

Assessing the impact on production and costs from the application of forest certification standards

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Abbreviations:

FM	Forest Management
FMU	Forest Management Unit
FSC	Forest Stewardship Council
FSC P&C	Forest Stewardship council, Principles and Criteria
HCVF	High Conservation Value forests
MAI	Mean Annual Increment
PCIA	Production and Cost Impact Assessment

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What is the Production and Cost Impact Assessment Tool for?

The development of standards is an essential part of forest certification. The contents of a standard are hierarchically organised in indicators, norms and verifiers chosen to ensure responsible forest management. According to the concept of sustainability, there are at least three dimensions to take into account –ecological, social and economic. All standards are based on tradeoffs between these three dimensions. The standard should reflect a balanced, and ideally also an efficient compromise between different ambitions. During a standard development process, continuous analysis of the consequences on the three aspects of sustainability is therefore needed, and this tool provides a practical methodology to make the assessment of the cost impact. Since timber production in most cases is the economically dominating process in forestry, the tool is built on the assessment of the impact on timber production. The Production and Cost Impact Assessment (PCIA) Tool is intended to be used for:

1. Enhancing transparency in standard development and thereby increasing acceptance of the standard among stakeholders
2. Developing cost-effective standards for responsible forest management
3. Harmonising processes when comparing regional and/or national performance standards for responsible forest management
4. Reducing uncertainty regarding the costs of forest certification among forest owners, thus lower the threshold for entering the certification

However, it is not possible to provide detailed guidance at a global level, which is applicable to all forest locations and types. **So, although this tool can be used directly, it is to be adapted to local conditions when applied.**

What is the PCIA Tool not providing?

Essential input regarding management systems used in different situations and forest ecosystems affected cannot be found in the tool. The application of the Tool requires that the assessor makes a thorough investigation of local growing and management conditions, possible impacts of different management options affected by the standard and finally translate that into measurable units. The tool only intends to provide a methodology to do this in an easy-to-follow stepwise manner.



The PCIA Tool is not intended for assessments of the benefits of certification. Clearly the benefits have to outweigh the costs to make forest certification a viable option. The economic benefits of forest certification may take different forms, including, but not limited to:

- A premium price may be paid for certified products
- Certain markets are simply not accessible without certification.
- Certification may be an efficient way to deal with a number of public and other relation issues, which in any case have to be addressed.
- If properly handled, certification can be used to increase the commitment among employees and contractors to good performance in general.

Who can use the PCIA Tool?

The guide is designed for use by anyone needing to develop a better knowledge about the production and cost impacts of standards for responsible forest management. Use of this generic guide, whether in a particular forest or as the basis for a process to develop national guidelines, requires **knowledge of the basic production and economic aspects of the forest management system currently applied**. This is likely to mean professional foresters or economists. However, the structure of the tool is not complicated, and the results derived by using the tool can be interpreted by anyone who understands trade-offs, including ecologists.

The main users will, considering the purpose of the tool, be:

- Members of regional or national standard development groups
- FSC AC and/or other bodies involved in the harmonisation between different regional and national performance standards
- Forest owners evaluating the option to certify their forests

What is in the PCIA Tool?

This tool is a manual supporting the assessment of the cost impact of forest certification performance standards. Since timber production in most cases is the economically dominating process in forestry, the tool is primarily built on the assessment of timber production impacts. The Tool consists of four sections:

- Introduction: this provides the background to production and cost impact assessments, including the important concepts of reference level and separability.
- Structure of the assessment process: describing the methodology to be used.
- Scientific support: giving hints on how to secure scientific references and support for assessments.
- Reference to the Swedish FSC-case: giving a reference to a practical case

Assesing the Impact on Production and Costs

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Assesing the impact on production and costs from the application of forest certification standards

1. Introduction to the PCIA Tool

1.1 What is a Production and Cost Impact Assessment?

A Production and Cost Impact Assessment is a quantitative estimate of the difference between the timber production and economic output from a forest managed according to a specific performance standard and the output from defined reference management. The estimate is expressed in volume and monetary terms. The potential impact on product prices and market access based on customer preferences for products originating from responsibly managed forests is not assessed. Accordingly the assessment will in most cases result in lower timber production and economic output compared with the reference.



