

# Sustainability Criteria and Indicators for Solid Bioenergy from Forests

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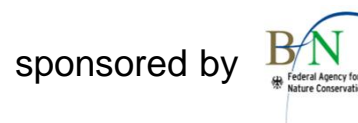
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## Previous Considerations

- Forests are characterized by many features: complexity and site-dependant effects
- Forest bioenergy: additional thinnings and residues from fellings
- Some potential impacts have to be addressed indirectly
- Some potential long-term effects unknown (precaution!)
- Sustainable Forest Management Processes and Certification schemes don't consider specifically some of the potential impacts.
- GHG Balances (not considered here )
- **Scope:** Feasible criteria and indicators to ensure additional forest biomass harvesting for bioenergy is sustainable (maintenance of forest productivity and ecosystem services)

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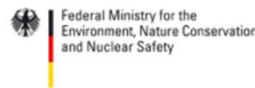
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# Logical Framework

Identification of:



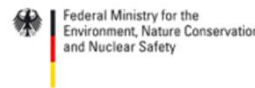
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# Risks of forest bioenergy harvesting

Risks	
Phase	Risks
<b>pre-harvesting</b>	<ul style="list-style-type: none"> <li>- No compliance with legislation</li> <li>- Lack of planning</li> <li>- Effects on high biodiverse forests and other areas</li> </ul>
<b>harvesting</b>	<ul style="list-style-type: none"> <li>- Impacts on biodiversity</li> <li>- Impacts on soils</li> <li>- Impacts on water</li> </ul>
<b>post-harvesting</b>	<ul style="list-style-type: none"> <li>- Management intensification, simplification and homogenization of forests</li> </ul>

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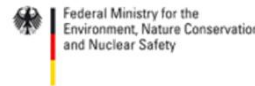


# Risks and measures

## Pre-harvesting phase

Risks	Measures to prevent them
Lack of respect for national regulations, EU Directives, international agreements	Assure compliance
Lack of planning	Existence of Forest Management Plan
Define harvestable areas	Assess go/no-go areas

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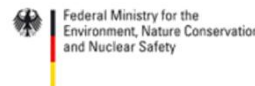


# Risks and measures

## Harvesting phase (I). Risks to Biodiversity

Risks	Measures to mitigate the risks
Survival of some species	<ul style="list-style-type: none"><li>- Control the amount of woody biomass removals</li><li>- Control of the amount of “singular dead or alive trees” (snags, den trees, etc...) removals.</li></ul>
Introduction of invasive/exotic species and GMOs	<ul style="list-style-type: none"><li>- Control the amount of woody biomass removals</li></ul>

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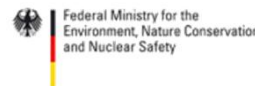


# Risks and measures

## Harvesting phase (II). Risks to Soils

Risks	Measures to mitigate the risks
Impacts on chemical and biological properties	<ul style="list-style-type: none"> <li>- Control the amount of woody biomass removals</li> <li>- Control the amount of Soil Organic Carbon</li> </ul>
Impacts on physical properties	<ul style="list-style-type: none"> <li>- Control the amount of woody biomass removals</li> <li>- Control/avoid the amount of stump removal</li> <li>- Avoid soils with high risks of compaction</li> <li>- Control the allowable slope for harvest</li> </ul>

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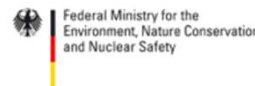


# Risks and measures

## Harvesting phase (III). Risks to Water

Risks	Measures to mitigate the risks
Impacts on hydrology	<ul style="list-style-type: none"> <li>- Protect riparian ecosystems and wetlands and establish adequate buffer zones to protect freshwater resources</li> <li>- Control the amount of woody biomass removals</li> </ul>
Impacts on water properties (physical, chemical and biological)	<ul style="list-style-type: none"> <li>- Protect riparian ecosystems and wetlands and establish adequate buffer zones to protect freshwater resources</li> <li>- Control the amount of woody biomass removals</li> <li>- Control the amount of agrochemical and pesticides used</li> </ul>

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# Risks and measures

## Post-harvest phase: intensification, simplification and homogenization of forests

Risks	Measures to mitigate the risks
Impacts on regeneration	Control the amount of woody biomass removals
Impacts derived of the use of agrochemicals and intensification of natural products uses	Avoid chemical fertilization Control wood ash recycling and quality Avoid pesticides. Allow natural methods
Introduction of invasive/exotic species, and GMOs	Avoid reforestation with invasive/exotic species and GMOs

