

Introduction to Indicators of sustainability – Ecological, economical and social



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Northern ToSIA open workshop in
Umeå



Innovatively investing
in Europe's Northern
Periphery for a sustainable
and prosperous future



European Union
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Outline

- Introduction to indicators of sustainability
- Defining a chain structure
 - Process
 - Products
- Indicators
- Introduction
- Linkage and calculation in ToSIA
- A selection of proposed Indicators for the case studies
- Further discussion



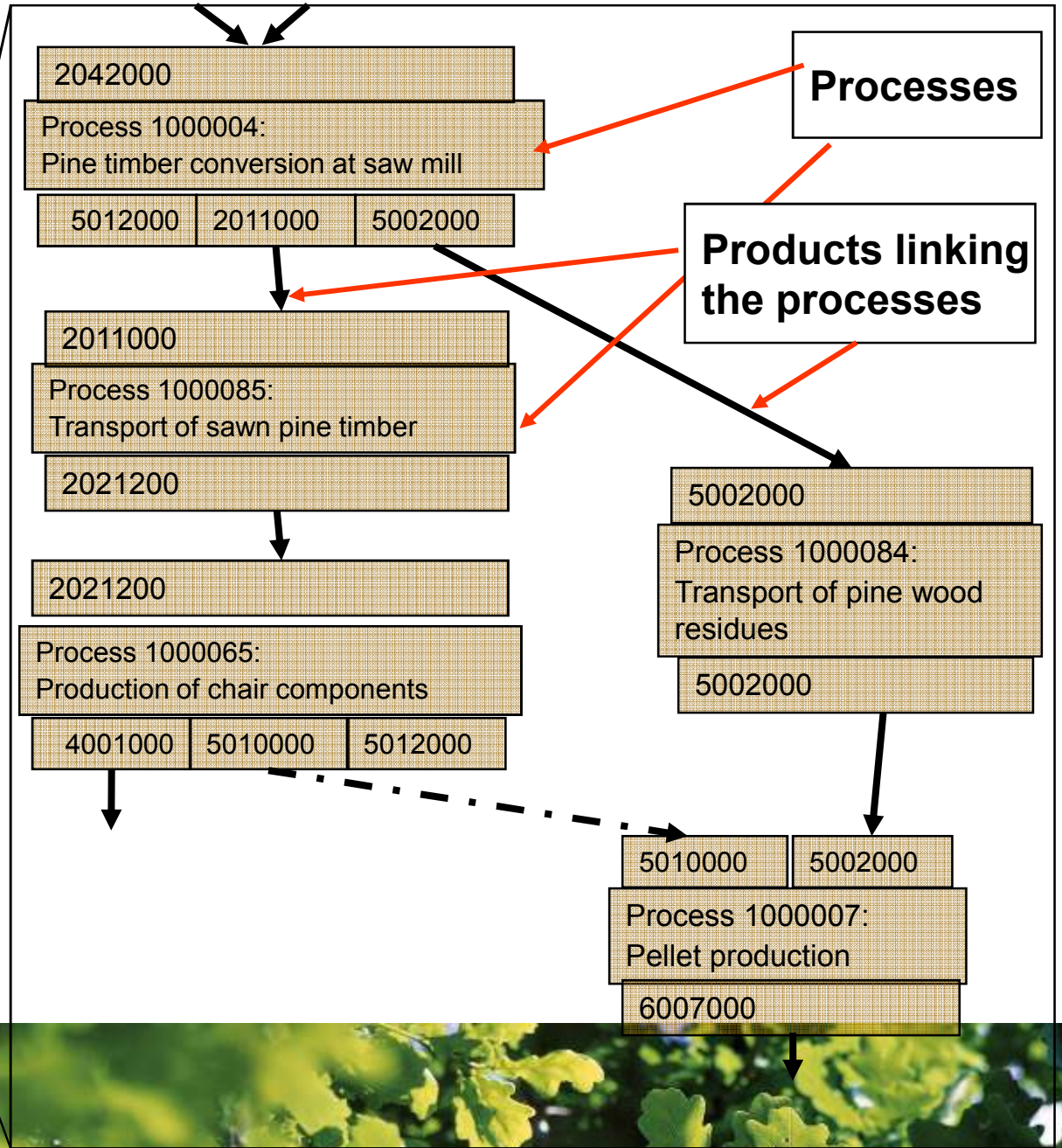
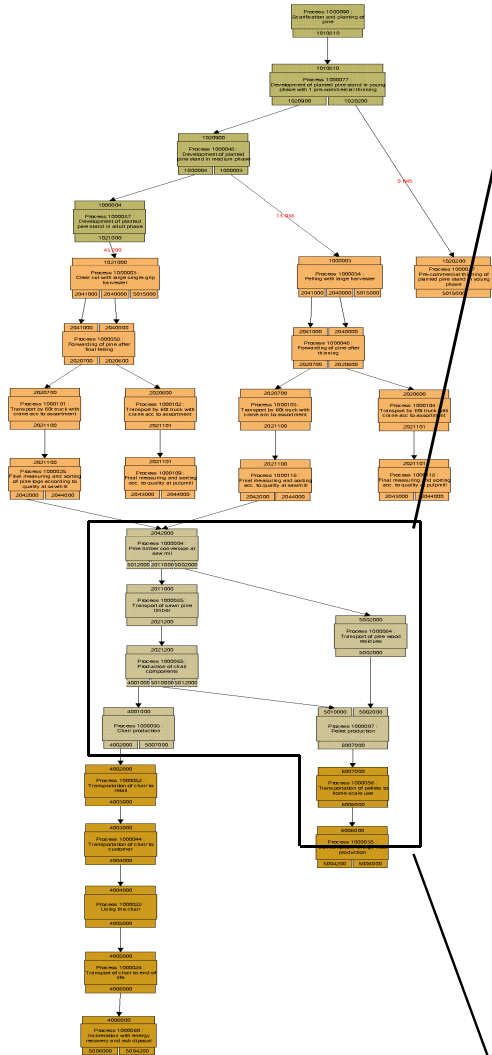
Defining a chain structure

