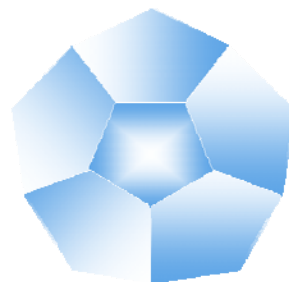# Tool for Sustainability Impact Assessment (ToSIA)

Initial Results from Single Chain Cases

Marcus Lindner, European Forest Institute

EFORWOOD CONFERENCE
"The Forest-based Sector –
Sustainability for Competitiveness"
1-2 October, 2007
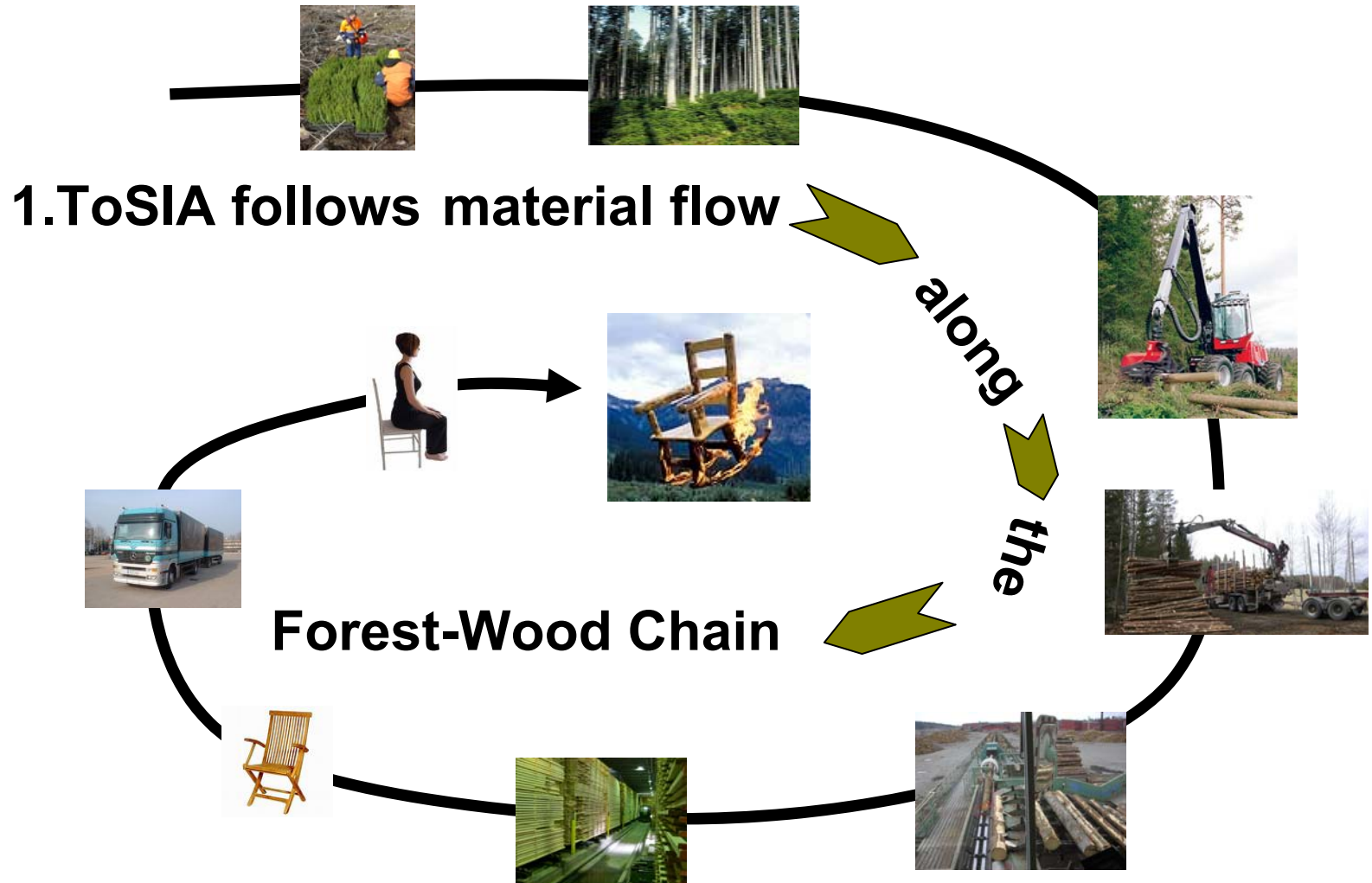Huis Van Het Hout, Arsenaal, Brussels, Belgium

ToSIA approach to Sustainability Impact Assessment of Forest-Wood Chains

Initial results from two Single FWCs

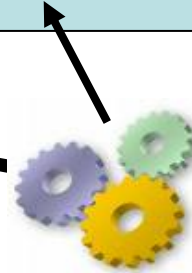1. Scots pine ► Furniture/Bio-energy

2. Norway spruce ► Timberframe

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How is ToSIA approaching the Sustainability Impact Assessment?

1.ToSIA follows material flow **along the** **Forest-Wood Chain**

Transformation

ha ➡ tons of C

ha of forest resources

tons of C

tons of C

Material flow along the Scots pine chain producing furniture

ha

n C

From 1000 tons of Carbon in harvested timber 9.2 % end up in the final furniture product

908 ton C are converted to other products:

|	
Harvest residues left in forest	- **224 ton C**
Pulpwood	- **409 ton C**
Pellets	- **172 ton C**
Wood residues	- **102 ton C**
Waste	- **1 ton C**

