from the individual Laender. A total of 44 management plans from the Laender could be analysed within this work package. A comprehensive presentation of results of this work package can be found in the work report by ROSENKRANZ et al. (2012).

3.2.1 Ideal typical structure of FFH management plans

Ideally the FFH management plans of the Laender are typically structured into five sections.

In the first section, the legal basis of the FFH area according to European, Federal State and Laender level is presented. In addition explanations can be found on the protective purpose and the conservation status, the importance of the FFH area as well as on safeguarding the FFH area with further conservation categories (e.g., landscape conservation area, nature protection area). In the introduction, explanations can also be found on the geographical, soil and climate conditions of the FFH area, on the ownership structure and the previous use.

In the second section the habitat types and species that occur in the FFH area and their respective conservation status are presented.

In the third section the conservation and development objectives are listed and the conservation and development measures derived for the habitat types and species.[6]

In the fourth section, funding measures and competencies, the participation of the public and the land owners at the management planning as well as necessary monitoring measures to comply with the reporting obligations are described.

[4] Polynuclear aromatic hydrocarbons
[5] plant protective agent
[6] As there are no consistent definitions and terminologies for conservation and development measures, they were defined as follows in the research project „FFH-Impact": Conservation measures describe the measures to maintain the current conservation status. Development measures on the other hand are measures to improve the conservation status or to enlarge the habitat type areas in the FFH area.

The fifth ideal typical section of the management plan is the annex. Here one can find, e.g., cartographic illustrations of the FFH management planning on management unit level or data sheets.

The extent of the management plans in the Laender ranges between below 20 pages (e.g., in North Rhine-Westphalia) and up to 300 pages (Baden-Württemberg, Saxony). Formally the FFH management planning often draws on regulations for, e.g., nature protection areas or landscape conservation areas (ELLWANGER et al. 2006).

There are differences in the structure of the FFH management plans between as well as within the Laender. Analysing the management plans it became apparent that only the management plans in Baden-Württemberg, Hesse, Mecklenburg West Pomerania and Saarland feature the same structure. The structure of management plans in the other Laender differs in parts considerably from each other. This could be problematic for forest owners who own forests in several FFH areas in different Laender. Furthermore it has to be questioned whether a 300-page planning act offers guidance in the ongoing management operations of a forest enterprise.

3.2.2 Planning of measures in beech habitats

On the basis of the analysed FFH management plans in the federal territory, the conservation of structurally diverse and close to nature *Luzulo-Fagetum* and *Asperulo-Fagetum* beech forests with their habitat-typical fauna and flora, different development stages and age phases and varying soil conditions as well as the conservation and development of a high percentages of old-growth trees, dead wood, nesting and biotope trees can be identified as main conservation objectives for both beech habitat types.

The most common conservation measure for beech habitat types is, in the first place, the conservation, respectively the increase, of habitat trees, dead wood and (islets) of old-growth trees. Of great importance are, furthermore, management plannings for the conservation of habitat-typical woody species, such as for example through the regeneration and promotion of habitat-typical woody plants, protection of rare local tree species (e.g., wild service tree) as well as the gradual removal of non-habitat typical tree species, in particular Douglas fir and common spruce. In addition, a sufficient share of trees has to be maintained in the maturity stage.

In matters of the silvicultural treatment the close-to-nature silviculture is specified as conservation measure in some Laender (e.g., Baden-Württemberg, Bavaria, North Rhine Westphalia). In the management plans reference is partly made to forest management principles (guidelines and decisions) of the public forest (e.g. Mecklenburg West Pomerania) and these are recommended for the other forest owner categories. Target diameter felling on single tree basis or group selection felling are often determined as a regeneration technique. In both beech habitat types, the natural regeneration of habitat-typical species is given priority compared to artificial regeneration. With a view to harvesting, techniques promoting soil protection are to be applied. According to the management planning, the soil outside the forwarding trails is not to be cruised.

No development goals are named for the two habitat types 9110 *Luzulo-Fagetum* and 9130 *Asperulo-Fagetum* beech forests in the analysed FFH management plans of the Laender Schleswig-Holstein, Mecklenburg West Pomerania and Bavaria. In the remaining Laender the most commonly used development goals are the expansion of the habitat areas, the increase in percentage of dead wood and habitat trees as well as the increase in percentage of habitat-typical tree species. For this reason the development goals and measures are in parts congruent with the conservation goals and measures.

Quantitative and operational information on the planning of management measures are given in the management plans mainly with a view to old-growth trees, dead wood and habitat trees (e.g., Mecklenburg West Pomerania, Lower Saxony, North Rhine Westphalia). These are in parts described in detail for the area or even for specific stands. Other measures are predominantly not referred to in detail to the area, but apply non-specifically to the whole habitat type area (e.g., Bavaria, Baden-Württemberg). Furthermore numerous measures are described in a qualitative way (i.e., without operational

steering mechanisms for forest management). In some Laender the reference to the area for the planning of management measures is completely missing.

Detailed plans for protected fauna of the Habitats Directive are specified in the management plans of the Laender Baden-Württemberg, Bavaria and Saxony. In the other Laender measures for Annex II and IV species are in fact also mentioned, but they often play a subordinate role in the analysed management plans. Conservation measures for habitat types are, e.g., described at length in a continuous text, whereas the planning of management measures for fauna is often displayed briefly in tabular form.

In most of the Laender the focus of the planning of management measures is on forest habitat types (e.g., Bavaria, Saarland, North Rhine Westphalia and Mecklenburg West Pomerania). This may be attributed to the fact that the planning of measures for habitat types is more practicable than the planning of measures considering the individual and differing requirements of different species on the same (habitat) area.

3.3 Nationwide overview on the affectedness of forest owners in FFH areas

Given that at the beginning of the research project it was unknown whether the FFH planning of measures has actually already had an impact on forest enterprises and as the case study results had to be classified (cf. chapter 3.4), two nationwide online-surveys were conducted. Thus, the following objectives were pursued within the work package „Nationwide overview on the affectedness of forest owners in FFH areas":

- Nationwide overview on the general affectedness of forest owners in Natura 2000 areas as well as
- Nationwide overview on the impacts of forest management in FFH areas.

The first online-survey was conducted between May and June 2010 and allowed for the analysis of replies of 339 private and communal forest owners nationwide. The results of this online-survey have been published for the federal territory and for selected Laender by WIPPEL et al. (2010), WIPPEL & SEINTSCH (2010a), WIPPEL & SEINTSCH (2010b), SEINTSCH et al. (2010a) and SEINTSCH et al. (2010b).

The more extensive second-online survey was conducted between April and May 2012. With this survey analysable replies of 211 private and communal forest owners are made available. The results of 89 forest enterprises with beech habitat types as the most area significant habitat type in regard to managed FFH areas have been published by SEINTSCH et al. (2012:80ff.)

3.3.1 Nationwide overview on the fundamental affectedness of forest owners in Natura 2000 areas

One of the main results from the survey conducted in mid 2010 was that only 23 % of the consulted forest enterprises stood in the phase of the operational implementation of the management planning and for another 26 % the FFH management plans were to be elaborated. Yet, in this context, it has to be borne in mind that the bans on deterioration and disturbance according to 33 §1 BNatSchG (Federal Nature Conservation Act) already have an impact on forest management in FFH areas as soon as the area is designated.

