



**EFORWOOD**

Sustainability Impact Assessment of the Forestry-Wood Chain

# **An application of cost-benefit analysis for sustainability impact assessment of forest wood chains: an example employing the Baden- Wurttemberg FWC**

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## The main principles of SIA

- Ex-ante assessment of policy proposals
- Broad social, economic and environmental impact of policies
- Policy alternatives that promote policy benefits while mitigating potential negative impacts



## CBA in project and policy appraisal

- CBA originally developed for the investment appraisal of (public) projects – early 20th century
  - Identify all winners and losers of a proposed project
  - Quantify the costs and benefits to the society (including unintended effects and externalities)
  - **EFFICIENCY PRINCIPLE:** project passes the CBA test if total benefits exceed total costs
- CBA is currently being applied to policy appraisal
  - USA: CBA present in most areas of public policy
  - EC: CBA of directives



## CBA as a tool for SIA

- Can CBA be used for SIA?
  - Depends on the operational definition of sustainability
    - Traditional economics: “non-declining per capita utility”
    - Modern economics: “non-decreasing joint productive potential of economic and environmental systems”
    - Rawls (1971), Sen (1999), Howarth (1997): “equality of rights”, “undiminished set of life opportunities”
  - Efficiency and sustainability do not necessarily go in the same direction



## CBA approach in EFORWOOD

- Implementing CBA in the TOSIA of EFORWOOD is not without complications and simplifications
- For example the time dimension is simplified
  - Long-term activities (forestry, consumption)
  - Discontinuous data set (2005, 2015, 2025)
  - Limited time dimension to analyse long-term impacts (e.g. biodiversity)
- Often the alternatives are defined as operational running systems evaluated against each other → transition costs may be ignored



## Standard CBA procedure

- Define the objects of the analysis (status quo, alternatives, scope, time dimension)
- Identify, quantify and value all the costs and the benefits of alternatives (*additionality principle*), including external effects (*economic, social and environmental*)
- Determine the timing of impacts and discount the monetary values to the present date
- Use CBA performance criteria (NPV, IRR, B/C ratio) to assess the desirability of the alternatives

# ...CBA interface in TOSIA

Tool for Sustainability Impact Assessment (ToSIA)

# ToSIA

Welcome Data Preparation Chain runs Comparison Analysis About


Select chain:  
Baden-Württemberg varia... 


Select reference future:  
2005 


Select scenario:  
2005 

Discount rate  % 

Generate overview

Customize parameters: 

External effects 

Product prices 



Analyse

Select visualization:  
 Table  Bar chart

Back

### Cost Benefit Analysis (CBA)

Cost-benefit analysis (CBA) is a decision-support tool that compares the benefits and the costs associated to an investment project or a policy. In the context of EFORWOOD, CBA is used to evaluate the overall sustainability impact of different policy measures on the European Forest Wood Chains (FWCs). The assessment involves the comparison of the status quo situation (reference future) to one or more alternatives (scenarios). The analysis focuses on the incremental costs and benefits, that is, the differences between the indicator values in the scenario and the reference future. Benefits and costs are measured in monetary terms taking individual preferences as the source of value. The resulting net benefits reflect the change in the net income of the society from undertaking the alternative. Since costs and benefits stretch over time, the usual practice is to discount future net benefit flows to obtain present values. A project or a policy passes a CBA test if social gains exceed social costs, that is, when the Net Present Value (NPV) of the change from the status quo to the alternative is positive.