224 ton C

172 ton C
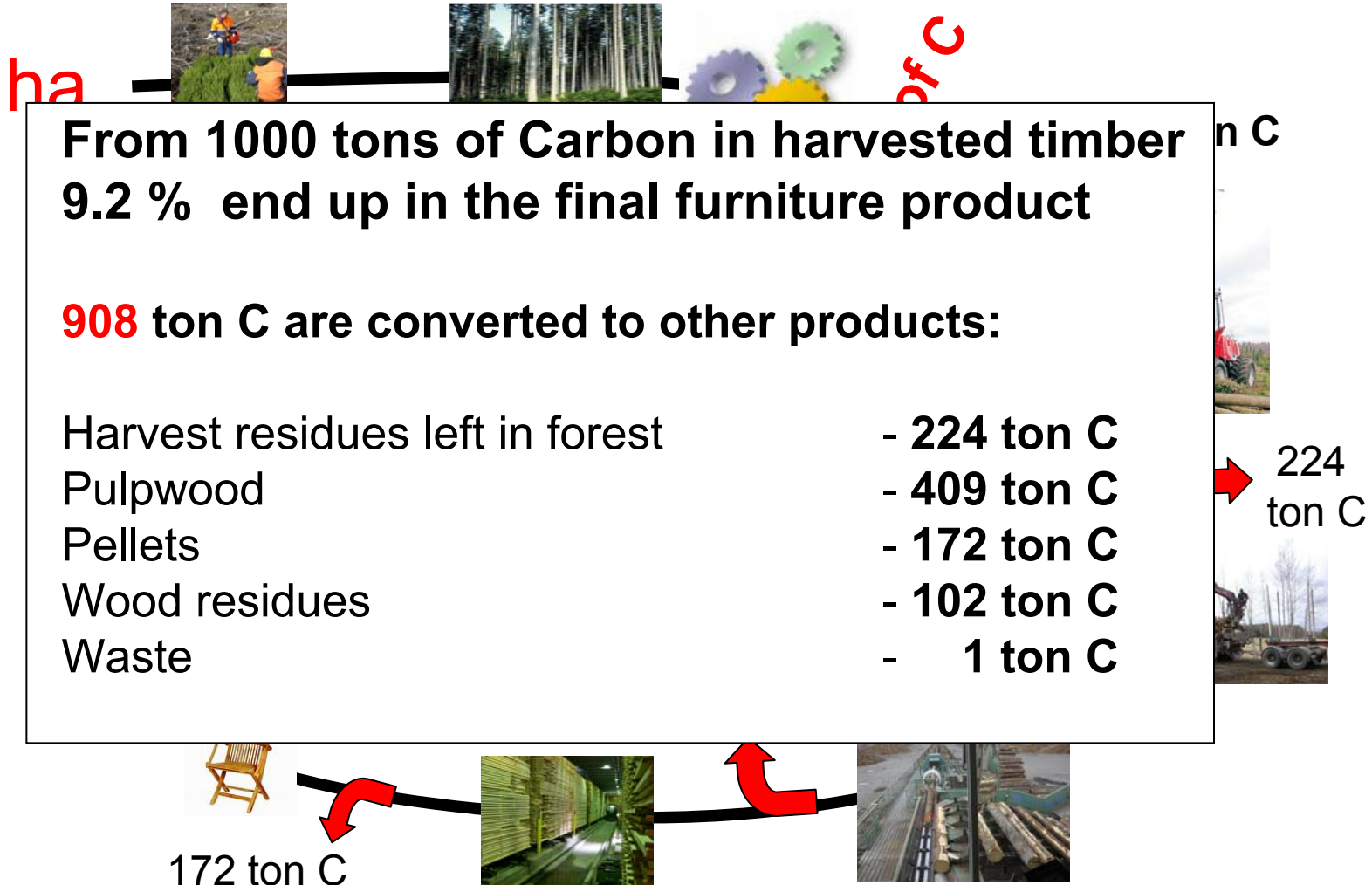
End of life of products

- Reuse
- Recycling, recovery of material
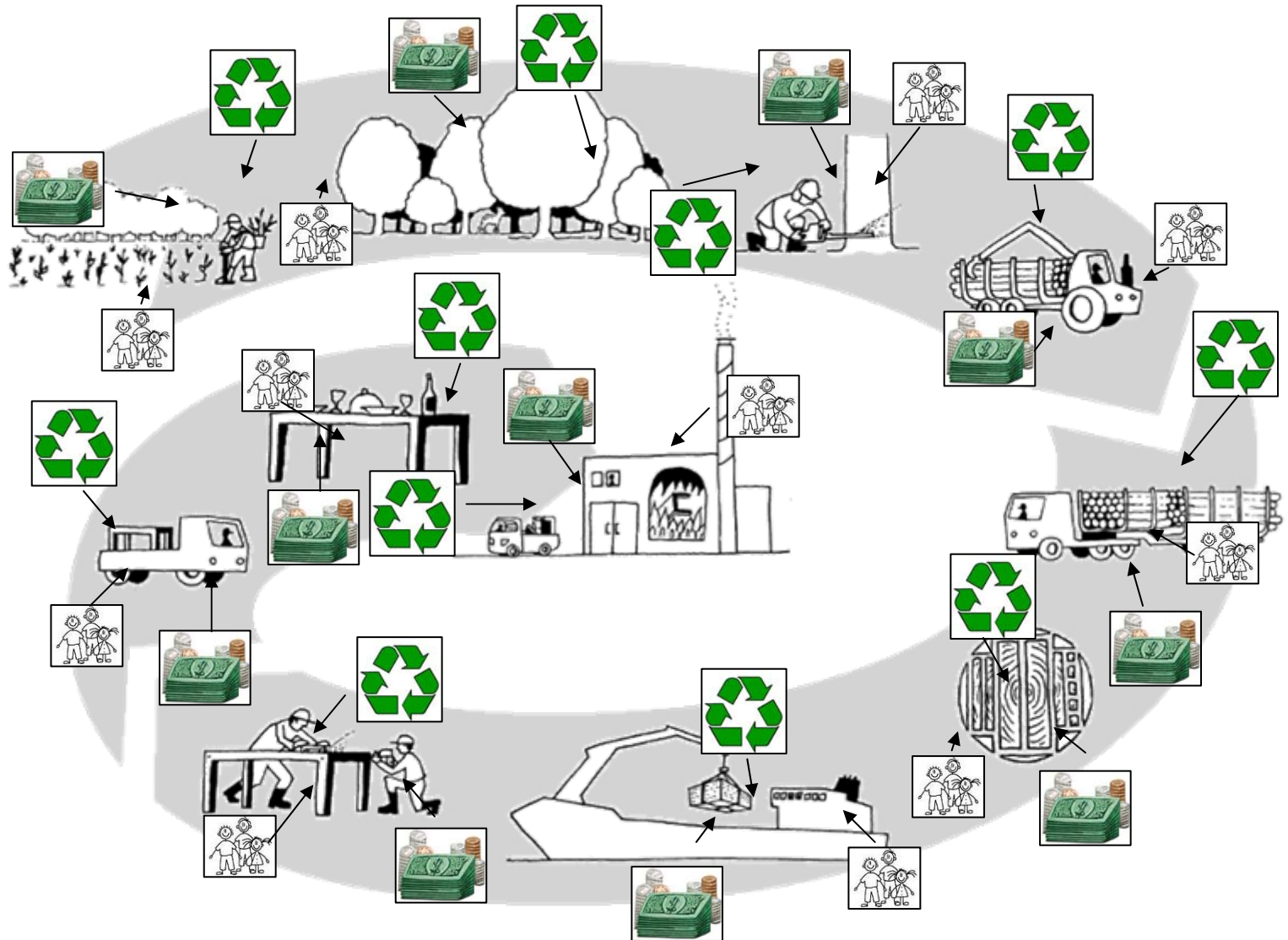
- Incineration, with/without energy recovery

- Landfill

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How is ToSIA approaching the Sustainability Impact Assessment?
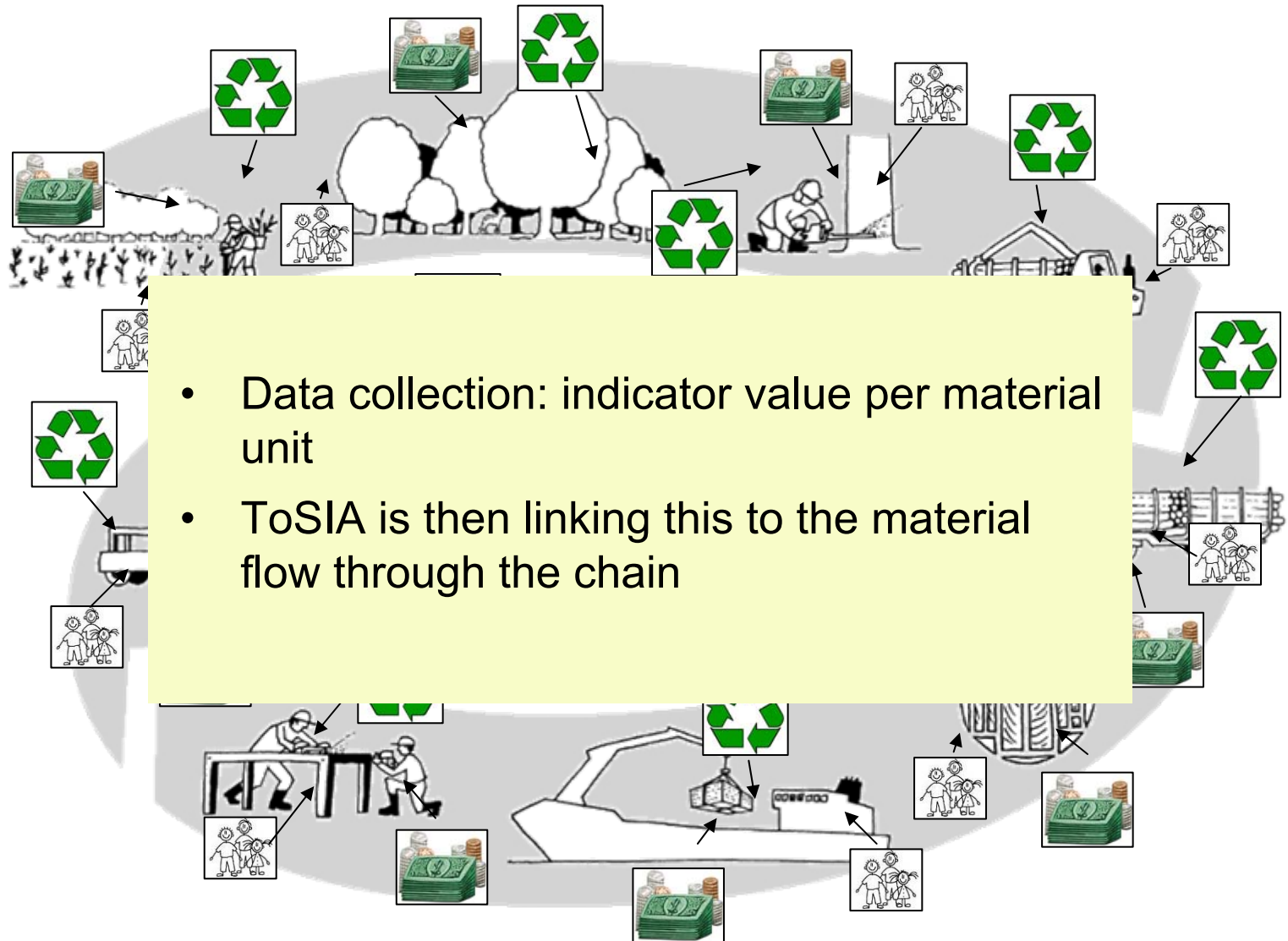