The assessment focuses on effects that can be linked to the specific indicators in the performance standard. General effects on production efficiency due to increased motivation and competence among employees are not accounted for. They are, however, important aspects to be considered in connection with decisions regarding certification.

The impacts on timber production are assessed both in short and long term. The cost impacts are only assessed by the impacts on short term profit levels. An alternative approach would be to assess the impacts on net present value. This would be theoretically more adequate and allow for application of the methodology in a wider range of situations. However, present value assessments are complex to make and hard to communicate, and the difference in conclusions is minor except for situations where future harvests are likely to increase significantly (as in forests consisting of young plantations).

1.2. The Tool methodology

The Tool is built on the structure of forest management performance standards. In this context the FSC P&C is used as a generic form for performance standards. In a national or regional performance standard, there are one or more indicators, norms and verifiers for each criterion. For each of these indicators an assessment of the impact on timber production and economic output is made. In addition an assessment of the indicator's contribution to standard complexity is made.

This methodology is chosen to facilitate negotiations and increase the transparency of impact assessments. However, it makes it necessary to develop methods to separate the effects from different indicators, which may be troublesome.

1.3. The concept of reference management

An important element of the PCIA is the reference management. An assessment of a difference (in production and/or economic output) has to be made in relation to something well defined. Therefore the first step in the assessment is to define the reference management regime. There are at least three different alternatives to be considered in this context:

- **The economically most optimal management regime.** Used as reference, this will measure the full effect of the standard impact. From a theoretical scientific view this is an advantage. However, in real life no optimal management regimes are applied, and therefore the costs and production impacts are easily exaggerated.



- **The normally practised management regime.** Used as a reference, this will measure the expected mean effect on all forest owners of the standard introduction. This would be relevant for the government or stakeholders not directly involved as forest owners

- **A realistic regime representing “best practice”.** Used as a reference, this will measure the impact on forests managed by active and knowledgeable forest owners of the type likely to be interested in certification.

In a negotiating situation, where forest owners are part of the standard development working group, the third alternative is recommended. However, the important thing is to agree on the choice of reference management regime, and also to ensure that all stakeholders are aware of the implications.

1.4. The importance of separability

The effects on production and economic output from different indicators and norms¹ are normally overlapping and interacting on each other. To deal with this, and allow for separate analysis of the effect of each indicator, a hierarchical approach can be applied. The indicators and norms can be arranged in a hierarchical order depending on the type and extent of the impacts incurred.

1. Indicators and norms leading to set asides of large forest areas (stand level and above)
2. Indicators and norms leading to set-asides of smaller areas and single trees
3. Indicators and norms affecting the management of the current (and subsequent) rotations (or harvesting cycles in continuous forest cover management)
4. Indicators and norms only affecting future rotations after regeneration felling (or future harvesting cycles in continuous forest cover management)
5. Indicators and norms affecting harvesting methods
6. Indicators and norms affecting silvicultural methods
7. Indicators and norms only affecting planning, monitoring and consultation processes

Given this order in the analysis, the assessment of indicators and norms affecting stand manage-

1. Norm: threshold of an indicator. Reference: Hierarchical framework for the formulation of sustainable forest management standards, available in the Pathfinder.



ment practices will only apply to the net area excluding set-asides. Similarly the assessment of indicators and norms affecting harvesting methods will only apply to the estimated net harvest volume taking both set-asides and stand management practices into account.

2. The structure of the assessment process

The methodology for assessing the impact on production and economic output of forest management performance standards consists of seven distinct and separate steps. In order to increase transparency and stakeholder support for the assessment results, it is important to document in detail the assessments made in the different steps. This will facilitate sensitivity analysis and provide a basis for future revisions of assessments. The use of a number of linked excel-models is recommended for the documentation.