Select the reference future: A1 or B2

Select the scenario



# Analysed alternative for illustration

## **The Baden-Württemberg case study**

**Where the expert team have kindly provided the basis for the first test runs and CBA-assessment of an A1 reference future along an A1 + bioenergy scenario**

Source: PD303,  
EFORWOOD





# Analysed alternative for illustration

Bio-energy Scenario in BW (Status Quo= 2005) absolute amount from model	Scenario Bioenergy
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**Caution needed!!!**

**Ongoing work on validating chain flows,  
topology and data.**

Status quo: 6%	2025: +40% of total vol. in beech; +10% of total vol. in spruce
Energy plantations from agriculture land (in ToSIA: import of energy; chipping and heating) available area: 40.000ha	2015: 75% ( $\frac{3}{4}$ =30.000ha) 2025: 75% ( $\frac{3}{4}$ =30.000ha)

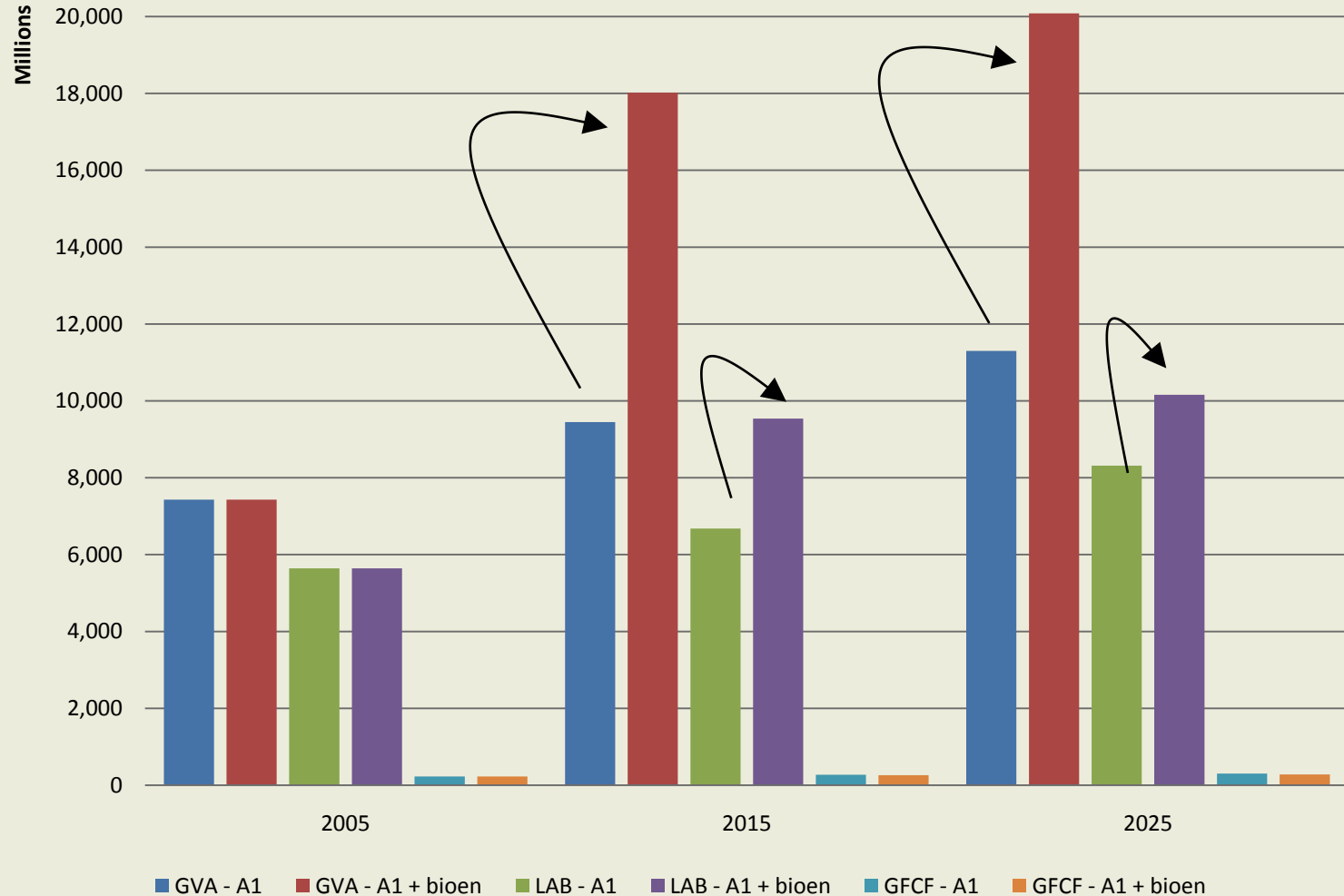
Source: PD303,  
EFORWOOD

Tab 1: Overview of M3 assumptions for the Bio-energy scenario for A1 and B2.