2. ToSIA measures sustainability indicators
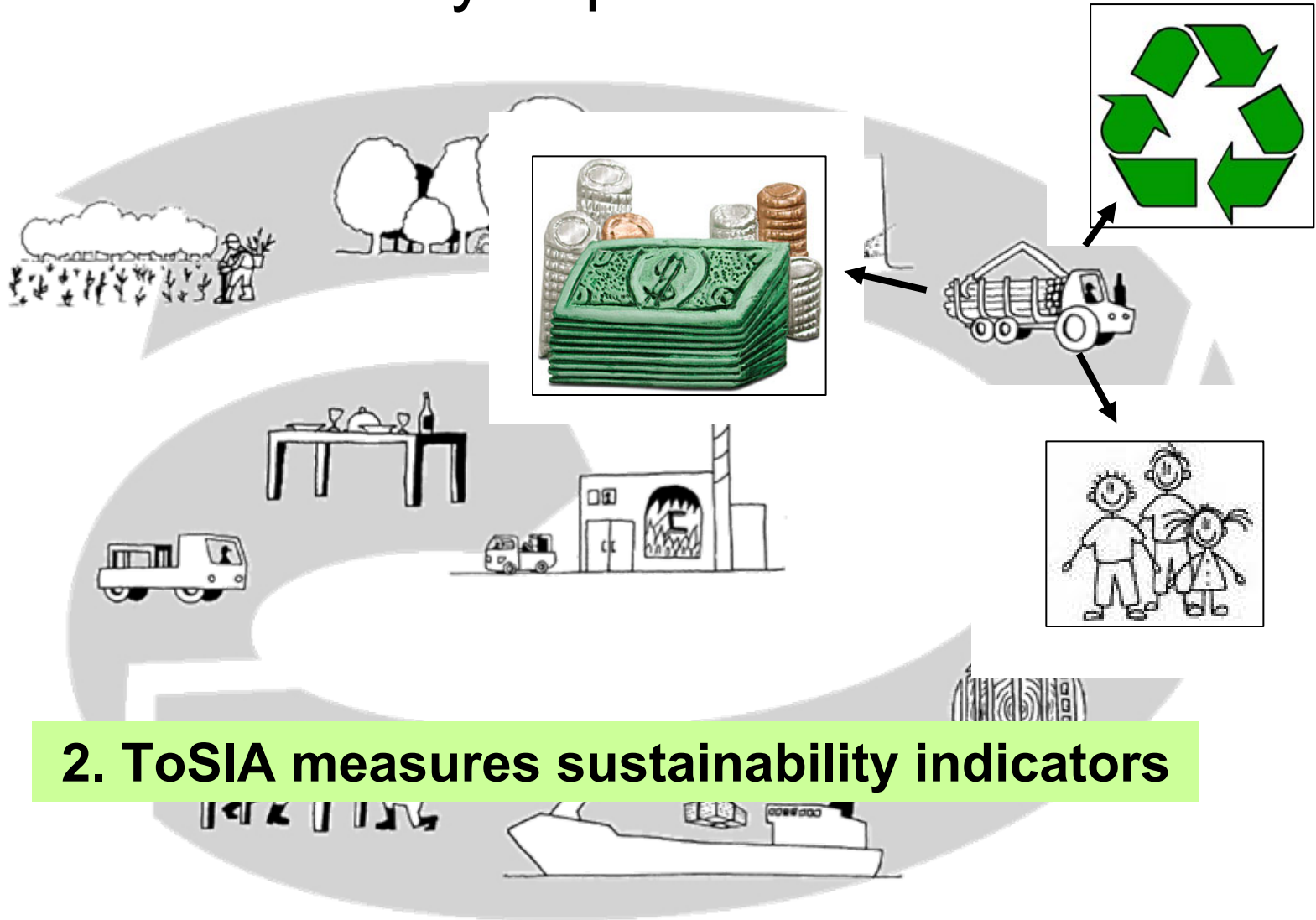
Sustainability indicators are linked to all production processes

Sustainability indicators are linked to all production processes

- Data collection: indicator value per material unit

- ToSIA is then linking this to the material flow through the chain

Selected Sustainability Indicators for Single FWC Analysis

Economic	**Environmental**	**Social**
Gross value added	Energy use	Employment
Production costs	Greenhouse gas emissions	Wages and salaries
Resource / material use	Transport distance and freight	Occupational safety and health
Total production	Water use	

Selected Sustainability Indicators for Single FWC Analysis

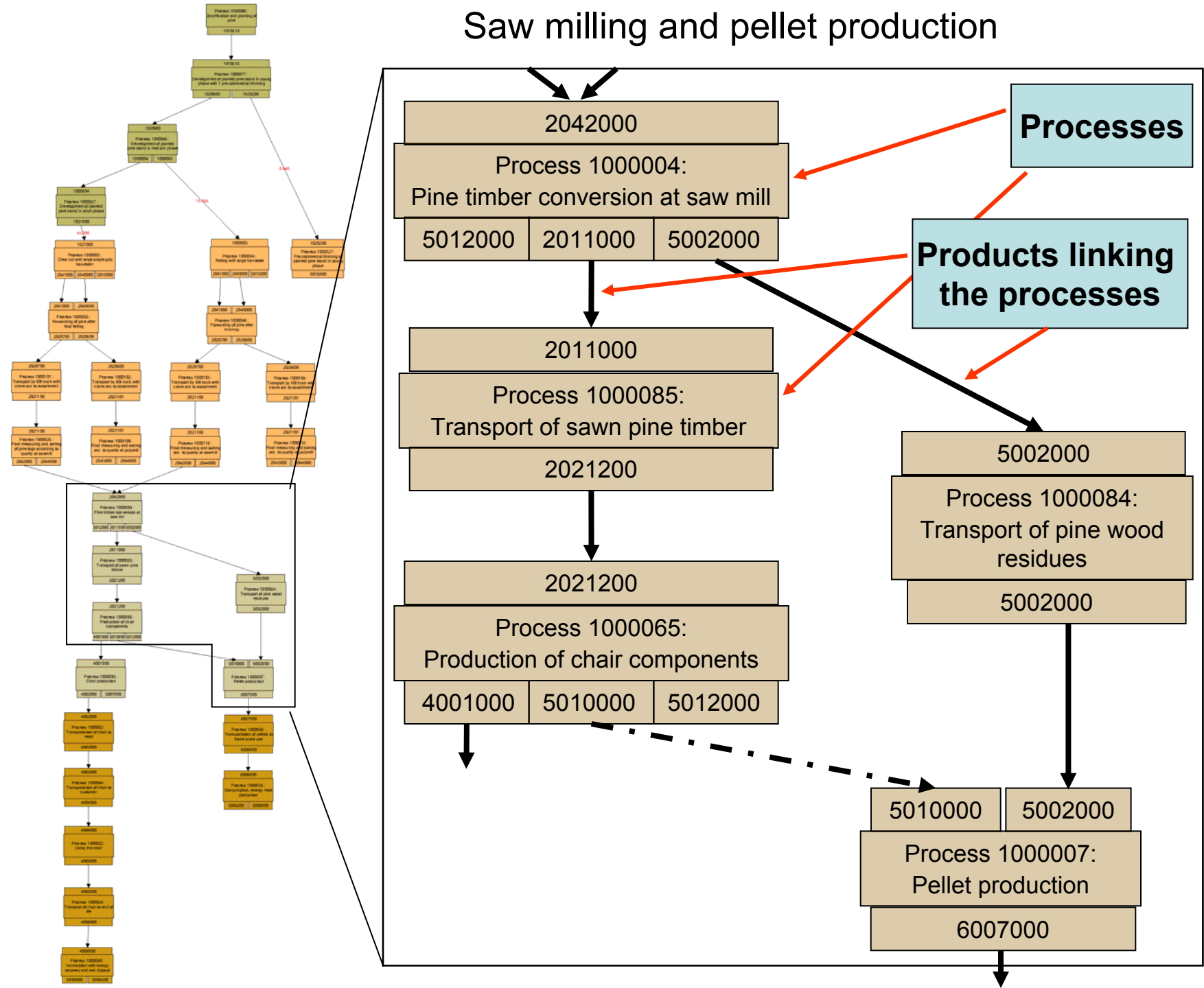| Economic	Environmental	Social
Gross value added	**Energy use**	**Employment**
Production costs	**Greenhouse gas emissions**	**Wages and salaries**
Resource / material use	Transport distance and freight	Occupational safety and health
Total production	Water use	