A total of 17 % of the forest enterprises felt strongly to very strongly affected by the FFH management planning, 42 % felt they were moderately affected and 27 % felt they were to a small extent or not at all affected in their forest management. In reply to the question of the affectedness by individual planning of management measures the forest enterprises listed constraints concerning the tree species selection and regeneration (63 %); selective management ban, e.g., to leave habitat trees (57 %); restraints on the execution of tending strategies and thinning (33 %); management ban on small areas, e.g., to leave islets of old-growth trees (33 %); restraints concerning the time of harvesting (32%); increased effort for securing work safety (20 %), as well as prolongation of the production cycle on small areas, e.g. islets of old-growth trees (16 %).

Two thirds assumed that the planning of measures with view to nature protection involves a decrease in profits and extra costs for the forest enterprise. From those participants in the survey who expect negative financial impacts, 15 % estimate the financial impact to be below 10 €/ha/annum, 45 % between 10 and 50 €/ha/annum, 20 % between 50 and 100 €/ha/annum and 16 % estimate the financial impact to be over 100 €/ha/annum.

3.3.2 Nationwide overview on the impacts of forest management in FFH areas

Based on the results of the case study analysis another online-survey was carried out on the impacts of forest management in FFH areas. The following information refers to forest enterprises with beech habitat types as the most area significant habitat type with a view to managed FFH areas.

In the second online-survey, the percentage of forest enterprises in the operational implementation phase of management planning (concrete rules, measures) with a share of 21 % was low, too. In the forest enterprises the conservation or increase of the share of dead wood (55 %); the conservation or increase of the share of old-growth trees (49 %); the conservation or increase of habitat trees (47%); the maintenance of close-to-nature forest management (43 %), as well as the preservation of habitat typical forest ecosystem through, e.g., the preservation of the current percentages in tree species and restrictions on the introduction of non-habitat-typical tree species (39 %) were stated as the most common FFH measures.

In addition the operational impacts through the implementation of the FFH planning of measures were enquired. Half of the forest enterprises rated the designation of old-growth and biotope trees or islets of old-growth trees as a loss of productive forest area. On average this was specified with 13 % of the operational FFH area. Also half of the consulted forest enterprises, with beech habitat types as most area significant habitat type on the operational FFH areas, rated measures for the conservation of the natural forest habitats as a limitation for the species selection. A production time beyond the regular rotation cycle for the conservation of mature stands was stated by one fifth of the forest enterprises. The planning of measures for the conservation of dead wood stocks was rated as a restriction by half of the enquired forest enterprises and was estimated to reduce the amount of felling by one twelfth (sales volume). One third believed that the FFH planning of measures results in increased extraction costs through additional measures for work safety in a range of 3 €/harvested m³. Additional day-to-day administrative costs for the operational management in FFH areas were stated by one third of the enquired forest enterprises and were estimated on average with 12 €/hectare. In a summarised reflection, the actual decrease in profits and extra costs on FFH areas were rated at 26.51 €/ha/annum on average. The range reached from 0 €/ha/annum up to 200 €/ha/annum.

The forest enterprises were complementarily asked which compensation instruments they would favour for management restrictions in FFH areas. To this question 56 % indicated their preference for an all-inclusive lump-sum per area covering all FFH measures, 26 % opted for a contract-based nature protection scheme with an individualised design of the level of compensation per forest enterprise and 9 % indicated a credit system of ecopoints for FFH measures (ecopoint account).

3.4 Analysis of the natural and economic impacts of the Habitats Directive on the basis of case study forest enterprises

The main research goal and methodical basic concept of the research project „FFH-Impact" was to identify the natural and economic impacts of the implementation of the planning of measures in the management unit „area of beech habitat type" of real forest enterprises. In detail the following research objectives were pursued with this work package:

- Development of an instrument for the assessment of changes in the natural assets and cash flows through FFH planning of measures,
- Estimation of the long-term natural and economic impacts of the implementation of FFH planning of measures for the FFH habitat types 9110 *Luzulo-Fagetum* and 9130 *Asperulo-Fagetum* beech forests,
- Evaluation of changes in felling, contribution margins, cash value and capitalised value through FFH planning of measures, as well as
- Further development of the assessment concept for management constraints in forestry by MÖHRING & RÜPING (2006) as a feasible model for the practical assessment of management constraints in forestry in FFH areas.

For the case study analysis 21 private, communal and state forest enterprises could be enlisted from the six Laender Baden-Württemberg, Bavaria, Hesse, Mecklenburg West Pomerania, Lower Saxony and North Rhine Westphalia. Two references were formed for the identification of the natural and economic impacts of planning of measures in the management unit „beech habitat type area", based on the operational objectives and management concepts of the case study forest enterprises. With the forest management reference „Status Quo", a continuation of the forest management without FFH planning of measures was imaged, which has led to the status of the beech habitats at the point of data collection. With the reference „Enterprise Objective" enterprise-specific management objectives were illustrated, insofar as they differed from the Status Quo. This reference was meant to illustrate the restricted freedom of action with view to forest management through FFH planning of measures, the execution of which is, in line with legal requirements, possible for forest enterprises outside of FFH areas.

As operational impacts of FFH planning of measures only planning of management measures were assessed, which, based on operational objectives and their implementation into forest management, were rated as restrictions by the case study forest enterprises. As the operational objectives were congruent with the FFH planning of measures in one case study forest enterprise no impacts were assessed for this particular forest enterprise. The individual planning of measures was summarised as forest management under the FFH regime („FFH-Regime") and compared with the references. Here the difference in felling and silvicultural contribution margins between forest management under the FFH regime and the two references was determined.

The conservation status of both beech habitat types was rated with value level A (excellent) or value level B (good) in the case study forest enterprises. Therefore only the conservation planning of management measures (safeguarding the conservation status) was considered as compulsory by the case study forest enterprises and included in the assessment. Planning of measures for the achievement of development objectives (improving of the conservation status) were regarded as voluntary and not assessed.

The silvicultural contribution margin corresponds here with the regular contribution margin I used in forestry (wood harvest-cost free profit) minus costs for cultivation and thinning. Based on the operational objectives and enterprise specific data input the natural and economic impacts of the respective FFH planning of measures per hectare beech forest habitat type area were modelled for the next 200 years with the Excel-based STRUGHOLTZ-ENGLERT-simulation model.

Based on the results from ten out of 21 analysed case study forest enterprises, the annuity model (MÖHRING & RÜPING (2006)) was at the same time further developed as an „assessment concept for management constraints in forestry".

The documentation of the results of this work package can be found in the work report by SEINTSCH et al. (2012)

3.4.1 Affectedness of forest operations and economics by FFH planning of measures

The planning of measures in both beech habitat types identified in the context of the analysis of 44 nationwide FFH management plans (cf. Chapter 3.2) were likewise found in the area-specific management plans of the case study forest enterprises. As one of the main results of the analysis of the case study forest enterprises it has to be pointed out,

that, from the wide spectrum of planning of measures in the FFH management plans, mainly three FFH planning of measures were rated as constraints for forest management by the case study forest enterprises:

- Designation of habitat- and biotope-trees,
- Preservation of an adequate percentage of stands in the maturity stage as well as
- Securing the share of habitat typical tree species.

Furthermore additional ongoing administrative costs were identified as having an impact for the forest management in FFH areas.