# Scenario impact (1)

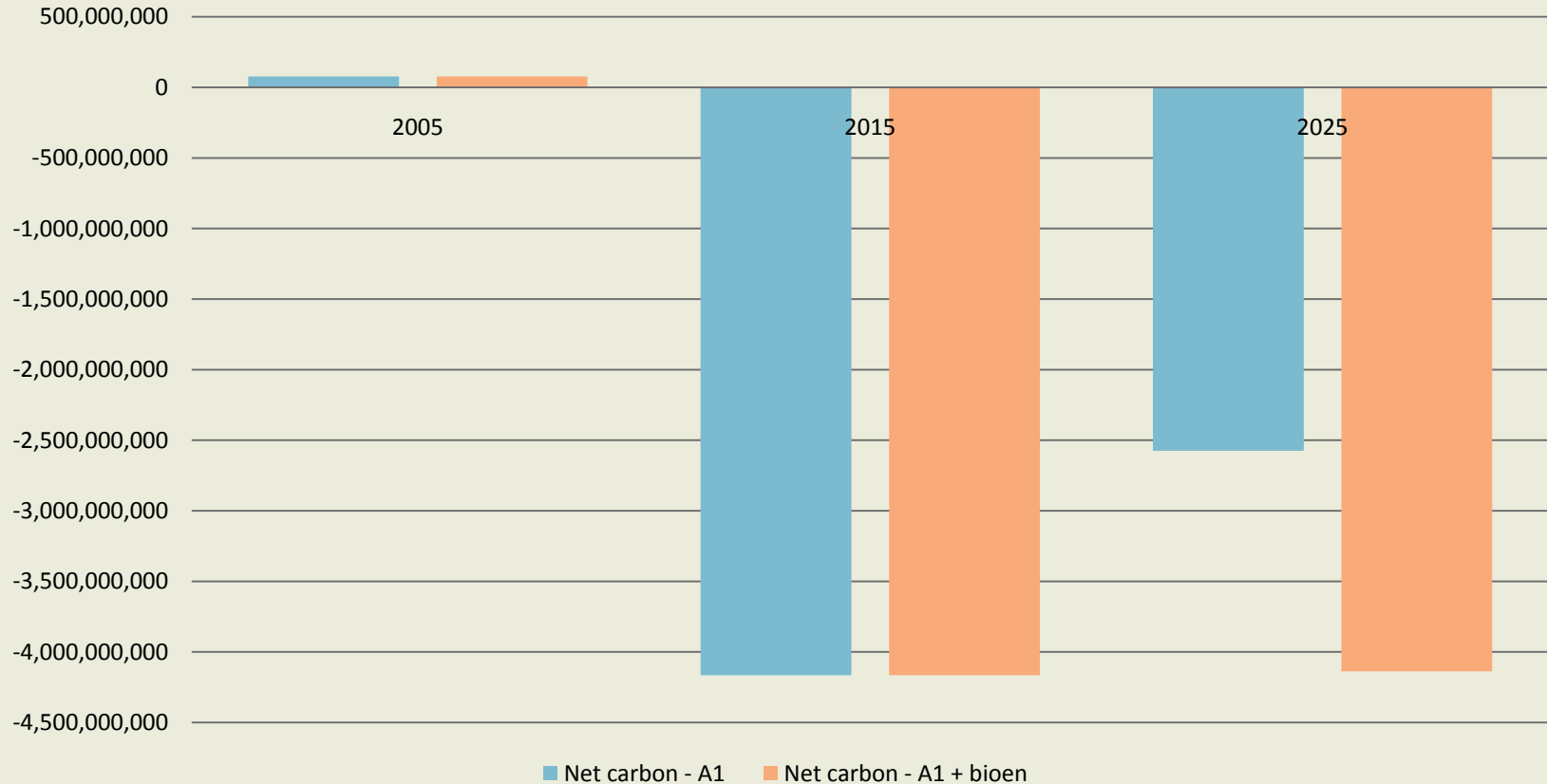
## Economic and social components (€)