Steps needed to apply ToSIA

1. Define structure of the forest value chains

2. Collect information about sustainability indicators for all production processes

3. Run ToSIA

4. Evaluation of sustainability impacts

FOUR MODULES

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Material flow

Processes

Forest resource management

Forest to industry interaction

Processing and manufacturing

Industry to consumer interaction
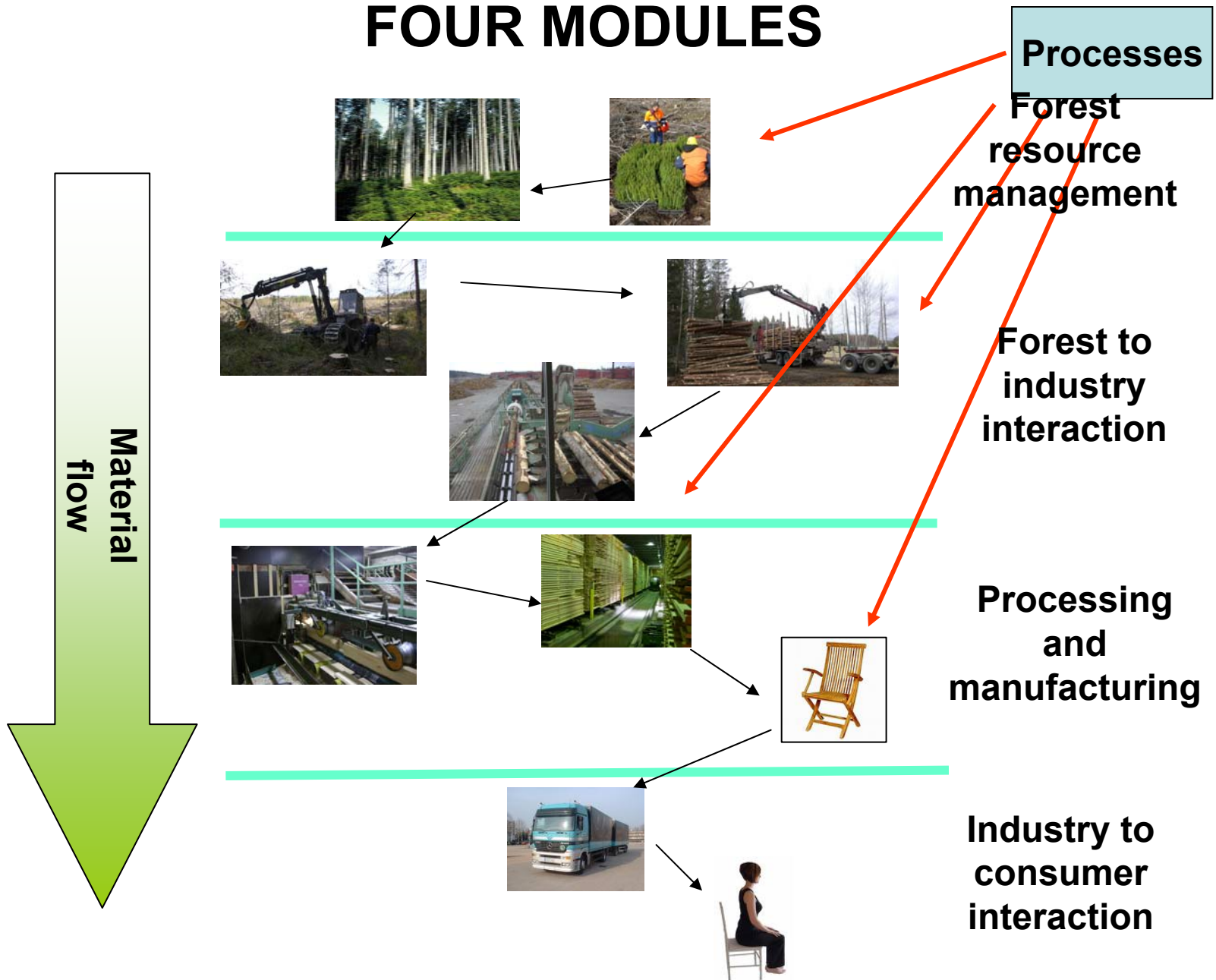
Saw milling and pellet production

2042000

Process 1000004:
Pine timber conversion at saw mill

| 5012000 | 2011000 | 5002000 |

Processes

Products linking
the processes

2011000

Process 1000085:
Transport of sawn pine timber

2021200

2021200

Process 1000065:
Production of chair components

| 4001000 | 5010000 | 5012000 |

5002000

Process 1000084:
Transport of pine wood
residues

5002000

| 5010000 | 5002000 |

Process 1000007:
Pellet production

6007000

Steps needed to apply ToSIA

1. Define structure of the forest value chains

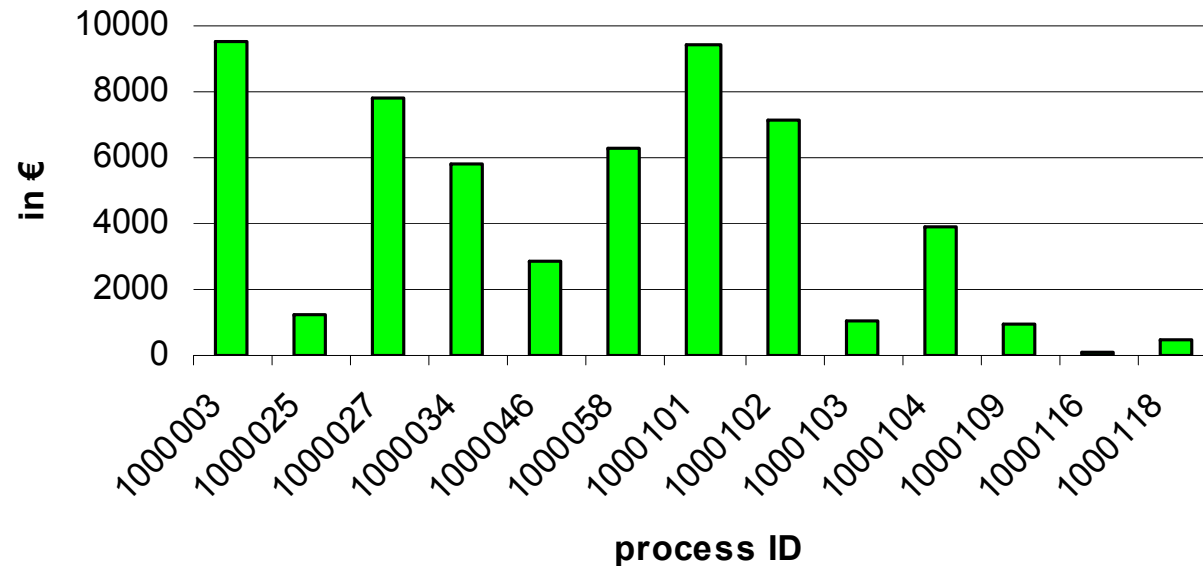2. Collect information about sustainability indicators for all production processes

Step 2: Indicator data collection

For each of the production processes, indicator values are collected per unit of material flow based on

- Statistical data

OR **- Outputs of detailed process–related models**

OR **- Expert opinion**

Sustainability indicator values
by process: Forest to industry interaction

Wages and salaries
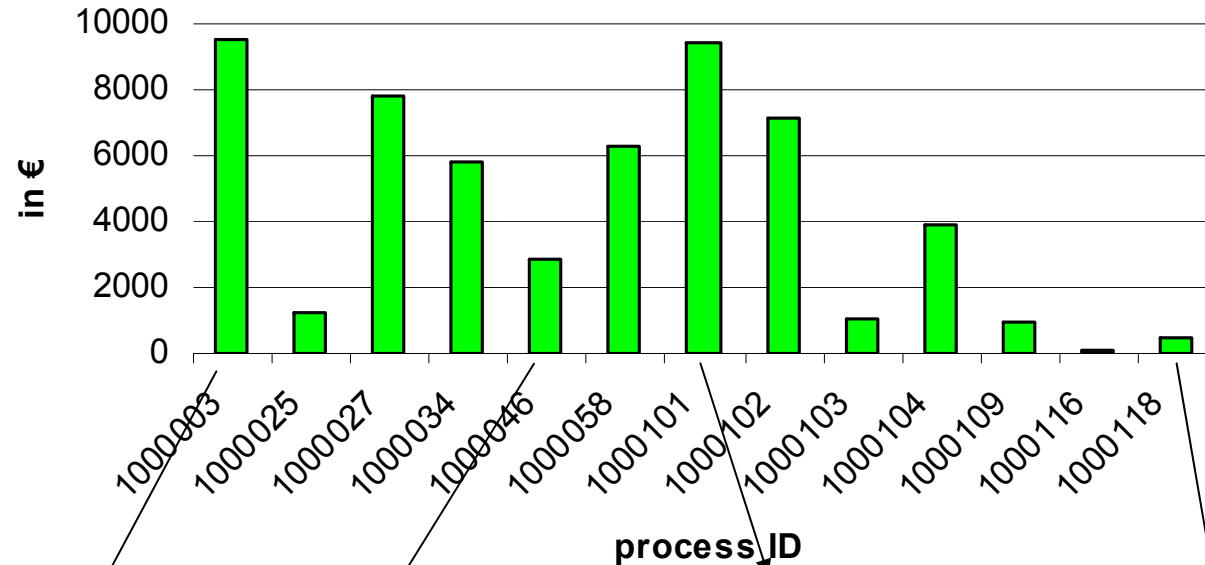
1000003: Clear cut with a single grip harvester