Designation of habitat- and biotope-trees

The designation and the conservation of habitat- and old-growth trees were rated as a permanent loss of productive area by 20 of 21 case study forest enterprises. This loss of productive forest area was rated by the majority as between 3 to 4 % of the habitat type area. A maximum value of about 10 % was reached in one case study forest enterprise. In connection with this planning of measures (as well as the preservation of an adequate percentage of mature stands) a higher risk for people was estimated through dead wood in treetops as well as decay and consequently higher costs for harvesting and liability for premises. The increased additional costs for extraction were indicated in the range between 1.5 €/harvested m³ up to 2 €/harvested m³.

Preservation of an adequate percentage of stands in the maturity stage

Two effects of impacts through the planning of measures for the preservation of an adequate percentage of mature stands were stated by the case study forest enterprises. On the one hand a postponement of the harvesting of mature stands because of a low share of old trees was mentioned, which equals a prolongation of the rotation period and can lead to a devaluation of the mature timber through, e.g., decay and red heartwood, and, on the other hand, a limitation of options to shorten existing rotation periods as a reaction to changing framework conditions.

Securing the share of the habitat typical tree species

Furthermore FFH planning of measures for the conservation of the habitat typical species inventory were rated as restrictions for the operational achievement of objectives by 14 of 21 case study forest enterprises. In the case study forest enterprises immediate effective costs for thinning and pruning could be derived from the occurrence of non-habitat typical natural regeneration as well as the medium- to long-term lasting constraints for the species selection in the succeeding stands. The operational simulations have shown, that through the introduction of productive tree species (e.g., Douglas fir) in beech habitats, the long term operational result can be significantly improved – taking as a basis the current economic framework conditions. Here the default risk of the different tree species was taken into account.

Additional ongoing administrative costs

As further impacts on forest management in FFH areas additional ongoing FFH administrative costs for the enterprises of on average 2 €/ha/annum was identified, e.g., for coordination with the lower Nature Conservation Authorities prior to management measures or for the selection and marking of old-growth and biotope-trees.

3.4.2 Impacts of FFH planning of measures on the case study forest enterprises

The economic impacts of the FFH planning of measures were at first assessed without consideration of an interest rate. The consideration was chosen to illustrate changes of cash flows on the time axis. The free availability of capital implied by this is however unrealistic. The non-consideration of interest rates would equate with forest enterprises that had unlimited financial means at their disposal.

In the context of the dynamic observation changes in cash value and differences in capitalised value were calculated over a period of 200 years. For the calculation of the cash value the future cash flows (silvicultural contribution margin) were discounted to the present date. In contrast to the calculation of the cash value the determined capitalised value takes into account the discounted value of the forest stands of the last simulation period in addition to the discounted net cash flows. For this purpose a calculative interest rate of 1.5 % was assumed.

The difference of the simulation results between forest management under the „FFH-Regime" and the management references „Status Quo" and „Enterprise Objective" were calculated. To be able to compare the natural and economic impacts in the case study forest enterprises with differing shares in areas of beech habitat types on the basis of FFH planning of measures, the differences were shown in felling amount and silvicultural contribution margin per hectare.

Considering the five-year calculation period of the STRUGHOLTZ-ENGLERT-Model, the results show considerable fluctuations, which are subject to the age class distribution and size of the operational area of beech habitat type, complicating an interpretation of the results. For the presentation of the results, 20-year periods were therefore used. The illustration of an average of 20 years was used to smooth the simulation results and is a method commonly accepted for comparative considerations of forest inventories.

The difference in felling and the silvicultural contribution margin were calculated for each of the twenty-year periods and on average for the 200 years period under consideration.

Natural and economic impacts to the reference „Status Quo"

Over the 200-year period under consideration, the overall felling rate on the habitat type area of the 21 forest enterprises is reduced to a range of between 0 and 1.2 harvested m³/ha/annum. Across all case-study forest enterprises, the reduction of the harvesting rate amounts to 0.4 harvested m³/ha/annum in its arithmetic average whereas the median lies at 0.33 harvested m³/ha/annum in the 200 years simulation period. The fluctuations of the differences of harvesting quantities in the individual forest enterprises can be significant in the course of those 200 years due to age class distribution. The changes in the overall felling rate range between -2.7 harvested m³/ha/annum and +1.9 harvested m³/ha/annum. For some of the analysed forest enterprises this means that with an implementation of the FFH planning of measures the felling rate can temporarily be higher than continuing with the forest management according to the „Status Quo".

The following chief causes can be identified for these fluctuations in the difference in felling. The reduction of the felling rate is on the one hand caused by the loss of productive forest area through the designation of habitat trees. This FFH measure described as „small scale non management" reduces the annually utilisable amount of timber. In addition, in some case study forest enterprises an FFH conditional prolongation of the rotation period takes effect in order to preserve the share of old trees. Thus, beech cannot be harvested at the previously scheduled age but its harvest is time-delayed. As the increment in volume for beech within the considered production periods (rotation cycles of up to 200 years) is still considerable also in higher age classes[7], the prolongation of the production period at first only postpones the time of harvesting. The harvesting volume will increase because of the continuous high increment rate of old beech stands, but will incur at a later date. Yet, here the processes of the devaluation of the stem wood through unusual production cycles are to be considered from a forestry point of view.

The silvicultural contribution margin, including the ongoing administrative costs, reduce to a range between 0 up to 139 €/ha/annum in a 200-year period. Across all forest enterprises the difference of the contribution margin amounts in average to -29 €/ha/annum and the median lies at -22 €/ha/annum. The level of changes of the contribution margin of forest management under the FFH-Regime compared to the reference „Status Quo" lies for all forest enterprises in a range between -197 €/ha/annum up to +46 €/ha/annum (cf. Figure 1).

[7] In contrast to many other tree types the beech still has a high increase in mass at a high age

Considering the ongoing administrative costs, a reduction of the cash value of an average 1,958 €/ha (median 1,491 €/ha) can be calculated for the reference „Status Quo". For the forest management under the „FFH-Regime" and the forest management reference „Status Quo" differences in capitalised value of in average 1,944 €/ha (median 1,434 €/ha) can be calculated considering the ongoing administrative costs. The highest difference of the capitalised value between „Status Quo" and „FFH-Regime" lies at 9,210 €/ha. These differences in capitalised value over the 200-year period under consideration can be interpreted as a loss in value for the operational unit „beech habitat type area".