## Scenario impact (2)

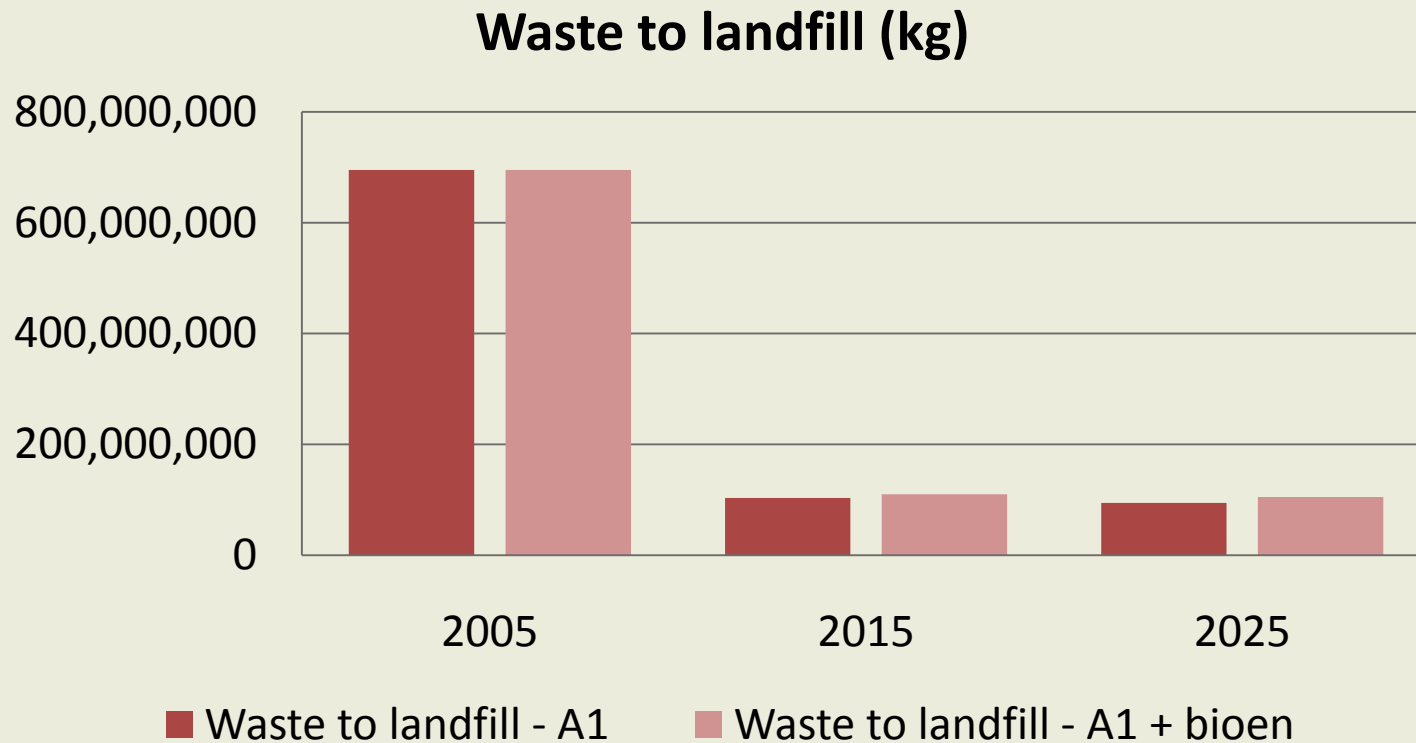
Net carbon (kg of CO2 eq)