1000101: Transport by 60t truck crane acc. to assortment

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Employment in the Scots pine chain
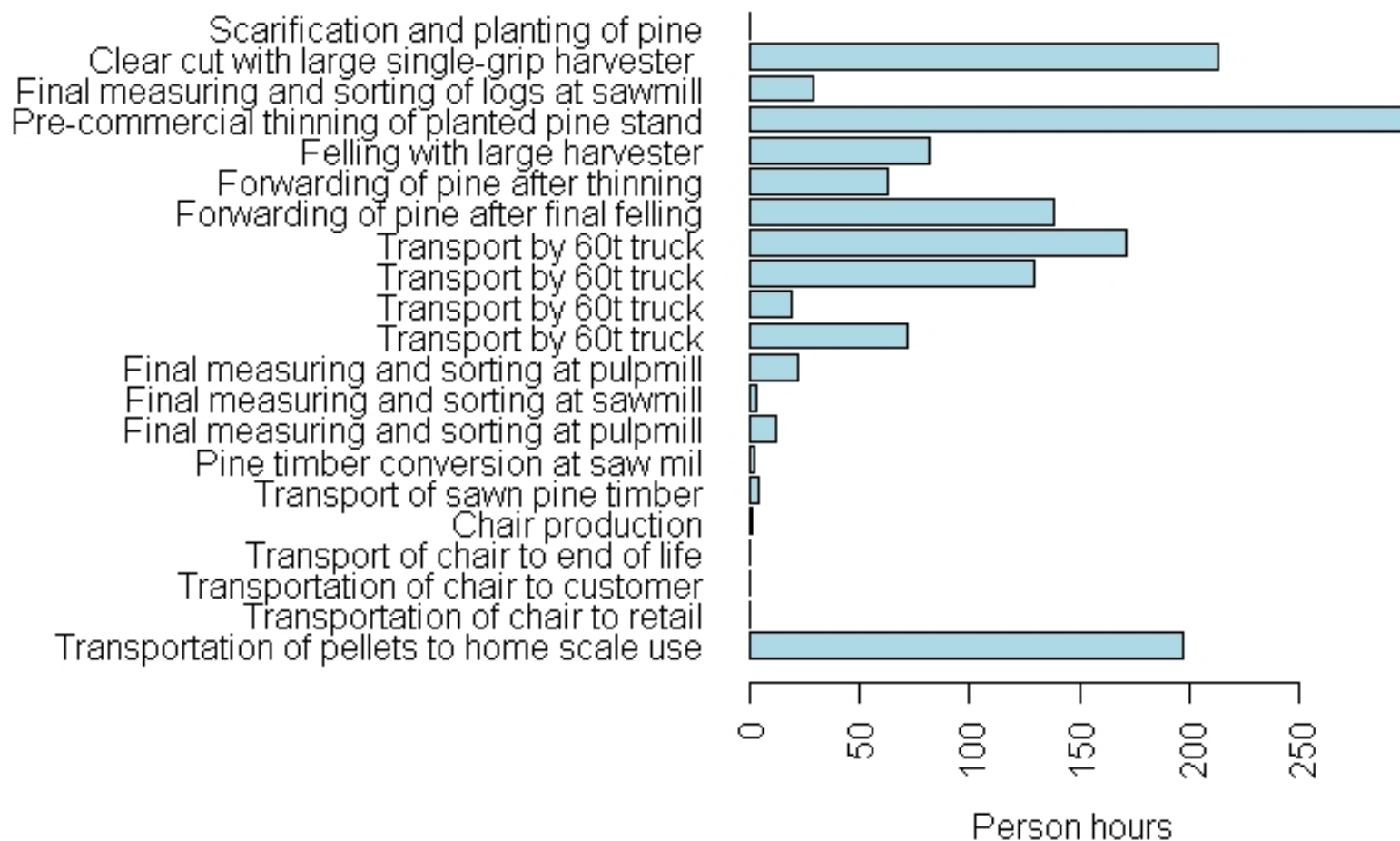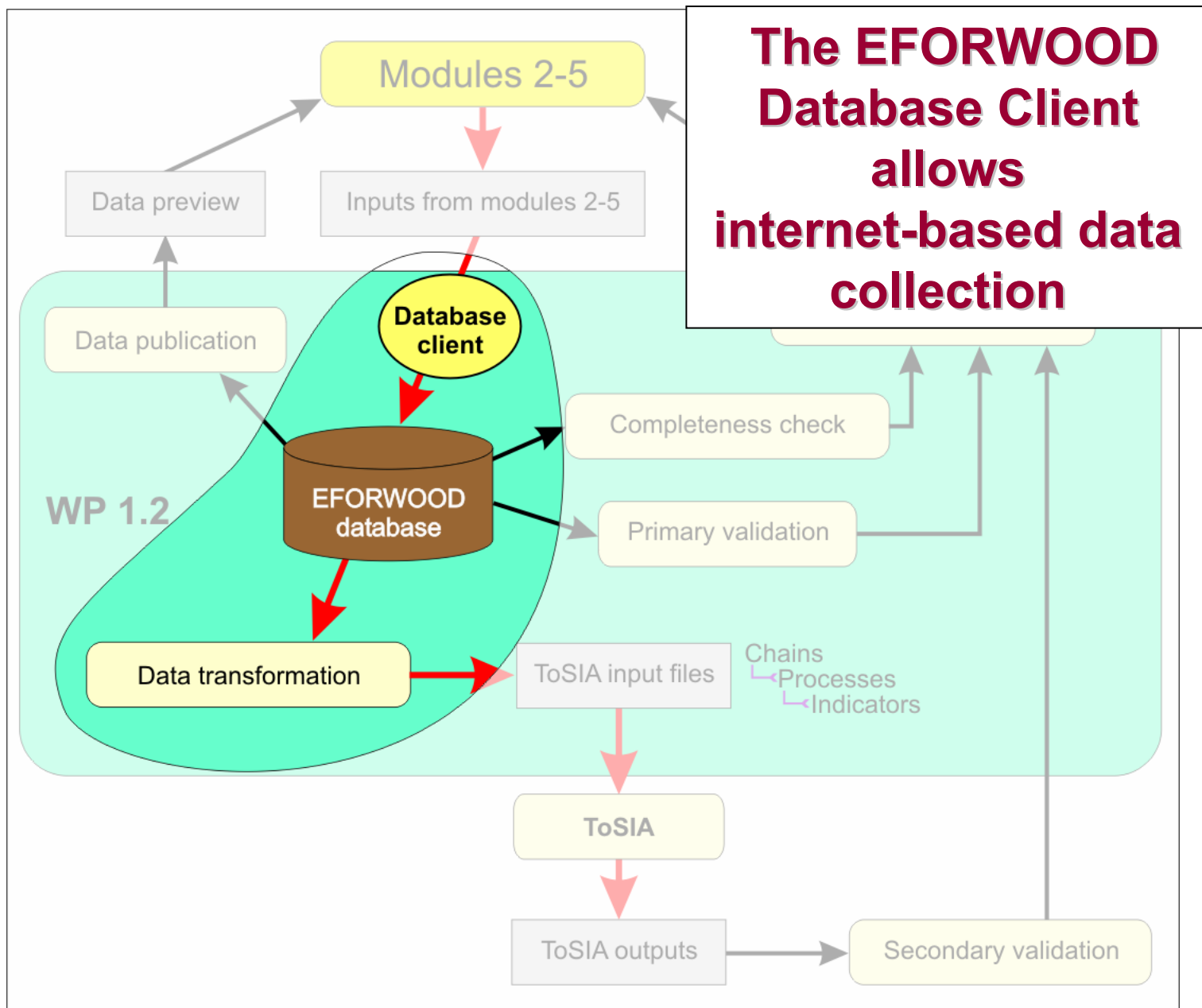
The EFORWOOD Database Client allows internet-based data collection

Steps needed to apply ToSIA

1. Define structure of the forest value chains
2. Collect information about sustainability indicators for all production processes
3. Run ToSIA

Step 3: Run ToSIA

ToSIA

- **calculates sustainability for the material flows in the specified FWC using data reported and further data processing**

- **aggregates indicator values along the FWC**

- **outputs raw indicator results**

- **submits aggregated and raw indicator results to evaluation routines**

Aggregation of indicator values

Example: Indicator Wages and Saleries
Scandinavian Pine Chain

Aggregation of indicator values

Example: Indicator <u>Wages and Saleries</u>
Scots pine FWC

Aggregation of indicator values
for FWC Modules

Forest resource management **10.972 €**

Forest to industry interaction **56.532 €**

Industry to consumer interaction **2.591 €**

Processing and manufacturing **5.802 €**

8 %   3 %   14 %

75 %
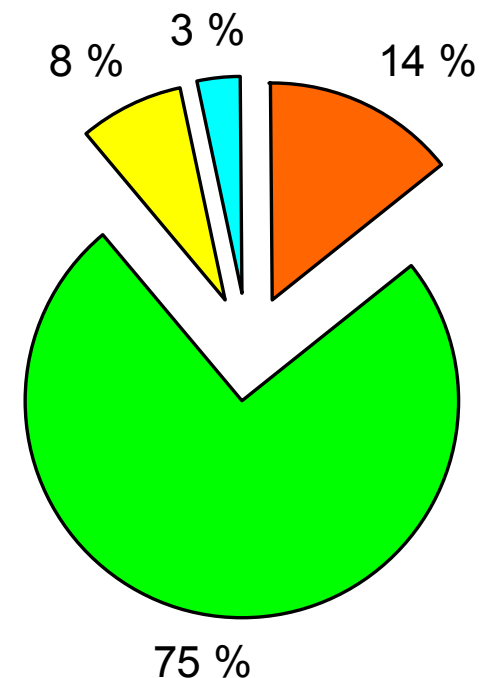
The ∑ of the indicator values along the chain: 75.898 €