Establish reference

Assess effects of each indicator

Compute total effects

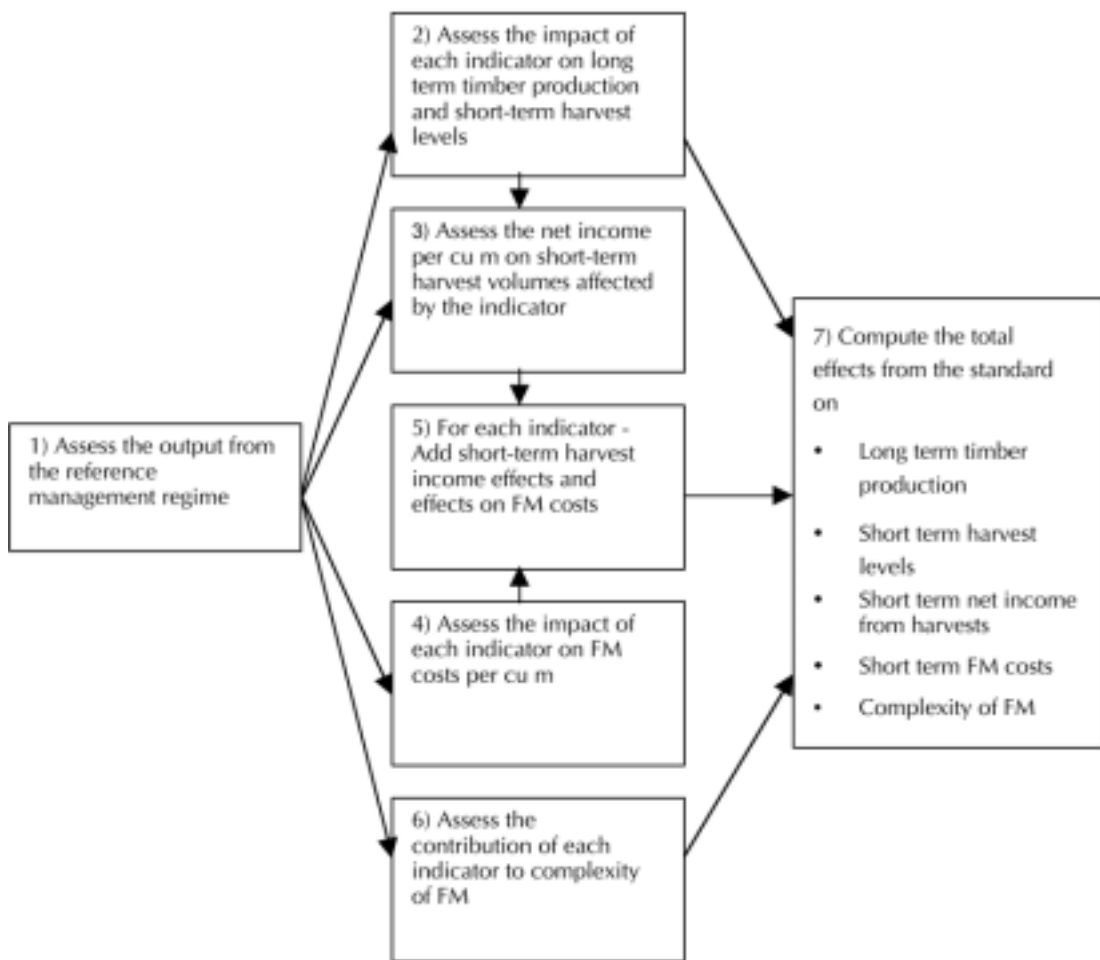


Figure 1. The structure of the assessment process. The separate boxes represent the different steps in the assessment process, which may be supported by linked excel calculation models.



2.1.1 Stepwise description of the assessment process

Step 1

Assess the output from the reference management regime, which includes the assessment of:

- Forest gross area
- Long term timber production per ha from Forest gross area
- Short term timber harvest per ha from Forest gross area
- Short term average net income per cu m from harvested timber
- Corresponding total output figures for the Forest gross area

Step 2

Assess the impact of each indicator on long-term timber production and short-term harvest levels by assessing:

- Forest gross area affected by the indicator assuming this is the only indicator in the standard.
- Forest net area affected by the indicator netting for areas already accounted for in assessing the impact of other indicators.
- Relative timber production capacity for net areas affected by the indicator in relation to average levels.
- Long term impact on timber production per ha in relative terms.
- Multiplier for short term harvest level impact

Step 3

Assess the impact of each indicator on income from short-term harvests by assessing:

- Multiplier for stumpage per cu m on short-term harvest volumes affected by the indicator

Step 4

Assess the impact of each indicator on forest management costs per cu m by assessing:

- Total cost impact on a representative Forest Management Unit
- Short term harvest on the representative Forest Management Unit
- The ratio between total cost impact and short term harvest level

Step 5

Assess the compound cost effect by adding effects on short-term harvest income and effects on forest management costs.