**Higher harvest activity – higher export of residues – a boundary issue**



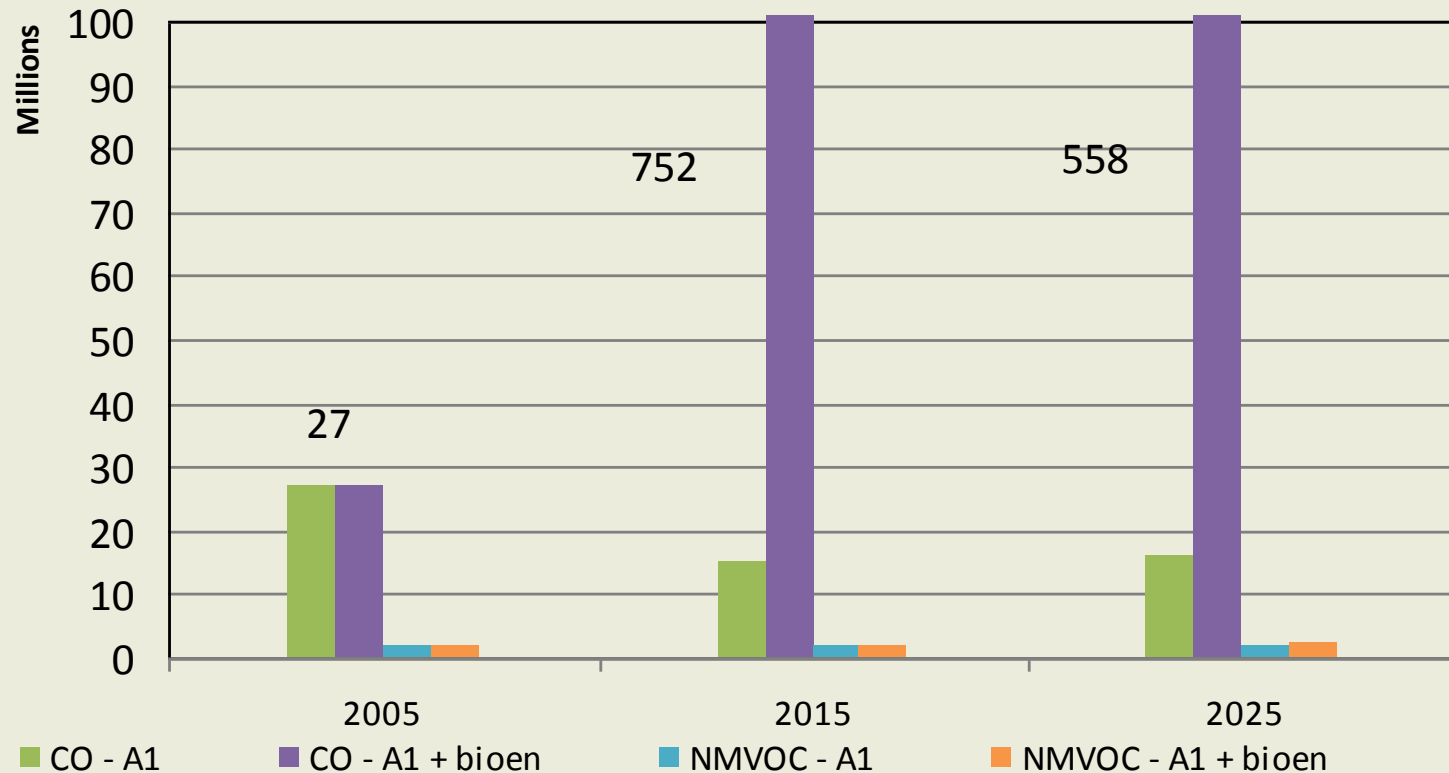
## Scenario impact (3)