Production Costs by Modules
Scots pine chain

12%

41%

24%

23%

- ■ Forest resources management
- ■ Forest to industry interactions
- ■ Processing and manufacturing
- ■ Industry to consumer interactions

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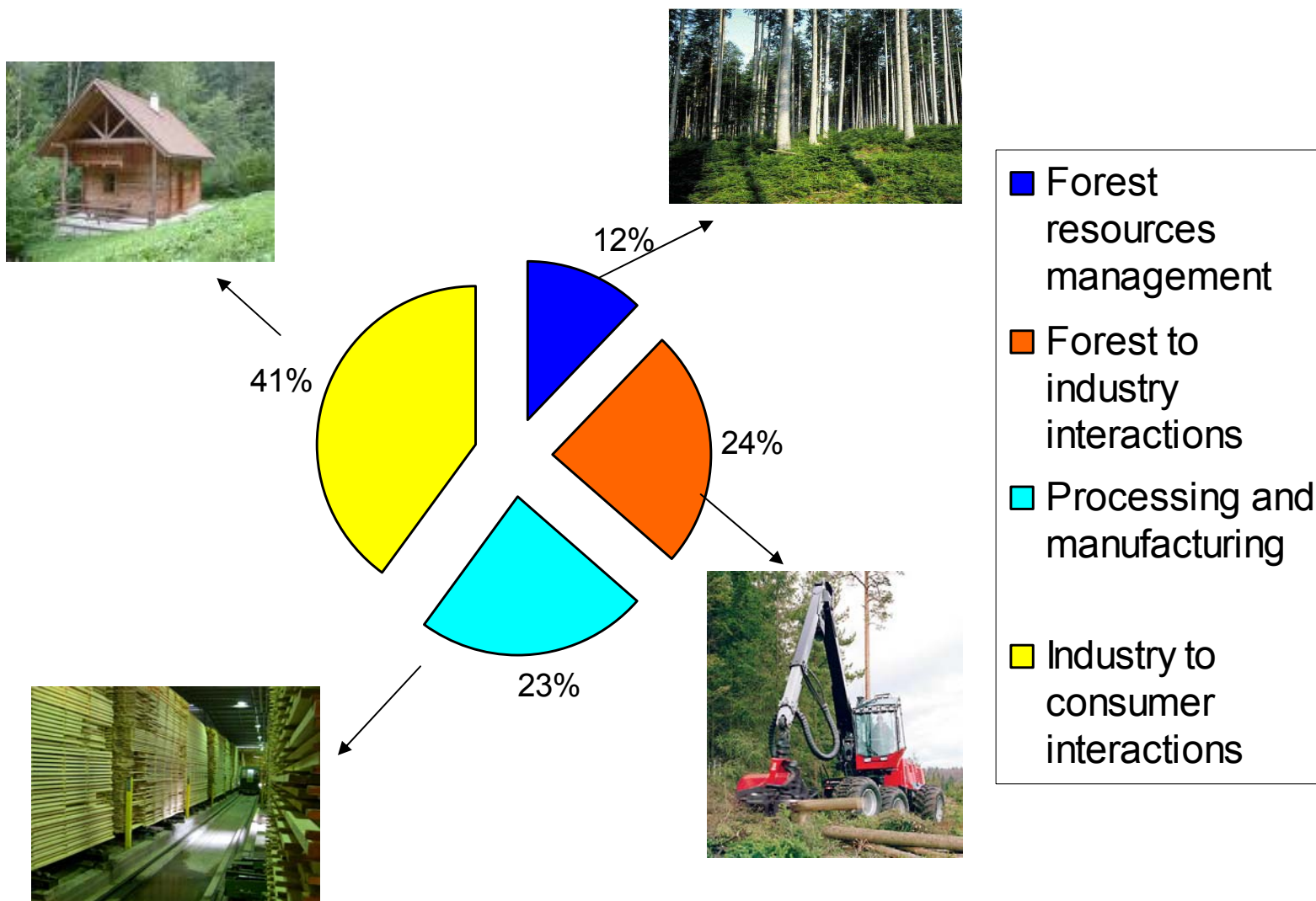
Aggregated indicator results Scots pine
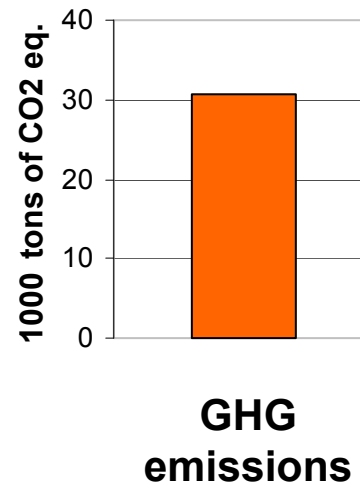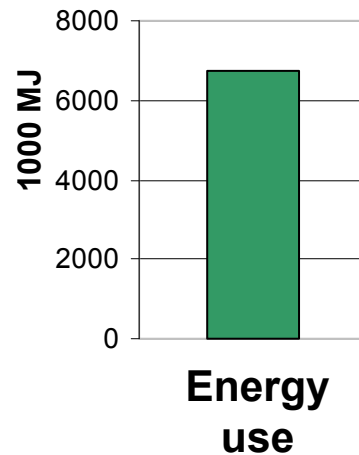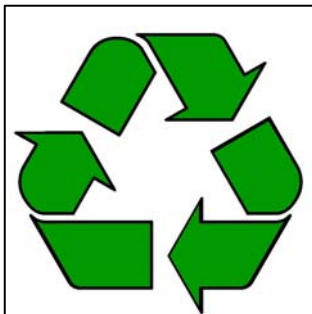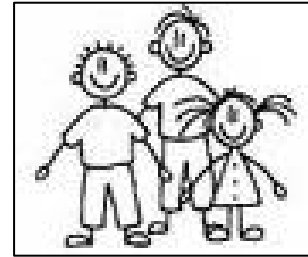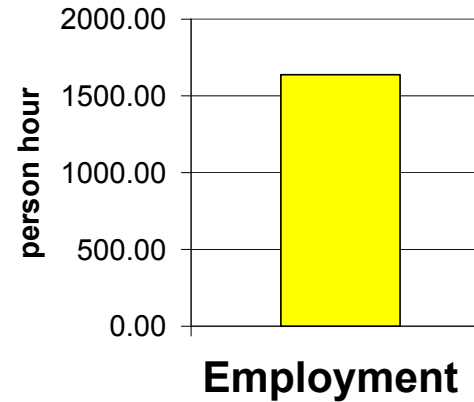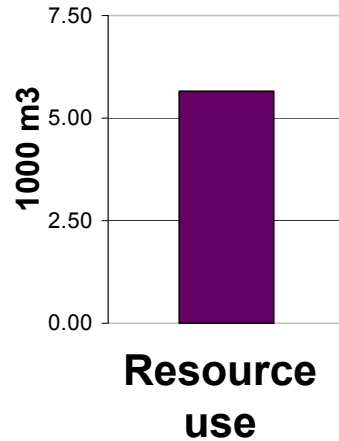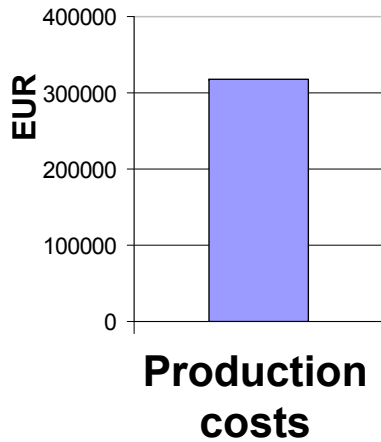
Steps needed to apply ToSIA

1. Define structure of the forest value chains
2. Collect information about sustainability indicators for all production processes
3. Run ToSIA
4. Evaluation of sustainability impacts

Overall objective of EFORWOOD...