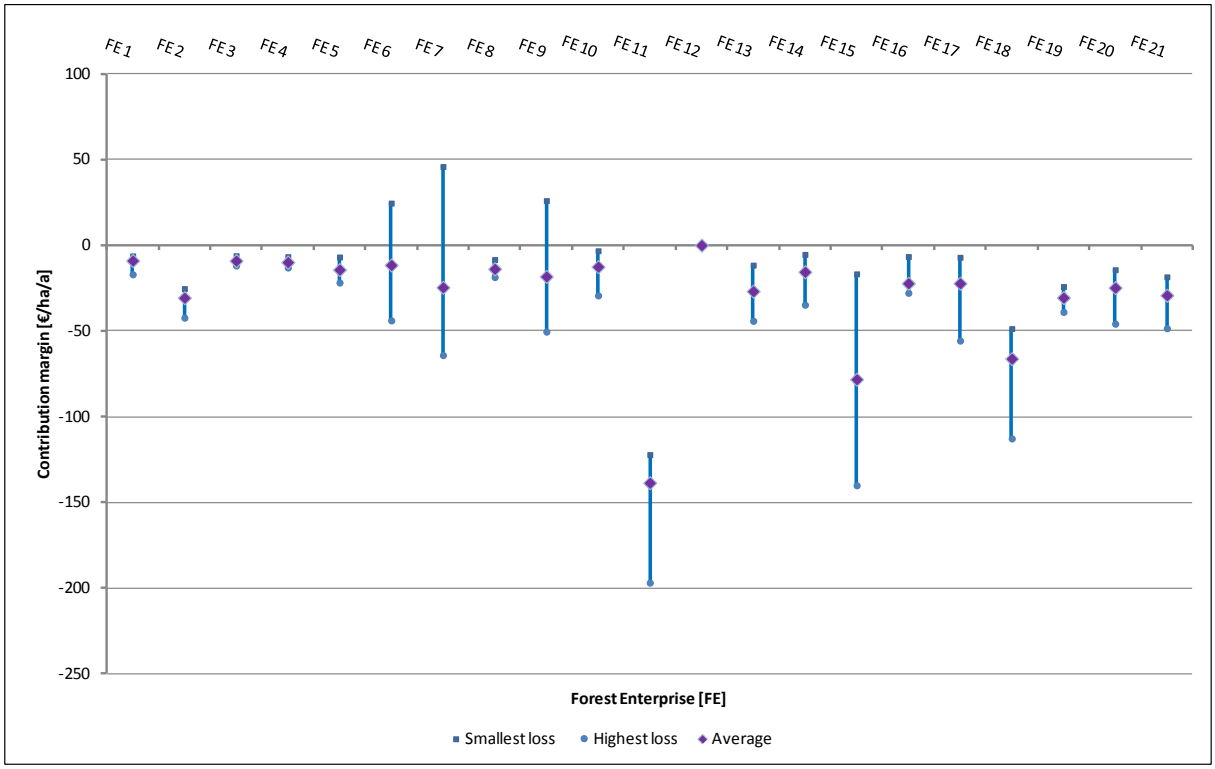

Figure 1: Range and mean value of differences in the contribution margin of forest management under the FFH regime with reference to the „Status Quo" for all case study forest enterprises (FE), including additional ongoing administrative costs, over 200 years.

Natural and economic impacts to the reference „Enterprise Objective"

Over the entire 200-year period the mean values for the differences in felling through FFH planning of measures compared to the forest management reference „Enterprise Objective" range between 0 up to -1.6 harvested m³/ha/annum. The difference in felling with view to the habitat type area amounts in its arithmetic average to -0.66 harvested m³/ha/annum and in the median to -0.57 harvested m³/ha/annum. The minimum and the maximum of the difference in felling ranges in one extreme case between-5.3 harvested m³/ha/annum and +3.7 harvested m³/ha/annum in the respective period under consideration.

Including the additional administrative costs, the mean difference of the silvicultural contribution margin of the forest enterprises lies within a range of 0 up to 180 €/ha/annum across the entire 200-year period. On average of all forest enterprises, the loss of the contribution margin amounts to 40 €/ha/annum in relation to the habitat type areas and in the median to 29 €/ha/annum. The differences of the contribution margin range across all case study forest enterprises between -234 €/ha/annum and +97 €/ha/annum (cf. Figure 2) in the respective periods under consideration.

The analysis of the loss of value of the management unit „beech habitat type area" comparing forest management under the „FFH-Regime" and the reference „Enterprise Objective" leads in average to a reduced cash value of 2,496 €/ha (median 1.767 €/ha).

As highest value a loss in cash value of 10,945 €/ha was identified. In average a difference of the capitalised value of -2,501 €/ha (median -1.885 €/ha) was calculated. A difference in capitalised value of -10,945 €/ha was identified as the highest value.

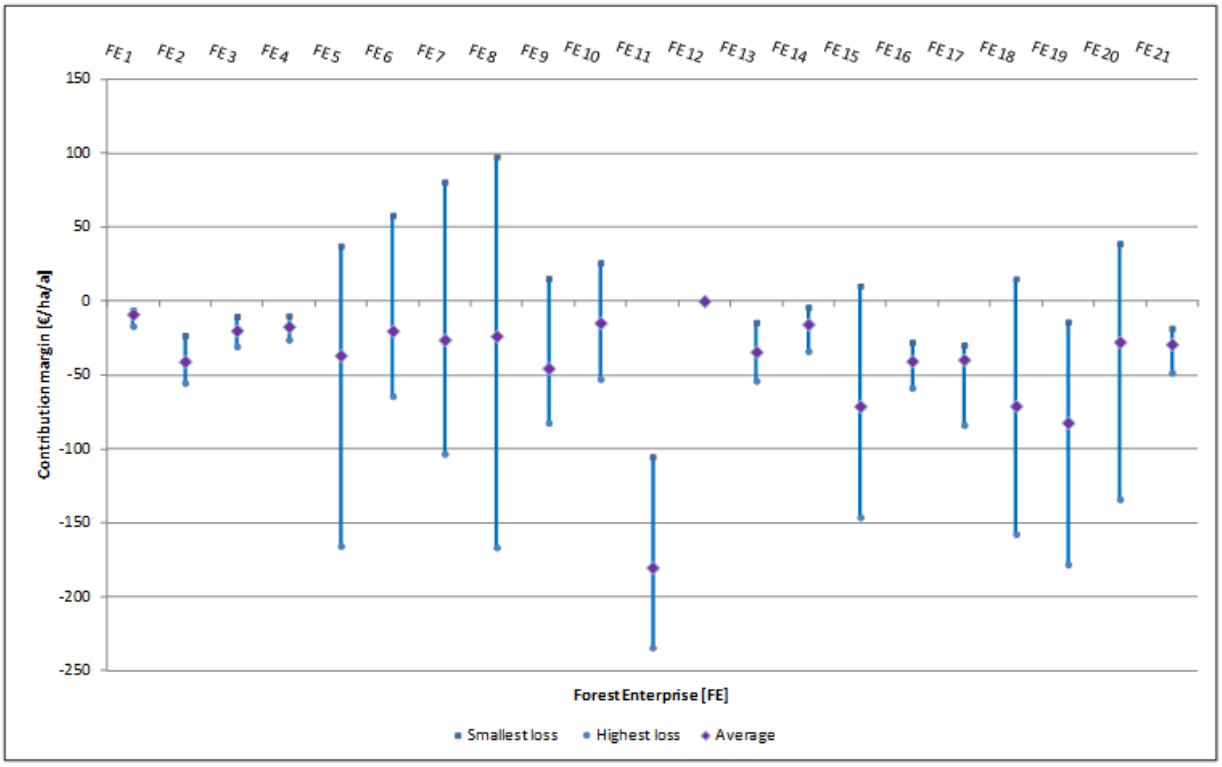

Figure 2: Range and mean value of differences in contribution margin of forest management under the FFH regime with reference to the „Enterprise Objective" for all case study forest enterprises (FE), including additional ongoing administrative costs, over 200 years

3.5 Further development of the „assessment of management restrictions in forests" for the practical assessment of management restrictions in forests in FFH areas

The so far presented economic impacts resulting from the implementation of the FFH planning of measures for forest enterprises were calculated on the basis of the complex STRUGHOLTZ-ENGLERT simulation model, the application of which is hardly possible for practitioners. Against this background, the assessment concept for management restrictions in forestry (annuity model) developed by MÖHRING & RÜPING (2006) was to be further developed as an easy to handle and well-established assessment method. The annuity complies here with an „annual timber production value" as annual contribution margin from timber production including costs of capital and before the deduction of annual fixed costs.