# Scenario impact (4)

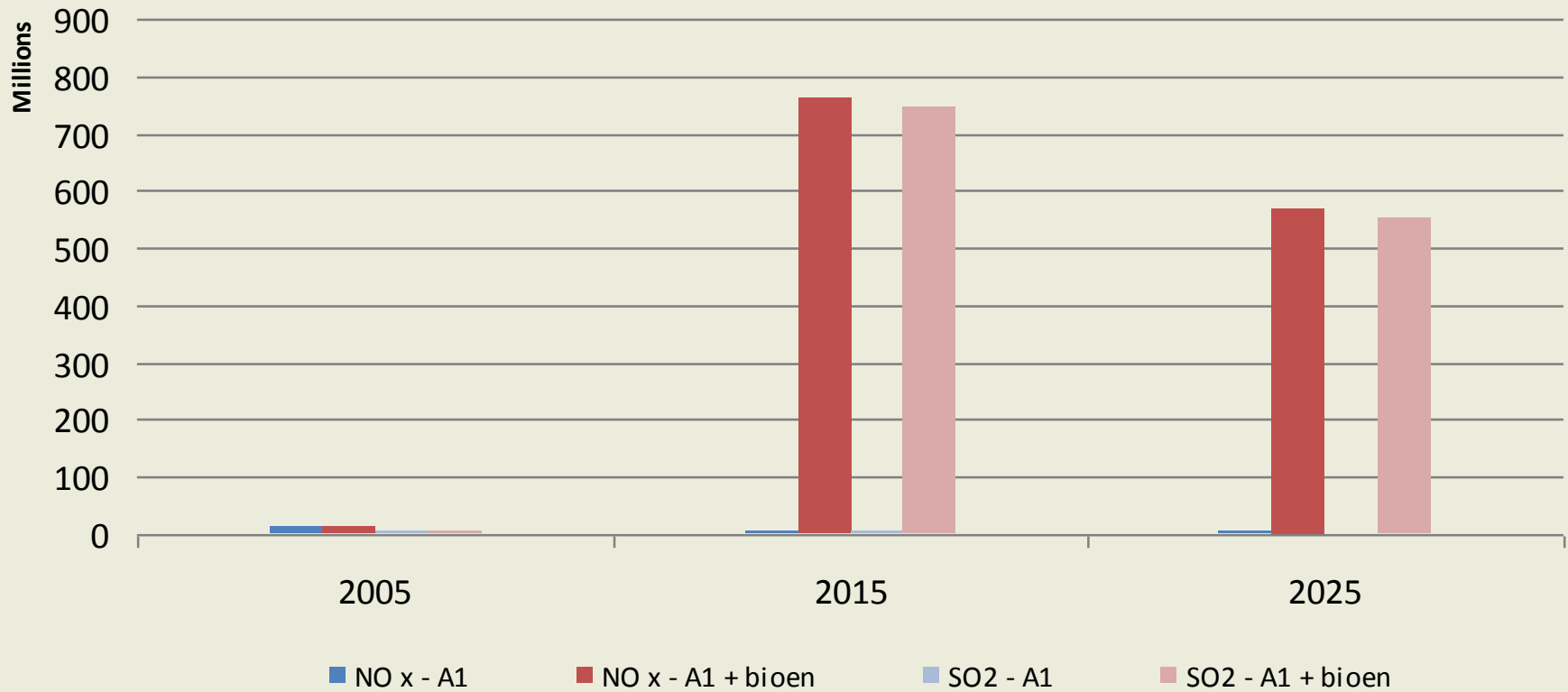
## Non-GHG air pollution (kg)