... is to conduct
   Sustainability Impact Assessments
   for the European Forest-Wood Chain(s)

- Calculating impacts of changes in
    - policies
    - technology
    - external forces (global markets, climate change)

   requires specification and analysis of
   SCENARIOS

Comparing FWC alternatives - changing technology
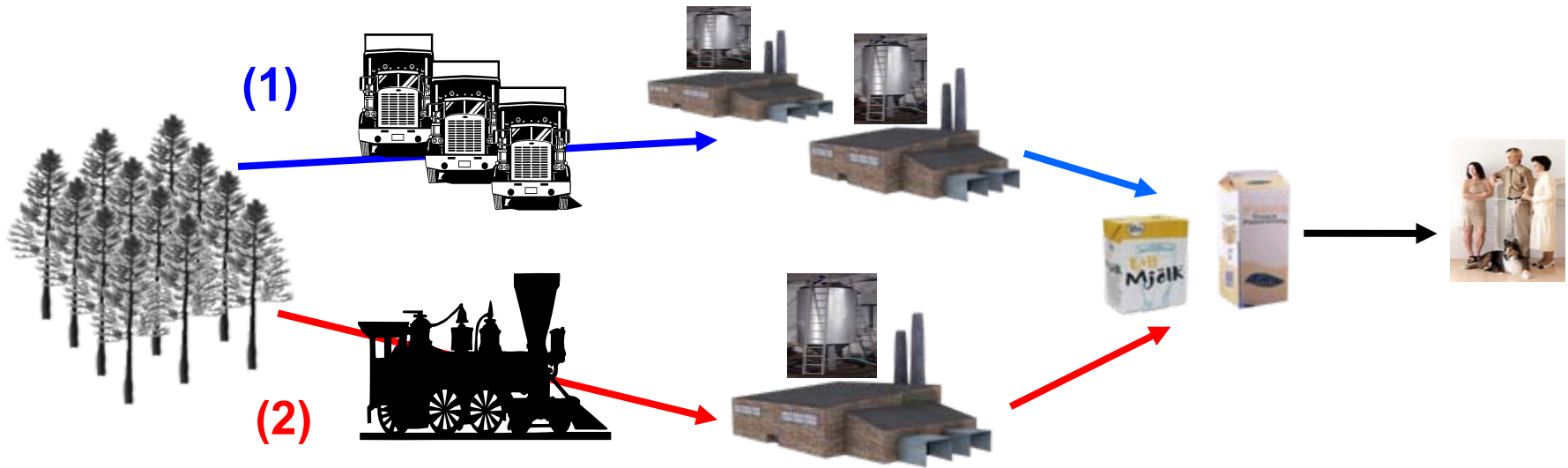
FWC example: Norway spruce ► Timberframe

- Forest management strategies:
  - ➤ strict reserves (unmanaged)
  - ➤ **close to nature forestry**
  - ➤ multifunctional forest management
  - ➤ **evenaged mono-specious clear-cut system**
  - ➤ high intensity biomass plantation

Sustainability impact of alternative Norway spruce management systems

GHG emissions

tons of CO_2 eq.

700000
600000
500000
400000
300000
200000
100000
0

total GHG emissions

☐ Spruce natural regeneration

■ Spruce Planted

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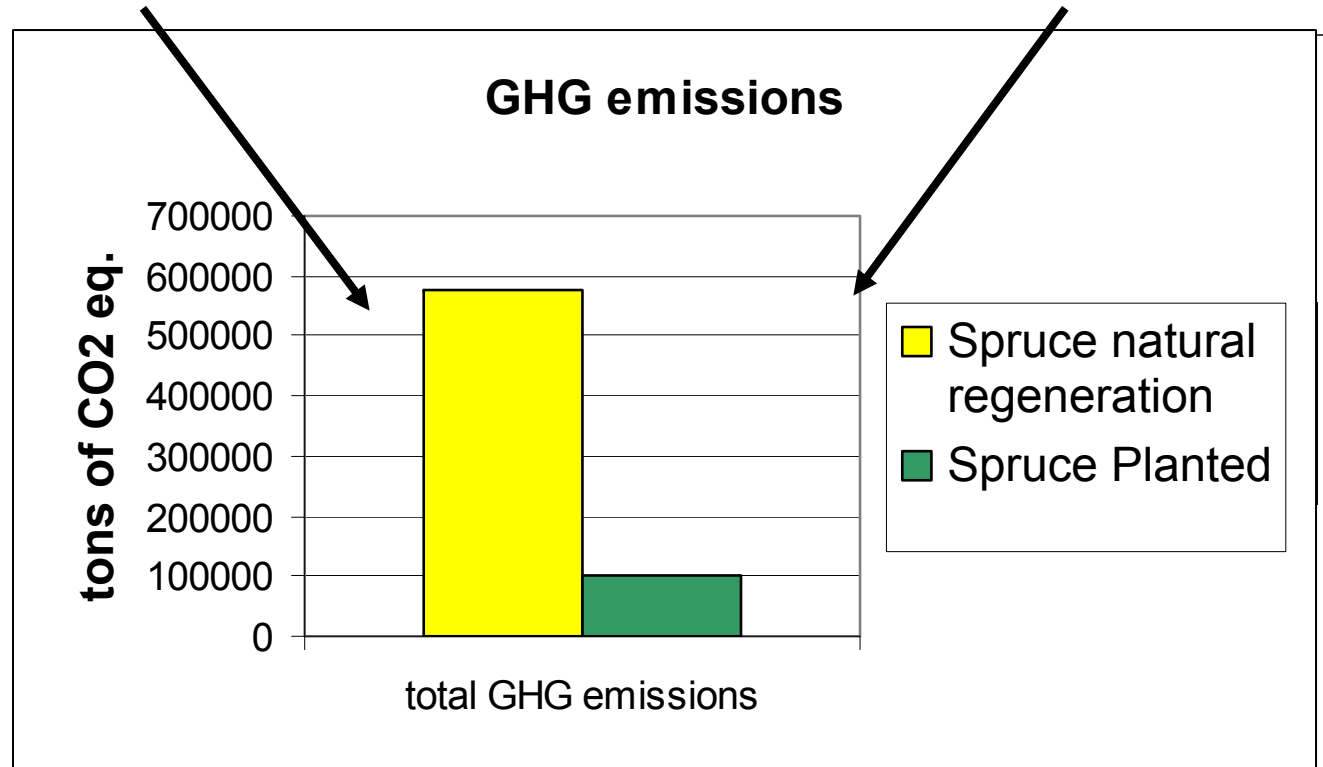
Evaluating indicator impacts

- What is better: more employment or less greenhouse gas emissions?

- ToSIA will apply Multi-Criteria Analysis and Cost Benefit Analysis to evaluate overall sustainability impacts

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Sustainability Impact Evaluation

Multi-Criteria Analysis

compares apples and pears

Top Quality Fruit from China

Cost-Benefit Analysis

Converts apples and pears into €

Multi-Criteria Analysis:
Choosing the best alternative
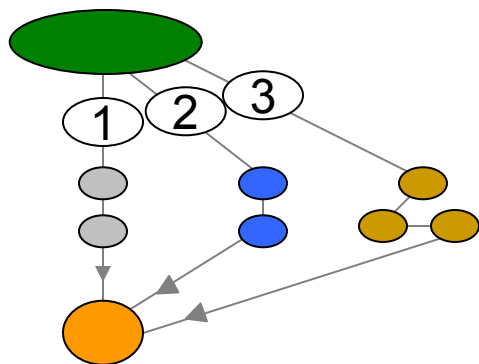
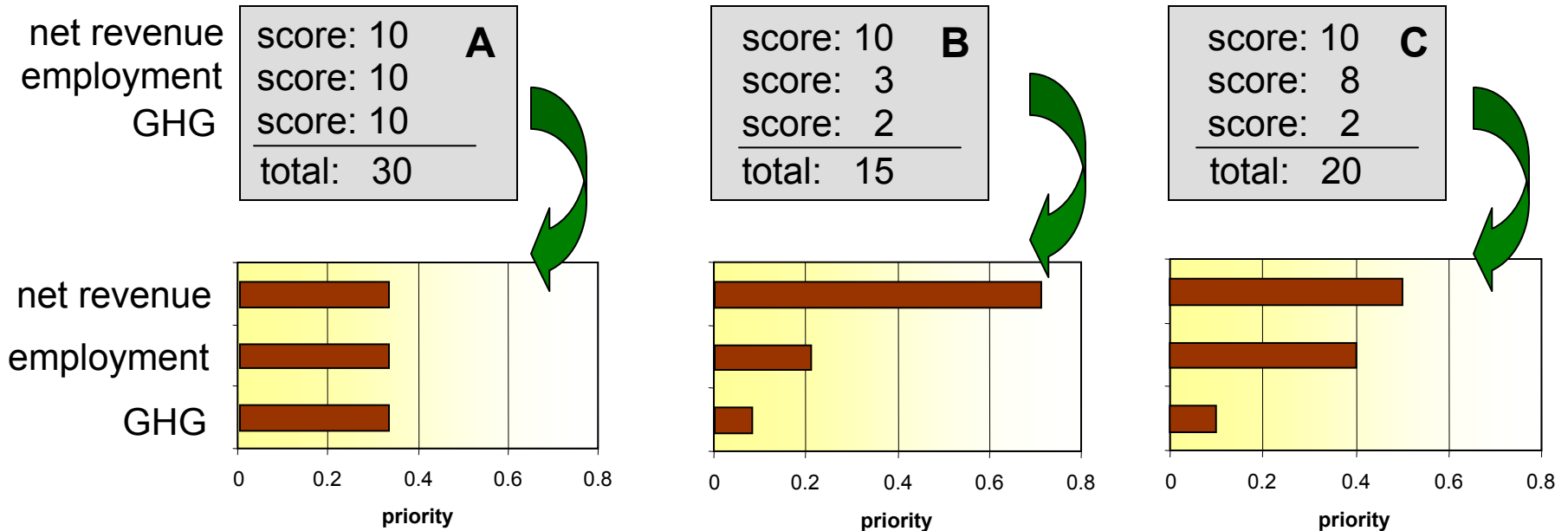|		FWC1	FWC2	FWC3
forest resource	net revenue [€/m3]	10	10	10
	employment [h/m3]	1.89	1.89	1.89
	GHG ($CO2_e$) [t/m3]	-0.037	-0.037	-0.037
harvest & transport	net revenue [€/m3]	2.43	2.88	3.99
	employment [h/m3]	0.63	0.28	0.17
	GHG ($CO2_e$) [t/m3]	0.011	0.0109	0.0105
industry (sawmill)	net revenue [€/m3]	8.33	8.33	8.33
	employment [h/m3]	1.47	1.47	1.47
	GHG ($CO2_e$) [t/m3]	0.003	0.003	0.003
total FWC	net revenue [€/m3]	20.76	21.21	22.32
	employment [h/m3]	3.99	3.64	3.53
	GHG ($CO2_e$) [t/m3]	-0.0220	-0.0227	-0.0235