Step 6

Assess the contribution of each indicator on the complexity of forest management by assessing

- Whether the indicator has no impact – indicate 0
- Whether the indicator requires formal organisation and/or compiling of something already in place – indicate +
- Whether the indicator requires implementation of new planning, monitoring and/or consultation processes – indicate ++

Step 7

Assess the total effects from the standard by calculating grand totals for the effects on:

- Long term timber production
- Short term harvest levels
- Short term net income from harvests
- Short term forest management costs
- Standard complexity

The general structure of final results from a PCIA based on the tool is illustrated in Table 1.

	Effects on Timber production 1000 cu m/year	Effects on short- term Economic output 1000 USD/year	Effects on forest management complexity
Principle 1			
Criterion 1			
Indicator 1	500	6000	+
Indicator 2	0	100	++
Indicator 3	100	800	+
Criterion 2			
Indicator 1	50	400	+
Indicator 2	120	1500	0
Sum	770	8800	5+

Table 1. Example of final results from a PCIA. The tool contains guidelines on how to structure the assessments of the individual figures in the table, and also on how to obtain scientific support for the assessments.

2.2 Effects on timber production

The introduction of a performance standard will have both immediate and long term effects. Capturing the effects on the future harvest trajectory by using some kind of harvest scheduling model would in theory give a complete picture of the effects. However, in many cases the models used for harvest scheduling are too coarse to suit this purpose. Scientific evidence regarding the effects of single indi-



cators and norms may be hard to incorporate in the models, and the results are often hard to dissect. In order to create a methodology applicable in a wider range of situations, and to increase transparency of the analysis another approach is recommended. For each indicator the effects are separately estimated for long term and short term effects, where long term is the next rotation and short term is the coming 1-5 years.

2.2.1 Long term effects

Long term applies to a future situation where the standard has been applied for at least one rotation (harvest cycle). This facilitates the use of scientific evidence as a basis for the estimates, since scientific results regarding forest growth and yield often are presented as effects on mean annual increment (MAI) during a full rotation or harvest cycle.

2.2.2. Short term effects

Short term effects are estimated as multipliers in relation to the long term effects using best available information. In many cases there is no ground for assuming any difference between short term and long term effects (applies for instance to many sub-compartment set-asides), and in these cases the short term effect is 100%. In other cases there are large differences and the short term may be smaller or larger than 100% (indicators and norms affecting regeneration methods will generally have a zero or very small short term effect although the long term effect may be significant).

In most cases the assessment of the short-term effect has to be based on judgements, but sometimes simulations may also be used.

2.2.3. Reallocation in time of timber harvests

Some indicators and their norms (mainly indicators affecting the allocation in time of harvests – rotation length regulations) may have a zero effect on long term harvest levels but significant short term effects. The use of a multiplier will not work in these cases, since any number multiplied with zero will yield the same zero result. Hence, the short-term effect must be assessed directly in absolute terms. However, using the multiplier approach will in most cases simplify the assessment process, since a default value 100% (short term effects equal long term effects) can be used when there is no other evidence.

2.3 Effects on net income from harvests

Given the impact of an indicator and it's norm on short term harvest levels, the effects on net income from harvests is estimated assessing a relative stumpage figure. The harvest volumes affected by an indicator may differ from the average in terms of harvesting conditions and/or timber assortment output. These differences are accounted for, and the relative stumpage for affected harvest volumes is assessed.



2.4 Effects on management cost

Indicators prescribing the use of certain management methods and/or planning, monitoring and consultation processes may have an impact on the management costs without directly affecting the timber production levels. In order to assess these

impacts a case is built around model forest management units. In a first step, the annual extent and associated costs for prescribed methods and/or processes is assessed for the whole forest management unit. In a second step, the cost per cu m annual harvest is calculated by dividing the costs with the annual harvest level within the forest management unit. The cost figure per cu m is finally applied to the harvest level of whole area affected by the standard in order to obtain the impact on total management costs.

2.4.1. Costs of modified forest management methods

The extent of prescribed management methods, such as low impact logging, is assessed in area or volume terms for a model forest management unit (FMU). The extent may vary according to:

- The extent of certain site or stand conditions where the methods apply (such as steep terrain or certain tree species)
- The frequency of methods applied (once in a rotation or more often?)