## Scenario impact (5)

### Non-GHG air pollution (kg)





## Monetary estimates for externalities

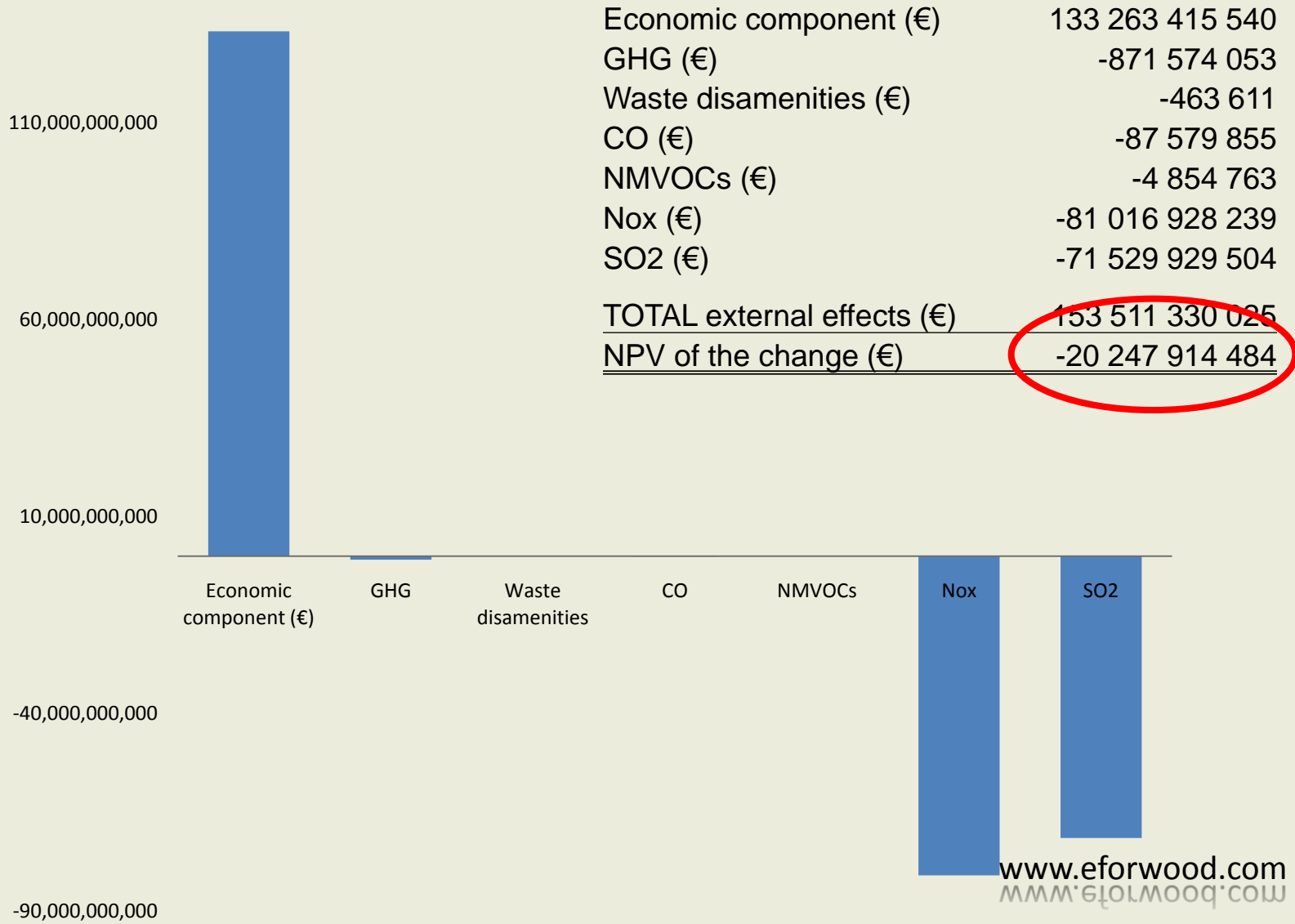
- Discount rate: 2%
- GDP/cap growth rate: 3,6%

Shadow price for GHG (€/kg CO <sub>2</sub> )	
2005-2009	0,011
2010-2019	0,025
2020-2029	0,040

NO <sub>x</sub> (€/kg)	6,270
CO (€/kg)	0,007
NMVOG (€/kg)	0,901
SO <sub>2</sub> (€/kg)	5,660
Landfilled waste (€/kg)	0,003