In this work package all planning of management measures and calculations corresponded to a financial compensation period of 30 years (e.g., period for the voluntary contract based nature protection scheme). The three following types of measures were integrated in the development of the model as important FFH measures in beech habitat types: Conservation/designation of habitat-trees, the exclusion, respectively the limitation of changes in tree-species composition, as well as limitations in the final harvesting, respectively the prolongation of the rotation cycle.

With the adapted assessment concept by MÖHRING & RÜPING (2006) calculations on the economic affectedness were carried out for 10 case study forest enterprises. Table 4 indicates the overall operational burden by management restrictions in forests in the case study forest enterprises in relation to the habitat type area. As the assessed habitat type

areas in the forest enterprises lie between 50 to over 1000 hectares, the calculations for the summarising assessment were based on the arithmetic average (ø) as well as on the area weighted average („*gew. Du.*").

For the selected case study forest enterprises a net total of the timber production value of -55.5 €/ha/annum as arithmetic average and of -66.6 €/ha/annum as area weighted average for the areas of beech habitat types was calculated over the 30-year assessment period for the three FFH planning of measures. For the individual forest enterprises the 30-year net total of the timber production value ranged -4 and -127 €/ha/annum. The figures prove that the FFH planning of measures for the designation of habitat trees to a noteworthy extent has the strongest economic impact in relation to the habitat type area in the case study forest enterprises.

Table 4: FFH-affectedness (calculated as an annual loss in revenue in €/hectare/year for a 30-year planning and assessment period) with view to the area of the habitat type

	Net total of the timber production value			
FFH-types of measures	**Designa-tion/preservation of habitat trees**	**Exclusion/limitations of changes in tree species composition**	**Prolongation of the rotation cycle**	**Total**
Code of the for-est enterprise	**€/ ha habitat type area and year**	**€/ ha habitat type area and year**	**€/ ha habitat type area and year**	**€/ ha habitat type area and year**
Enterprise A	**29**	**11**	**-**	**40**
Enterprise B	**34**	**24**	**-**	**58**
Enterprise C	**34**	**52**	**-**	**86**
Enterprise D	**44**	**27**	**-**	**71**
Enterprise E	**37**	**1**	**-**	**38**
Enterprise F	**4**	**-**	**-**	**4**
Enterprise G	**37**	**-**	**12**	**49**
Enterprise H	**35**	**6**	**-**	**41**
Enterprise I	**41**	**-**	**-**	**41**
Enterprise J	**59**	**68**	**-**	**127**
Ø	***35.4***	***18.9***	***1.,2***	***55.5***
gew. Du.	***33.,2***	***33.0***	***0.4***	***66.6***

It has to be explicitly pointed out that the calculated values illustrate the expected losses in revenue due to the FFH planning of measures. These must not be confused with an „appropriate price" for the implementation of this planning. When, for the purpose of a contract based nature protection scheme, one seeks an appropriate price for nature protection services, an „appropriate" overhead for the loss of revenue has to be granted. Besides providing an incentive for signing the contract, this must also compensate for elements that are difficult to assess, like, e.g., additional costs for administration or for limited flexibility with a view to forest management, etc. (cf. MÖHRING & RÜPING 2006).

The potential impacts of „limitations in the final harvesting, respectively the prolongation of the rotation cycle," seem to be of rather subordinate importance, they can hardly be assessed on the basis of just one forest enterprise case study.

The differences in results between the annuity model and the STRUGHOLTZ-ENGLERT-model are primarily justified by the different periods under consideration. Also with a view to the simulations for forest enterprises with the STRUGHOLTZ-ENGLERT-model, the losses and additional costs are the highest in the first period under consideration due to the age class distribution. Through the 200-year period under consideration, the burden evens out compared to the 30-years period under consideration in the annuity model.

Furthermore the data bases are partly differing somewhat from each other. For the STRUGHOLTZ-ENGLERT-model, the stand tables by OFFER/STAUPENDAHL (2009) as well as en-

terprise specific extraction costs for timber and sales revenues for timber were taken as a basis. For the annuity model, in contrast, the stand tables as well as the extraction costs for timber and sales revenues for timber were taken from the forest assessment guideline from North Rhine Westphalia (MURL NW 2010). In addition different methods were applied for the assessment of natural and economic losses through the designation of habitat trees. For the calculation with the annuity model, the habitat trees were assessed as non-management areas exclusively in matured stands. For the calculations with the STRUGHOLTZ-ENGLERT-model, the enterprise specific implementation variations of the designation of habitats were taken as a basis. Thus the small scale non-management areas determined by the designation of habitat trees were assessed by some forest enterprises as losses in area across the entire operational area, whereas others assessed the loss in area exclusively in matured stands. In addition it has to be borne in mind that data from 10 forest enterprise from North Germany were used for the average calculations of the annuity model whereas the calculations with the STRUGHOLTZ-ENGLERT-model used the data of 21 forest enterprises from all over Germany.

3.6 Assessment of impacts on the regional supply of round wood users

Based on the results from the case study forest enterprises the work package „Assessment of the regional supply of round wood users" pursued the following objectives:

- Nationwide classification of a changed round wood supply through forest management of areas of beech habitat types into the round wood needs of material and energetic users in Germany as well as
- Assessment of the influences of FFH planning of measures on the regional round wood supply of round wood users in a pilot region.

Due to the still „young" implementation processes of planning of measures in both beech habitat types from a forest enterprise point of view, the analysis of the case study forest enterprises provided for the first time reliable information on the natural and economic impacts. Against this background, profound knowledge on the changes in round wood supply by round wood users was hardly available.

The results of this work package have been published by SEINTSCH et al. (2012).

3.6.1 Nationwide classification of possible impacts on the round wood use

The status quo and possible developments on the German round wood market have been analysed for the classification of possible changes in the supply for material and energetic round wood users through FFH planning measures across Germany.

The use of round wood in Germany is characterised by an 80 % share of softwood and relies thus far on a domestic supply. The main users of hardwood with a view to overall volume are private households with their need for split logs from the forests. Around 70 % of the hardwood is currently used for energetic purposes. A further increase of the domestic demand is expected in the future. In view of a proportion of use of over 90 % softwood, the material raw wood users have to develop adaptation strategies to a, in perspective, decreasing domestic supply of raw wood from softwood. Here the substitution of softwood by hardwood offers potentials for development.

Whereas the domestic raw wood potential of softwood can be considered as skimmed, there are unused potentials of hardwood. These potentials, however, lie to a lesser extent with the tree species beech itself, which is marked with a comparatively high level of use among the hardwood species. In what way these unused raw wood potentials can be realised in the future depends on a number of influencing factors; amongst others the implementation of the objective of the biodiversity strategy of 5 % of the forest area with natural development by 2020.

Based on the results from the case study forest enterprises, no estimations are possible on the nationwide impacts on round wood supply of the material and energetic users by the FFH planning measures on the 568,000 ha of both habitat types 9110 *Luzulo-Fagetum* and 9130 *Asperulo-Fagetum* beech forests. The results on the changes in the

felling rate of the case study forest enterprises through the FFH planning measures can only impart the possible dimensions. Currently 1.7 mill. ha of the wooded area in Germany are covered with beech.