The total management costs within the FMU is then calculated by multiplying the extent (in area or volume terms) by the unit extra cost induced by the prescriptions.

2.4.2. Additional planning and monitoring costs

Additional planning and monitoring costs, such as costs for identification of key habitats and monitoring HCVF areas, are assessed directly in monetary terms for the model FMU. The costs may vary according to:

- The complexity of the planning and monitoring processes
- The frequency of planning and monitoring

In order to minimise the additional planning and monitoring costs it is essential to know what information is really needed and not to collect a lot of 'just in case' data.

2.4.3. Costs for consultations

National/regional standards often prescribe new or expanded consultation processes to be implemented. The costs of these consultation processes can be assessed on a model FMU level parallel to the assessment of planning and monitoring costs.



2.5. Effects on complexity of forest management

The use of a performance standard to support responsible management will inevitably increase complexity of forest management. Although some of these effects may be accounted for in terms of increased management costs, it is recommended to track separately the extent of complications introduced by the standard. The goal should be to develop standards with no redundant indicator and to make use of existing planning and monitoring systems. Using a simple qualitative classification scheme may help in this.

2.6 The impact categories

2.6.1 Timber Production Impact categories

The production impact assessment is based on a hierarchical approach to how restrictions on the management options affect timber production output. Based on the structure of the management cycle, a list of production impact categories can be used to facilitate assessments. An example of such a list is presented in table 2.

First order classification of impact	Second order classification of impact	Sources of information to be used for assessments
Set asides where timber production is subordinated other management goals	Compartment or higher level set asides (Forest reserves)	Forest inventories (national, regional or local) describing the extent of different area classes MAI estimates for different sites
	Sub-compartment level set-asides, such as riparian zones, other buffer zones and small patches of sensitive habitats	Post-harvest monitoring inventories MAI estimates for marginal and odd sites
	Green tree retention	Post-harvest monitoring inventories
	Decaying wood protection	Forest resource inventories
Prescriptions regarding Forest management system	continuous tree cover system	Growth and yield tables
	Shelterwood cutting system	Growth and yield tables
Prescriptions regarding regeneration methods	Tree species	Research
	Soil preparation	Research
	fertilisation	Research
	Drainage	Research
	Regeneration method (assisted or natural regeneration)	Research
	Use of herbicides	Research
	weeding	Research
Prescriptions regarding stand management methods	Species and density regulation (pre-commercial and commercial thinning)	Research
	Fertilisation	Research
Prescriptions regarding forest protection	Use of pesticides	Research

Table 2. Examples of production impact categories and sources of information to be used for assessments.

2.6.2. Cost Impact Categories

The cost impact assessment is based primarily on the impacts on short-term harvest levels. In a second step, the relative stumpage (net income per cu m) for affected volumes is assessed. Based on the structure of income generation, a list of categories can be used to facilitate the assessment of relative stumpage. An example of such a list is presented in table 3.

Element of net income creation	Categories to be considered in the assessment	Sources of information to be used for assessment
Gross value of timber production impacts	Tree species	Forest inventories Bucking models Timber price lists and statistics regarding average timber prices
	Tree sizes affecting log size mixture	
	Wood quality	
Harvesting costs	Accessibility and distance to roads	Road maps and GIS-systems Terrain models Pre-harvest inventories and Post-harvest monitoring inventories Harvesting cost models based on "Best practice".
	Slope	
	Ground properties	

Table 3. Examples of categories used for relative stumpage (net income per cu m) on short-term harvest volumes and sources of information to be used for assessments.

3. Scientific support for assessment

Production and cost impact assessments should be based on scientific evidence to an extent as large as possible. The stepwise structure of the assessment process increases the possibilities to do this at a reasonable cost. Scientific evidence is generally available only in scattered and fragmented form, which makes it hard to incorporate in fixed integrated calculation models.

3.1. Site and stand type distributions

Knowledge about area distributions for site and stand types is useful for the assessments. Information from forest inventories, such as national forest surveys, is necessary or recommended to make the assessment for the reference (Table 4).