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- Who should decide the importance of indicators and indicator levels?
  - experts
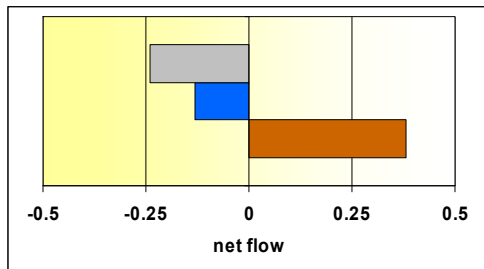 - multi-stakeholder dialogue
  - decision maker / user of TOSIA

Importance of indicators

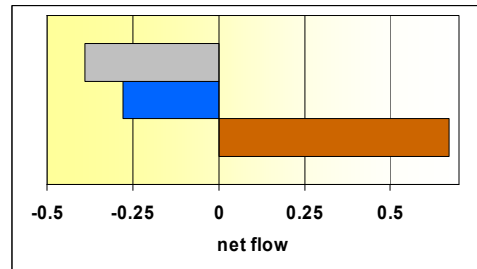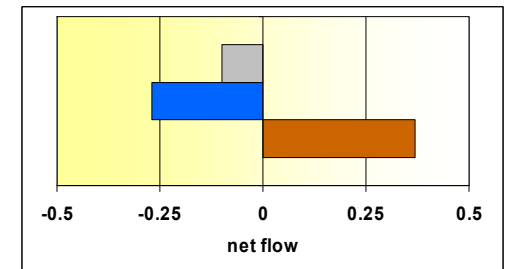**Scoring the importance of indicators**   [score 10 = most important]

Outlook on User-Interface

- How the user will work with ToSIA
  - a few examples for illustration

run
ToSIA

EFORWOOD
project

the
forest-
based
sector

sustainability

user
manual
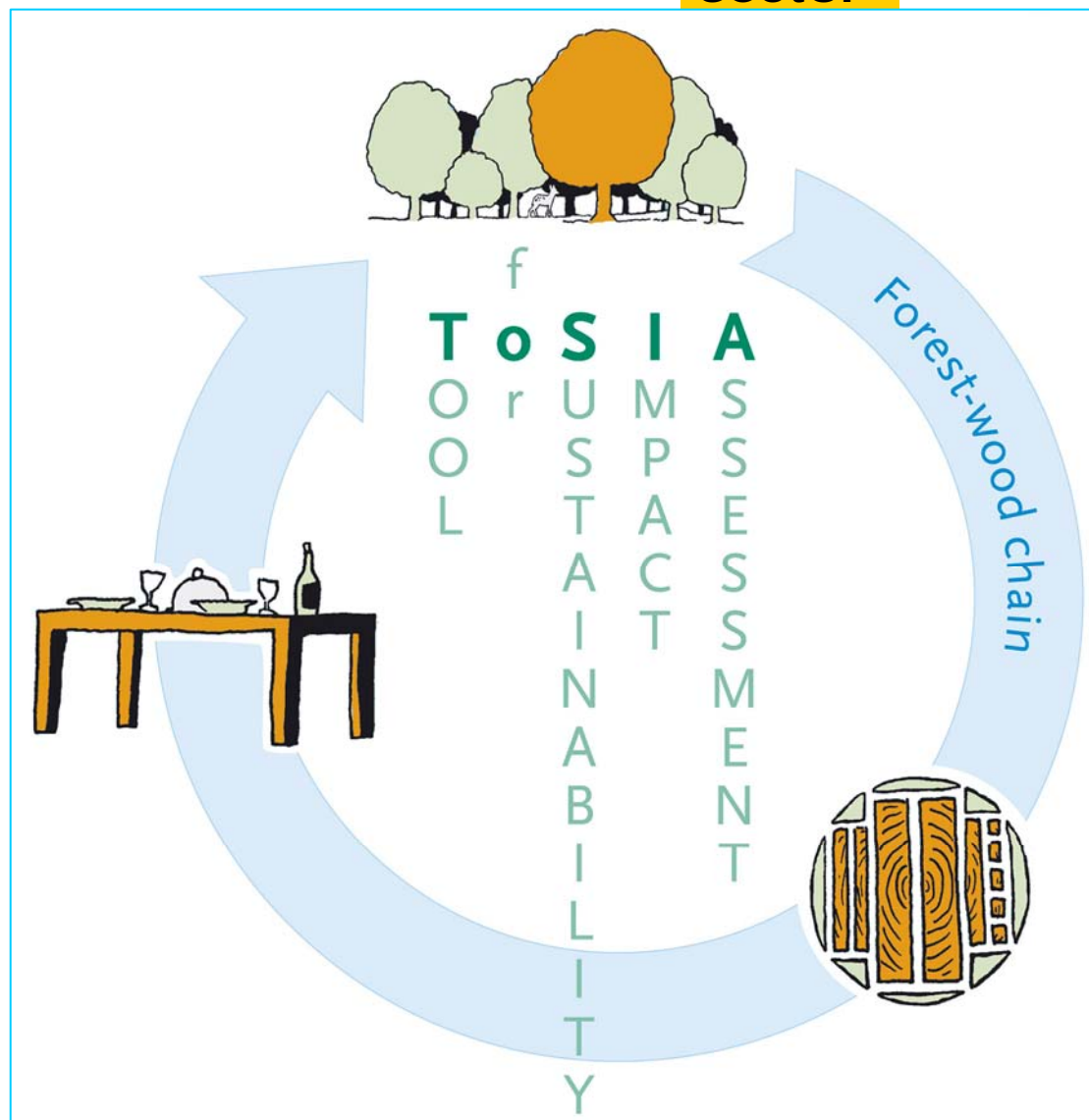
ToSIA

f
Tool
for
SUSTAINABILITY
IMPACT
ASSESSMENT

Forest-wood chain

Project overview

Project definition

Name: Sample project

Objective: test effects of both a new technology and policy impacts

Chain specification

- ● single FWC — Scots pine (Sweden)
- ○ multiple FWC

Runs: tech change1, Sample policy1 — Add / Remove / Edit

indicators:
- Gross value added (GVA)
- resource/material use (wood)
- production costs
- energy use
- greenhouse gas emissions (GHG)
- employment

Edit

Name your project

Choose an existing chain as basis for the impact assessment

List of user defined runs. A run describes foreseen technological, or policy changes

List the indicators for which you want to analyse impacts

Define a run (1/2)
technology change

Define a run (2/2)
Policy change

Name your run

Run specification

Name — Sample policy1

Run type

○ Technology

Technological change — *Management alternative*

Option — *length*

Select 'policy' as run type

◉ Policy

Reference scenario — A1, global economy ▼

Choose a reference future baseline

Air, water, soil pollution directive — ☑ implement

Share of energy from renewables — ▲

Prevent land filling woody material:
○ not applicable
◉ 20% of all
○ 50% of all

The reference future determines the available policy instruments and their default values

User Interface Perspectives

The ToSIA interface

- will integrate ToSIA and its evaluation modules MCA and CBA

- same "look" and "feel" for different versions

- easy access to fact sheets and context help

- make assumptions transparent

➢ stakeholder suggestions welcome!
➢ main development scheduled for 2009

THANK YOU

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