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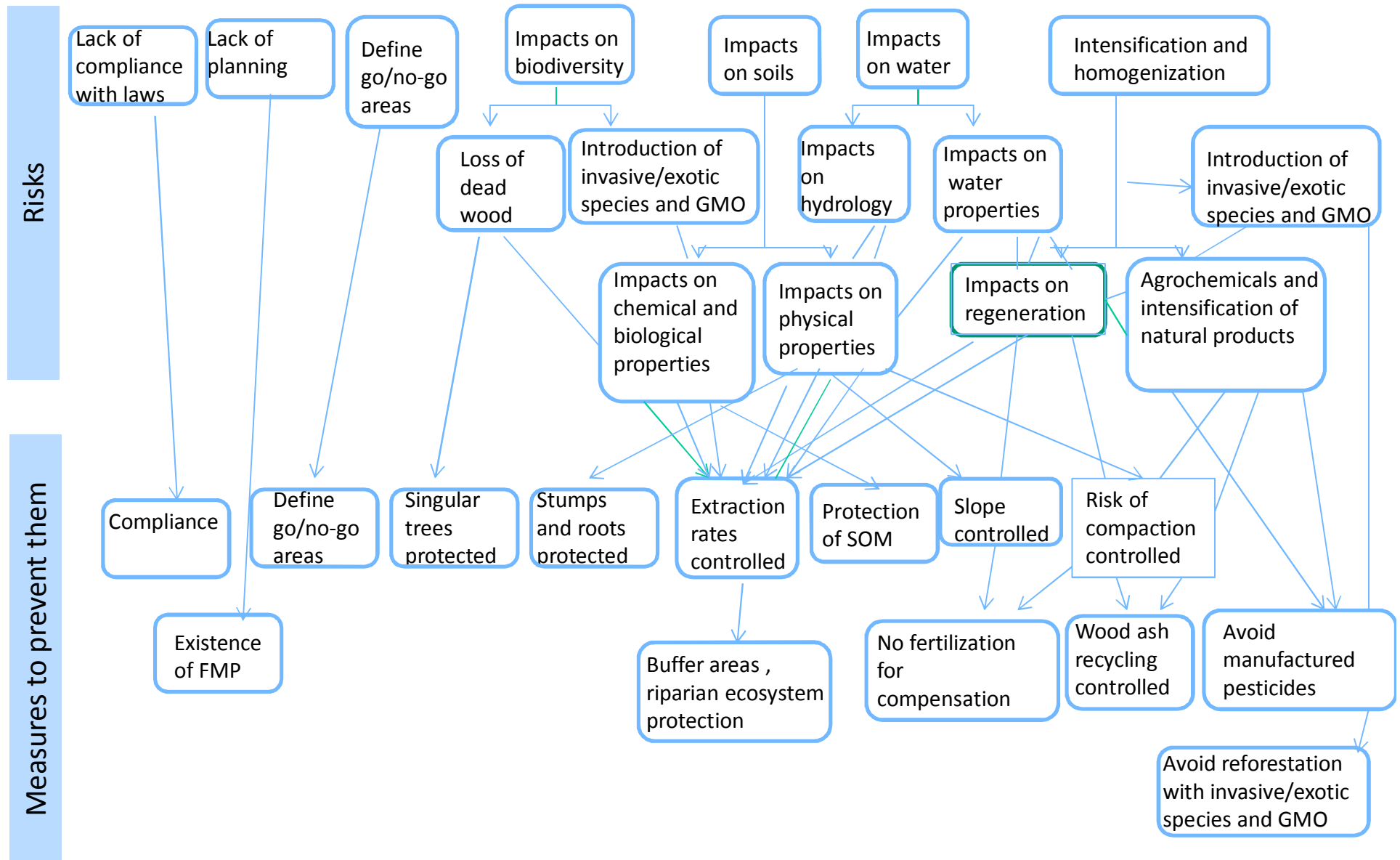


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# Concept map of risks and measures to prevent them



# Criteria, Indicators and Thresholds

Proposed set:

- 8 Criteria
- 16 Indicators (+ GHG Balances to be discussed)
- Thresholds: quantitative (compliance) or qualitative

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# C1. Raw material legitimacy

Indicator	Threshold
I1.1. EU Timber Regulation (EU No 995/2010)	Compliance
I1.2. Existence of Forest Management Plan	Compliance

## EU Timber Regulation

- Forest Law Enforcement, Governance and Trade FLEGT
- All wood products supplied legally included those produced in the EU
- Operators have to show “due diligence”
- CITES
- Into effect from March 2013

## Forest Management Plan

- Long-term productivity and ecosystem services of the stand. It allows to address very specific issues at stand-level.