3.6.2 Case study in the pilot region Lower Franconia

In addition to the nationwide classification of possible impacts of management restrictions through FFH planning of measures on areas of beech habitat types, a case study was conducted for the administrative region Lower Franconia. Here the regional dimension of raw wood markets with partly local and regional characteristics was to be taken into account. The administrative region Lower Franconia was selected because of its high percentage in the area of the tree species beech and of areas of beech habitat types in the overall wooded area, and as it is a region that is characterised by the use of hardwood. Moreover results from the project FFH-Impact were available in a regionally concentrated way for three case study forest enterprises.

The results from the three regional case study forest enterprises on the impacts of FFH planning measures on the felling rate were transfered for an assessment on the pilot region Lower Franconia. In relation to the 79,000 ha wooded area with the tree species beech the areas of the two habitat types represent a regional share of 40 %. Under the given assumptions, the regional timber supply from beech would decrease by about 6 %, which would correspond to the demand for split logs of about 4,300 private households and the demand for raw wood of several small sawmills processing hardwood. In this connection it has to be taken into account that the decline in the felling rate in areas of beech habitat types could be compensated by a higher felling rate on the remaining wooded area covered by beech outside FFH areas in the region.

3.7 Property rights related assessment of forestry activities/use

Based on the results from the case study forest enterprises the following research objectives were pursued with the legal opinion on „Property rights related assessment of the impacts of the Fauna-Flora-Habitat-Directive (92/43/EEC)":

- Property rights related assessment of impairments on private forest enterprises through FFH planning of measures,
- Property rights related assessment of impairments of overlapping requirements on forest areas with FFH planning of measures and other protection area categories as well as
- Property rights related assessment of constraints of silvicultural management options (tree species selection) by private forest enterprises through FFH planning of measures.

Strictly speaking, the legal opinion was meant to deliver a basic systematic assessment, in which parts of the FFH implementation „the traffic light with view to property rights", stands at red, yellow or green for the selected case study forest enterprises. A comprehensive property rights-related assessment of the case study forest enterprises was not intended. Six private case study forest enterprises were included in the legal opinion. The legal opinion is published in a work report by PASCHKE & RIEDINGER (2012).

3.7.1 Property rights related assessment of adverse effects on private forest enterprises through FFH planning of measures

The FFH planning of measures are based on different legal bases in the individual Laender, which at present do not consistently have a direct effect on forest enterprises and forest owners. They are, however, of property rights related importance as, on their basis, the competent authorities on Laender level can pass legal regulations at the expense of concerned forest owners.

When such regulations are passed, they cause management restrictions for forest properties due to nature protection interests. From a property rights point of view these are beyond reproach and are in particular consistent with the relevant Article 17 of the EU Charter of Fundamental Rights (CFR) addressing the protection of property rights vis-à-vis FFH measures based on European law.

There is no separate legal protection of property rights in place against the designation of FFH areas, in particular the pre-selection of sites, the nomination of the areas as well as the compilation of the list of FFH areas of community interest. The declaration of the protection of an area causes a ban on deterioration and disturbance in implementing the provisions of Article 4 §5 in connection with Article 6 §2 of the Habitats Directive according to § 33 Para. 1 BNatSchG. This ban has a subsidiary „absorbing function" vis-à-vis the concrete planning of management measures. Thereby it serves to ensure, in cases of an inadequate design of concrete administrative FFH measures, that illegal changes or disturbances on the FFH area are ceased, or respectively prohibited. The legal ban on deterioration and disturbance does not have a downright effect, but on the one hand prohibits severe adverse effects, and on the other hand, is not per se opposed to changes or extensions of the current use of FFH areas because of the explicitly foreseen exception clause in § 33 BNatSchG.

The foreseen designation of old-growth and habitat trees in the areas of beech habitat types in operational plans is consistent with the protection of property rights of the relevant Article 17 CFR due to the pursued goal of nature protection. For this purpose, it is not only decisive, that to the extent and the manner only limited territorial and physical sub areas of forest management are affected and the forest ownership is therefore in principle untouched in its essential features. These FFH measures are intangible from a right of property point of view. They are conceptually associated from a nature protection point of view with the conservation objectives and with the goals of the designation of FFH areas. The order of such measures only encounters legitimacy limits with regard to property rights if the named bans are to be considered as disproportional to their conservation objective in a particular case. For this purpose it has to be proven that the essential features of a forest property under forest management are questioned.

3.7.2 Property rights related assessment of adverse effects of overlapping requirements on forest areas with FFH planning of measures and other categories of protected areas

Overlapping requirements on forest properties can occur by means of the protection of the same forest area through FFH measures on the one hand and further designations of protected areas in terms of §§ 20 ff. BNatSchG on the other hand. This could lead to the fact, that the property rights related assessment of measures has to be qualified as (de facto-) expropriation in the limit range to pure management restrictions and thus has to comply with the applicable rules.

Differently to the site-specific changes caused through FFH conservation measures, adverse effects through overlapping requirements can be so intensive, that – contrary to the legitimacy with a view to property rights according to article 17 CFR – the owner is no longer free to dispose of his property and to convey it to any other use that is not prohibited. In such case a de facto-expropriation would be given.

The legal question of whether in the case of overlapping requirements a de facto-expropriation of the property in terms of article 17 CFR is existent has to be analysed for each singular case on the basis of the extent and burden of the impacts of overlapping requirements. Thereby it has to be borne in mind, that the intensity of protection for the respective designation of areas in terms of §§ 20 ff. BNatSchG is not identical and does also not lead to the same burden for the affected forest owner.

The intervention threshold, that according to the jurisdiction of the EuCJ has to be extravagated for accepting a de facto-expropriation, requires that the owner is excluded from any relevant management and disposal. By this high hurdles are established for accepting an expropriation for those cases in which – like in the situation of overlapping requirements – the property is not formally withdrawn from the owner.

3.7.3 Property rights related assessment of constraints of silvicultural management options by private forest enterprises through FFH planning of measures

FFH measures that concern silvicultural management options of forest owners are, from a property rights point of view, without exception management restrictive measures, however not expropriating measures in terms of Article 17 CFR.

Management restrictions are first of all existent in the form of measures that effectively impact the revenue of the forestry activity; they are furthermore a result of measures that are a cost burden for the forest owner and occur in the form of a restriction of future silvicultural management options.

Restrictions on the pursued, and in the future to be achieved, silvicultural management options, due to which the pursued operational objectives cannot be entirely or to the full extent achieved, are a priori unobjectionable from a property rights point of view. The provision of Article 17 CFR protects the right of property as such, however not future developments, prospects and objectives.

The silvicultural changes induced by the operational plans for the case study forest enterprises do not disproportionally question the protected essential content of forest ownership from a property rights point of view according to Article 17 CFR. Despite the partly serious economic intensity of burden for the individual enterprise according to the results of the analysis, the respective measures bear up against an assessment of justification from a property rights point of view as their nature protection objectives are a matter of public interest. This applies in principle to the measures impacting on the profit of the executed forestry activity as well as for the costs caused by silvicultural measures. Each of these silvicultural management restrictions is justified in regard to its nature protection objective and its benefit to the public good. In terms of a property rights point of view, according to constitutional law, the essential content of forest ownership of the forest enterprises is in principle not questioned.