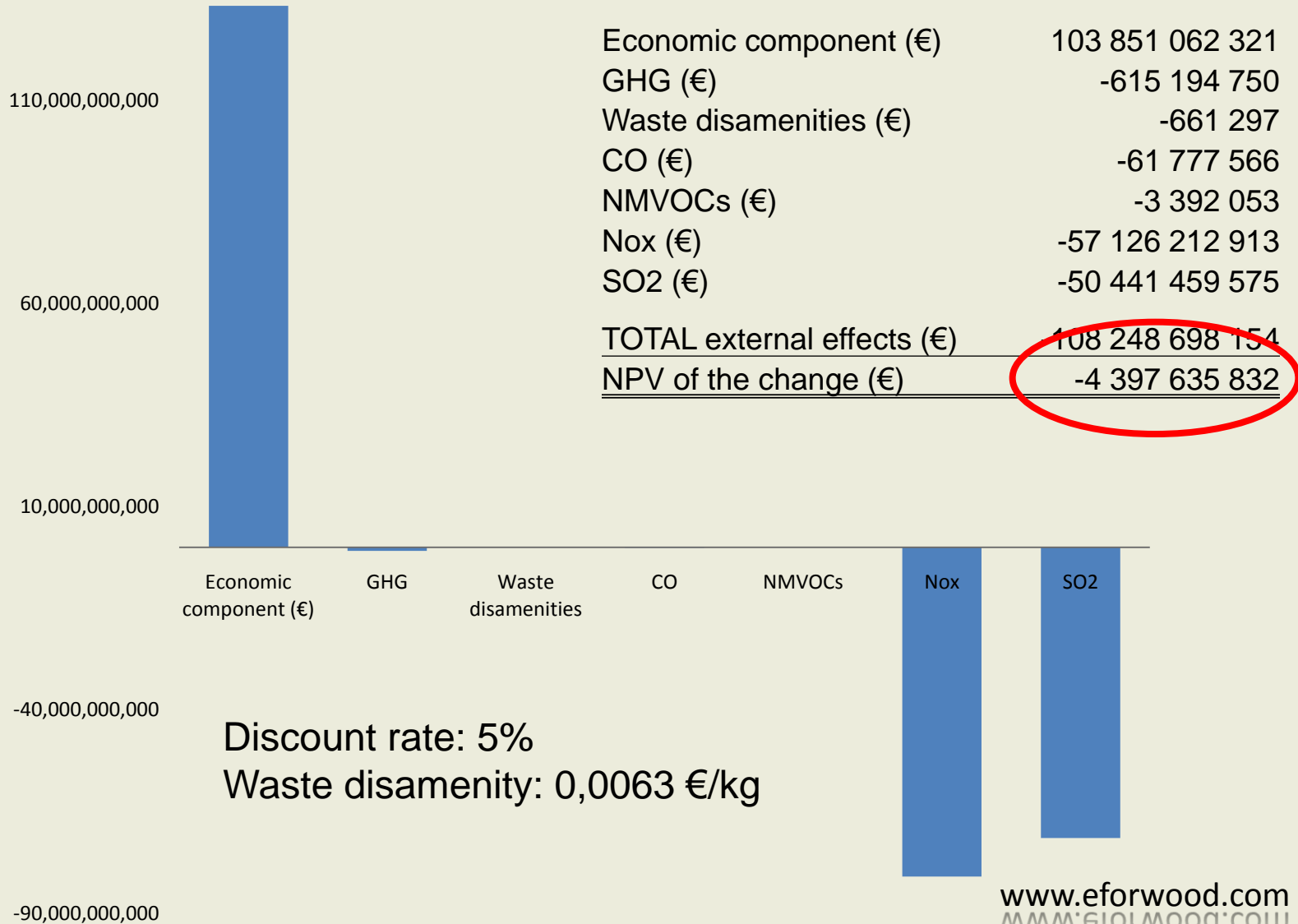
## NPV of the change







## Sensitivity analysis





## Conclusions

- In principle, the tool works
  - Simplifications in the implementation of CBA:
    - Dynamic Market corrections not entirely integrated
    - Not all externalities of relevance is easily valued
    - Often TOSIA may not consider transition from one management system to another
    - When TOSIA evaluates an “operating system” against another, this is not a usual CBA-type of evaluation
    - Applying TOSIA in other sectors: Relies on an indicator set defined in the same way as in EFORWOOD (same DCPs)
- Side benefit: Can also be used for data quality checking

# Thank you for your attention!

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