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## C2. Potential harvestable areas

Indicator	Threshold
I2.1. Non-HCVF (unless for management purposes)	Compliance
I2.2. High risk of natural hazards, salvage logging	Allowed
I2.3. Primary Forests	Tbd

### Ecosystems that should be protected

- High Biodiverse Forests (Forests and other wooded land that are species-rich or harbor rare, threatened or endangered ecosystems or species recognized by international agreements or included in national lists or lists drawn up by intergovernmental organizations or the IUCN).

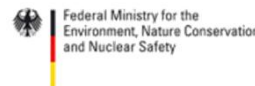
### High risk of natural hazards, salvage logging

- Ecologically sound; respect to the other indicators

### Primary forest

- Controversial definition. To be discussed.

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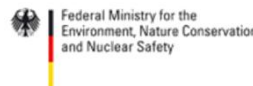
# C3. Sustainable extraction rates and retention of deadwood

Indicator	Threshold
I3.1. Stumps and roots left in forests. Only selected extraction allowed and complete stump removal is avoided.	Compliance, further threshold defined at national/local level
I.3.2. Live cavity trees, den trees, other live decaying trees and snags left in the forest and protected	Compliance, further threshold defined at national/local level
I3.3. Extraction restricted to soils without nutrient depletion risks. Coarse/fine wood should be addressed?	Compliance with “zoning”(or 1/3 residues left)
I.3.4. Protection or enhancement of SOC	Maintenance or enhance the value

## Map of soils risks (“zoning”):

- Considered in some countries (i.e.UK, some US States)
- Parameters: i.e. UK addresses ground damage, soil fertility and soil acidity
- Traffic light system with: green/yellow/red areas
- When map not available: 1/3 of residues should be left

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# C4. Soil compaction and erosion

Indicator	Threshold
I 4.1 No harvesting in area having steep slope	Proposed threshold (>35°)
I 4.2 Extraction only from soils with low-to-medium compaction risk (exceptions when soil is frozen)	Compliance

**Soils:** Key factor in ecosystem dynamics

Some precautions put in place through residues removal control (seen before).

**Erosion:**

- Avoid steep slope to prevent from erosion

**Compaction:**

- Avoid the risks of productivity loss and impacts on water hidrology

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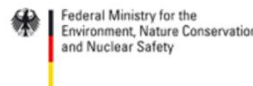
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# C5. Use of agrochemicals and intensification of natural products uses

Indicator	Threshold
I5.1. No fertilizer use to compensate for residue extraction	Compliance
I5.2. Wood ash recycling assuring no heavy metal loads above current levels in forest soils	Only allowed in “yellow” areas?
I5.3. Avoid manufactured pesticides	Compliance

- FSC and PEFC indicate that inappropriate use of chemicals or other harmful substances shall be avoided in forestry
- Fertilisation or liming allowed to correct specific problems in both schemes.
- In both national standards of FSC and PEFC wood ash recycling is allowed

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# C6. Water quality and quantity

Indicator	Threshold
I6.1. Riparian ecosystems and wetlands are protected and adequate buffer zones are established	To be defined at local level?

- Some features of water quantity addressed by the amount of woody residuals removal and the use of agrochemicals and intensification (seen before).
- Areas closed to watercourses are of special concern to protect water ecosystems (avoid water quality degradation, increase water runoff, and protect biodiversity)

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# C7. Invasive/Exotic Species, and GMOs

Indicator	Threshold
17.4. Reforestation of harvested stands should not be performed with invasive/exotic species and GMOs	Compliance?

- Woody biomass removal should not take place in a way that allow to invasive/exotic species and GMOs (seen before).
- Both PEFC and FSC prefer regeneration with native species but allow the introduction of exotic species as long as negative impacts can be avoided or minimized
- The use of GMOs is generally prohibited by FSC and not well indicated by PEFC (some national standards allow their use)

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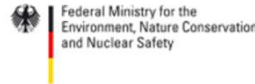
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# C8. GHG Balance

Indicator	Threshold
To be defined	To be defined

Later!

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# Pending questions and further work

## Open questions:

- Are these indicators the most relevant?
- Are the proposed thresholds appropriate?
- Should all indicators be applied at European level?  
Or (some) to be defined at local (landscape) level ?

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