If the silvicultural changes induced by the FFH planning measures are causing particular hardship for the affected forest enterprises, forest owners are entitled to demand financial compensation according to the prevailing legal norms based on the relevant Article 14 of the Basic Constitutional Law. From a property rights point of view it is required, that the right for compensation in cases of unacceptable burden for the affected forest enterprises are shaped in such a way, that at the same time with an updated administrative decision on the basis of the operational plan on the unacceptable burden for the forest enterprises a decision has to be taken on the compensation to be paid if need be (package deal requirement).

The right for compensation has at least in principle to be envisaged together with the burden of the FFH measure; a concrete amount of the right for compensation in individual cases does not have to be named. The right for compensation that is necessary from a property rights point of view according to constitutional law can also be regulated in so-called severability clause in basic statutory law.

The right for compensation by owners of forest enterprises is however to be rejected if the person concerned does not defend himself against adverse effects. Forest enterprises are therefore in principle obliged to take legal action in order to not lose their protection of property under constitutional law.

The namely legal situation exists in matters of agreements which the forest enterprises negotiate with the competent authorities for the implementation of silvicultural measures in execution of operational plans (so-called contract based nature protection scheme). By the acceptance of a contract the land owner in principle takes the decision to accept the adverse effect on his property. The protection of the ownership due to occurring silvicultural changes then remains in principle denied for the consenting owner due to the consensus.

The assessed provisions at hand for FFH management plans do not consistently meet the package deal requirement with regard to the right for compensation for cases of hardship that are necessary from a property rights point of view according to constitutional law.

4 Conclusions

The status of implementation of the FFH planning of measures in forests differs greatly in the Laender. Equally, only a small percentage of the forest enterprises are in the process of the operational implementation of measures of area-specific FFH management plans. Against this background, the Habitats Directive stands rather at the beginning than at the end of its implementation in forests, despite its initiation already 20 years ago. This situation offers also wide options for the further practical elaboration of the Habitats Directive. The implementation of the Habitats Directive can therefore still be transferred to practice „filled with life and good ideas" from both the nature protection and the forestry side.

The assessment of the conservation status and the herefrom derived planning of management measures are essential for the impacts on forest enterprises. The different approaches in the Laender in regard to the general implementation of the Habitats Directive, the assessment of the conservation status and the planning of management measures reflect the federal system in Germany. This heterogeneity can be used for comparison („competition of ideas") and can serve for the identification of efficient approaches.

From a nature protection and forestry point of view, problems of acceptability could arise from the in parts significantly different threshold values in some parameters in the assessment of the conservation status of the beech habitat types. Furthermore it is questionable, whether some assessment parameters can at all be surveyed at a justifiable cost. Forest owners with forest areas in different Laender consequently not only have to be prepared for different systems concerning the FFH planning of measures but also for different requirements for securing the conservation status.

In the analysed FFH planning of measures in the federal territory, a noticeable planning focus lies on forest habitat types, whereas the planning of management measures for fauna and flora (with partly individual and differing requirements) is mainly of minor significance. Whether the conservation and development objectives of fauna and flora in forests are adequately ensured „in the wake" of planning of measures for forest habitat types cannot be judged. A significantly more differentiated and more elaborated planning of measures in forests can be expected with a stronger emphasis on species protection needs in the FFH management plans still to be developed.

The conservation of habitat trees, dead wood and islets of old-growth trees, the conservation of habitat-typical forest communities and the conservation of an adequate percentage of mature stands can be identified as main conservation measures for both beech habitat types. As a further result of the analysis of 44 FFH management plans nationwide the following problem areas can be pointed out. The obligation for the planning of management measures does not clearly arise from some planning acts, at least not for juristic laypersons. Furthermore for a number of planning of measures it remains unclear, whether they serve to ensure a good conservation status or to target desirable improvements (conservation measures versus development measures). Numerous FFH planning measures in beech habitat types are in addition phrased in a qualitative way. Without operational steering mechanisms and a reference to the area, in particular for FFH areas across different ownership categories, the implementation of these measures is impossible within the scope of administrative action and practical forest management. Furthermore it has to be questioned what kind of guidance the partly very extensive planning acts can offer for the operational management of the forest enterprise.

As it became clear via the online-surveys and the analysis of the case studies, there is currently only little experience available in regard to the operational implementation of FFH planning of measures and practical forest management in FFH areas. Via the FFH planning of measures, requirements have to be integrated in forest management for which partly no comprehensive experiences in forestry exist. Against this background the

results of the assessment are subject to a certain degree of uncertainty. Thus, it seems to be essential to provide practical information to forest owners and to accompany and support them in the further FFH implementation process.

It has to be pointed out that, due to the case study approach and the still ongoing FFH implementation process, the results of the analysis are not representative and cannot be transferred to the federal territory. Within the research project resilient data on the impacts of FFH planning of measures on forest enterprises were made available for the first time. Furthermore, assessment instruments were developed and tested to demonstrate the impacts of FFH planning of measures on forest enterprises. From the forest enterprises point of view it would be desirable for such assessments to be an obligatory component of future FFH planning of measures.

From the numerous FFH planning measures in beech habitat types, in particular three planning measures were judged as restrictive to their forest management by the analysed case study forest enterprises: the preservation of old-growth and habitat trees, the conservation of an adequate percentage of mature stands as well as the conservation of a habitat-typical species inventory. The identified losses and additional costs convey on the one hand the dimension of the lower value limits for possible compensation payments for private forest properties, and on the other hand they illustrate the economic impact of non-management of public forests.

Whereas the loss of productive forest area for the permanent preservation of old-growth and habitat trees has direct effects on the forest enterprises, the limitation for the selection of tree species to conserve the habitat typical species inventory has a long-term effect. Because of the long production cycles, the high path-dependency of silvicultural decisions taken, the high uncertainty with a view to site-specific conditions and the societal demands in the future, there is no other decision in forest enterprises of equally high importance as the species selection. This freedom of choice has rested so far to a large extent without restrictions on the forest enterprises, for which reason wrong decisions redounded upon them. To achieve the FFH conservation goals, this freedom of choice for the selection of species is restricted by society. Whether these silvicultural regulations prove to be, in their extreme, „best case" or „worst case" for the individual enterprise cannot be judged, but should be taken into account in the context of FFH planning of measures.

On the basis of the current operational implementation of the Habitats Directive the dimension of impacts of FFH planning measures on the supply of the material and energetic raw wood users cannot yet be estimated. According to the current structure of hardwood use, primarily the numerous private households were affected by a reduced availability of raw wood through FFH planning measures in both beech habitat types through their need for split logs from the forests.

The FFH management plans are, as such, in principle not legally mandatory for the analysed private forest enterprises. They are, however, the basis for the passing of regulatory measures. Article 17 CFR provides the protection of ownership. This leads to the fact, that FFH planning of measures have to be accepted as management restrictions of the property by the affected forest enterprises in the interest of nature protection. In individual cases the disposed measures can result in disproportional burden. For these cases the insofar relevant protection of ownership grants the right for compensation according to article 14 of the Basic Constitutional Law that has to be granted together with the measure that is a burden (package deal requirement). For the case study forest enterprises it is required to verify the compensation provisions in the FFH management plans with view to the package deal requirement of the legal protection of the right of property.