Forest inventory data required for PCIA	Necessary - X Recommended - R
Forest gross area	X
Average site productivity/growth level	X
Area distributions according to site conditions relevant to the standard (soil moisture, soil type etc)	R
Area distributions regarding relevant forest types and/or tree species	R

Table 4. Basic forest inventory data needed to make the assessment for the reference management.

3.2. Forest growth and yield

The majority of the scientific evidence regarding the impact on timber production from individual indicators has to be based on forest growth and yield research. A thorough knowl-

edge of relevant and available growth and yield research results will improve the assessment results. Areas of special importance are:

- Site productivity
- Forest management systems
- Tree species regulation
- Regeneration practices
- Stand management practices
- Rotation length

3.3 Management costs

The impacts of performance standards on management costs can be categorised in wide classes: Direct expenses and productivity effects. Direct expenses are cost associated with additional prescribed actions such as erosion control and consultation processes. The productivity effects are costs rising from modifications of management practices, such as low impact logging prescriptions. In both cases scientific evidence may be obtained from models regarding best practice costs.

4. The Swedish FSC-standard case

During 1996-1997 the Swedish FSC-standard working group made continuous assessments of the production impacts of the national FSC-standard under development. However, since the cost consequences were considered to be strongly correlated with the impact on production, no specific assessments were made regarding economy, apart from simple translations from harvest impact (%) to profit impact (%). An important feature of the existing Swedish FSC-standard is that it doesn't follow the structure of the FSC P&C. The main impact of the standard on production is, however, concentrated to section 5 and 6 in the standard dealing with environmental and biodiversity issues.

4.1 The standard development process

The Swedish FSC-standard was developed by an official FSC national standard working group. The working group appointed a number of sub-groups and task forces to solve different issues. One sub-group – the production group – was given the task to make continuous assessments of impacts on production. The work in the sub-group and the results were documented in protocols open to all stakeholders in the process

4.2 Stakeholders and working group members

The Swedish FSC national standard working group consisted of representatives from all three stakeholder categories –ecological, social and economic. The participating stakeholders are presented in table 5.

Category of stakeholders	Stakeholder
Economic	The Swedish Forest Industries association
	The Swedish Church
	The Swedish society for forestry
	IKEA
	Kinnarps
Environmental	WWF
	The Swedish society for nature conservation
	Young field biologists
	The society for ornithology
	Friends of the Earth
Social	The Sami people
	Union of sawmill workers
	Union of forest workers

Table 5. Stakeholders in the Swedish FSC national standard working group.

4.3 Scientific support

Scientific support for the assessments were provided by several means:

- The person responsible for the official forest statistics in Sweden participated as member of the production sub-group
- Hearing with researchers were carried through
- Scientist on request from the sub-group investigated some specific issues
- Special analysis were made on data from the Swedish national Forest Survey

4.4. Assessment results

The main results from the assessments were presented in an excel table with comments attached for each indicator in a word document. An extract from the excel table is presented in table 6.

Assessment of the impact on timber production of the Swedish FSC-Standard 1997-09-24

Average long term harvest level m3/ha 4,26

Sample of indicators in the standard	Gross area 1000 ha	Net area 1000 ha	Production loss %	Site productivity Multiplier %	Long term loss 1000 m3	Short term loss Multiplier %	Short term loss 1000 m3
6.1.1 HCVF a+b	250	250	95	100	1011	200	2021
6.1.1 c Low productive	4000	4000	100	12	2043	100	2043
6.1.2 Landscape set-asides	1120	770	95	100	3113	150	4669
6.1.3 Effects of aggregation	3	3	95	100	12	200	24
6.2.1 a Pastures with trees	400	200	20	150	255	50	128
6.2.1 b Wet sediment soils	200	100	20	100	85	100	85
6.3.1 Drainage	250	150	40	60	153	25	38
.....
.....
.....
.....
Accumulated effect of all indicators							
Including reserves and low productive forests					15646		18680
1000 m3							
In relation to total production in Swedish Forests					15,6%		18,7%
Excluding reserves and low productive forests					11442		12399
Excluding reserves and low productive forests					11,9%		13,2%

Table 6. Extract from an assessment of the impact of the Swedish FSC-standard 1997-09-24 on long term timber production and short-term harvests.

The assessment in table 6 was made in relation to a theoretical management regime with no environmental considerations. As a second reference regime the minimum considerations according to legislation was used.