The presented research project has – from the authors' point of view – elaborated important research results on the economic assessment of the Habitats Directive and its implementation, which can prove to be helpful for the further FFH planning of measures and the design of solutions for financial compensations. Basically the FFH planning of measures need to be assessed in a more comprehensive way on their effect for society than was carried out here. In the Federal Government's „Forest Strategy 2020" the following

nine main fields of actions are identified: 1) Climate protection and adaptation to climate change, 2) Ownership, employment and income, 3) Resources, use and efficiency, 4) Biological diversity and nature protection in forests, 5) Silviculture, 6) Hunting, 7) Protection of soil and water resources, 8) Recreation, health and tourism and 9) Education, public relations and research (BMELV 2011). In this regard the results of the research project FFH-Impact, as well as the Habitats Directive, should not be considered and assessed in isolation.

5 Bibliography

BUNDESAMT FÜR NATURSCHUTZ (BFN) (2006): Ergebnisse des Arbeitskreises „Wälder" (Link: Bewertungsschemata). Stand: 02.01.2006. URL: http://www.bfn.de/0316_akwald.html

BUNDESAMT FÜR NATURSCHUTZ (2012): Waldlebensraumtypen in Deutschland. Sonderauswertung des BfN im Auftrag des Verbundforschungsprojektes FFH-Impact. (Stand: Mai 2012)

BUNDESMINISTERIUM FÜR VERBRAUCHERSCHUTZ, ERNÄHRUNG UND LANDWIRTSCHAFT (BMVEL) (2011): Waldstrategie 2020: nachhaltige Waldbewirtschaftung – eine gesellschaftliche Chance und Herausforderung. Bonn

BUND/LÄNDERARBEITSGEMEINSCHAFT NATURSCHUTZ, LANDSCHAFTSPFLEGE UND ERHOLUNG (LANA) (2001): „Beschlüsse der Arbeitsgemeinschaft „Naturschutz" der Landes-Umweltministerien (LANA)". URL: www.bfn.de/fileadmin/MDB/documents/030306_lana.pdf

BURKHARDT, R.; ROBISCH, F. & ECKHARD, S. unter Mitarbeit der Mitglieder der LANA-FCK-Kontaktgruppe und des Bund-Länder Arbeitskreises „FFH-Berichtspflichten: Wald" (2004): Umsetzung der FFH-Richtlinie im Wald. Gemeinsame bundesweite Empfehlungen der Länderarbeitsgemeinschaft Naturschutz (LANA) und der Forstchefkonferenz (FCK). Natur und Landschaft 2004/7: 316-323

ELLWANGER, G.: SCHRÖDER, E. & Ssymank, A. (2006): Erfahrungen mit der Managementplanung in Natura 2000-Gebieten in Deutschland. In: ELLWANGER, G. & SCHRÖDER, E. (Bearb.) (2006): Management von Natura 2000-Gebieten. Erfahrungen aus Deutschland und ausgewählten anderen Mitgliedsstaaten der Europäischen Union. Naturschutz und Biologische Vielfalt Heft 26. Bundesamt für Naturschutz, Bonn-Bad Godesberg. S. 9-26

EUROPÄISCHE KOMMISSION (2000): Natura 2000 - Gebietsmanagement: Die Vorgaben des Artikels 6 der Habitat-Richtlinie 92/43/EWG. Luxemburg: Amt für amtliche Veröffentlichungen der Europäischen Gemein schaften. 73 S. URL: http://ec.europa.eu/environment/nature/Natura 2000/management/docs/art6/provision_of_art6_de.pdf

MINISTERIUM FÜR UMWELT, RAUMORDNUNG UND LANDWIRTSCHAFT DES LANDES NORDRHEIN-WESTFALEN (2010): Richtlinien zur Waldbewertung in Nordrhein-Westfalen (WBR NW)

MÖHRING, B. & RÜPING, U. (2006): Bewertungskonzept für forstliche Nutzungsbeschränkungen. Schriften zur Forstökonomie Band 32. J. D. Sauerländer's Verlag, Frankfurt am Main.

OFFER, A. &, STAUPENDAHL, K.-U. (2009): Neue Bestandessortentafeln für die Waldbewertung und ihr Einsatz in der Bewertungspraxis. In: Forst und Holz, 64. Jahrgang, Heft 5, S.16-25POLLEY, H. (2009): Wald in Schutzgebieten - ein Überblick. Landbauforschung vTI agriculture and forestry research - Sonderheft, Band 327, Seiten 75-82

PASCHKE, M. & RIEDINGER, D.(2012): „Eigentumsrechtliche Bewertung der Auswirkungen der Fauna-Flora-Habitat-Richtlinie (92/43/EWG) auf private Forstbetriebe". Rechtsgutachten erstellt im Auftrag des Johann Heinrich von Thünen Institut im Rahmen des Verbundforschungsprojektes „Auswirkungen von naturschutzfachlichen Anforderungen auf die Forst- und Holzwirtschaft". Hamburg. (in Druck)

POLLEY, H. (2009): Wald in Schutzgebieten - ein Überblick. Landbauforschung vTI agriculture and forestry research - Sonderheft, Band 327, S. 75-82

ROSENKRANZ, L.; WIPPEL, B. & SEINTSCH, S. (2012): Umsetzung der FFH-Richtlinie im Wald in den Bundesländern. Arbeitsbericht des OEF, vTI, Hamburg 119 S. (im Druck)

SEINTSCH, B.; ROSENKRANZ, L. & WIPPEL, B. (2010b): Umsetzung von FFH- bzw. Natura 2000. Die Waldbauern in NW, Heft 5, S. 13-14

SEINTSCH, B.; ROSENKRANZ, L.; ENGLERT, H.; DIETER, M.; WIPPEL, B.; BECKER, G.; STRATMANN, J.; GERST, J.; UND MÖHRING, B. (2012): FFH-Impact: Teil 2: Auswirkungen von FFH-Maßnahmenplanungen auf Forstbetriebe (im Druck)

SIPPEL, A. (2007). Forstliche Nutzung in FFH-Gebieten. Situationsanalyse und Perspektiven. Fachstudie erstellt durch die Forstliche Versuchs- und Forschungsanstalt Baden Württemberg im Auftrag der Bundesforschungsanstalt für Forst- und Holzwirtschaft. Freiburg, Forstliche Versuchs- und Forschungsanstalt Baden-Württemberg: 86 S.

WIPPEL, B.; ROSENKRANZ, L. & SEINTSCH, B. (2010): Zwei Drittel erwarten negative wirtschaftliche Folgen: Betroffenheit von Waldbesitzern durch Natura 2000: Forschungsprojekt FFH-Impact mit einem bundesweiten Überblick. Holz-Zentralblatt, 136. Jahrgang, Nummer 29, 23. Juli 2010, S. 718

WIPPEL, B. & SEINTSCH, B. (2010a): Betroffenheit von Waldbesitzern durch Natura 2000: Starker Einfluss auch für Bayern erwartet. Der bayerische Waldbesitzer, Nr. 4/2010, S. 21-23

WIPPEL, B.& SEINTSCH, B. (2010b): Betroffenheit von Waldbesitzern durch Natura 2000: Hohe kommunale Beteiligung in Baden-Württemberg. Der Waldwirt, Nr. 37 (9), S. 8-9