- Process:
“process (lat. processus - movement) is a naturally occurring or designed sequence of operations or events, possibly taking up time, space, expertise or other resources, which produces some outcome.”
- Example of a typical process:
starting point – something happens – gives a result
a – the next thing happens to this – gives a result b -
... - end point.



Defining a chain structure

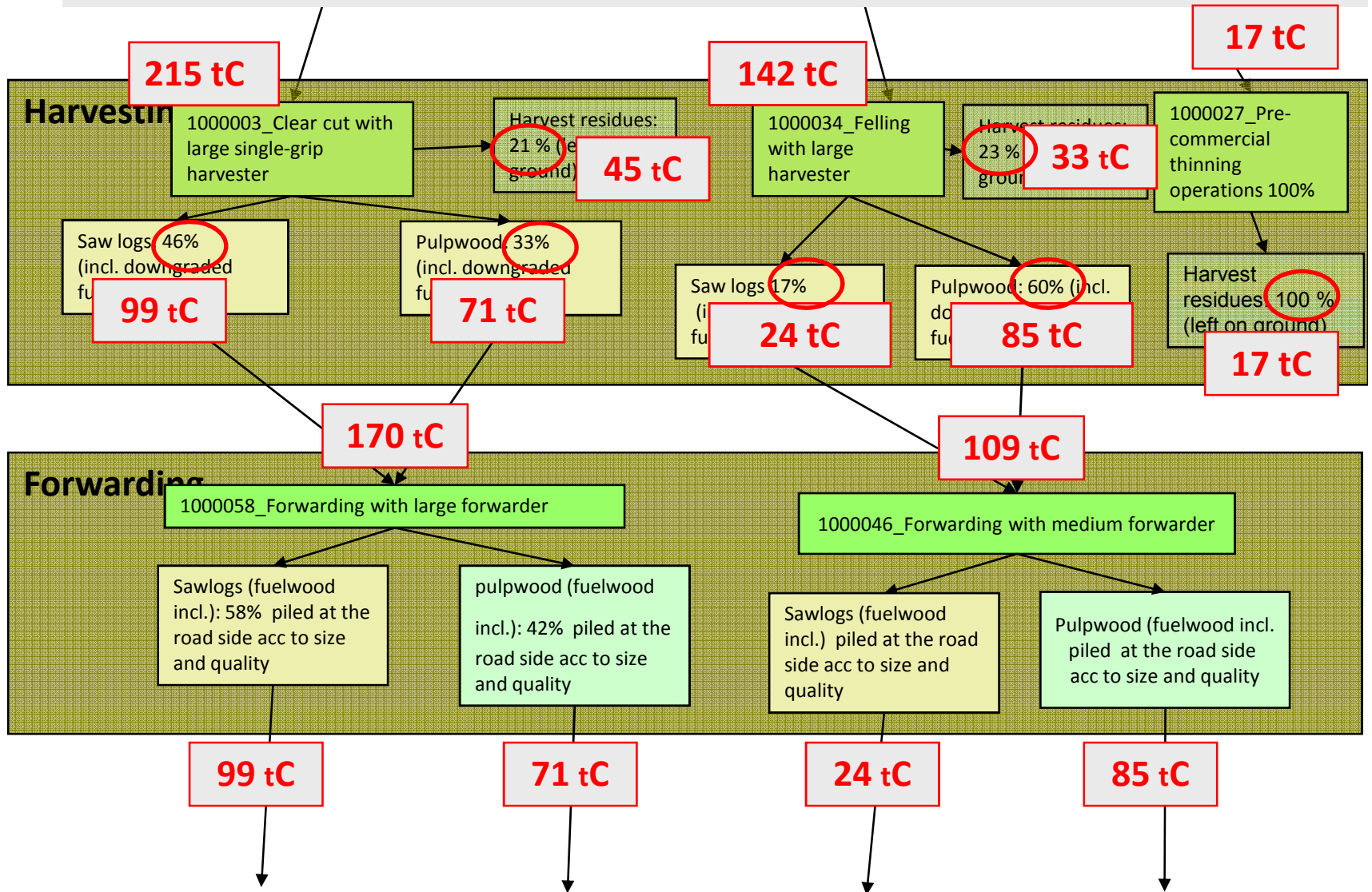
- In short, action undertaken in order to change a product's state or location, resulting in a new product
- Coverage of non-material processes, e.g. planning processes?
→ discussion





Products: Calculation of material flows

- Material flows in ToSIA refer to organic woody biomass; they are defined by products and stated as products in *product units*; e.g. pulpwood in m³, or boards in tons
- For each product *conversion factors* from product unit to tons of carbon are needed
(e.g. for spruce pulpwood: m³ to t of C)
→ Enhances comparability and calculation along the chain
- ToSIA calculates *material flows* by using input and output *product shares* of each process





So, those were the essential basics...

... let's now have a closer look at indicators



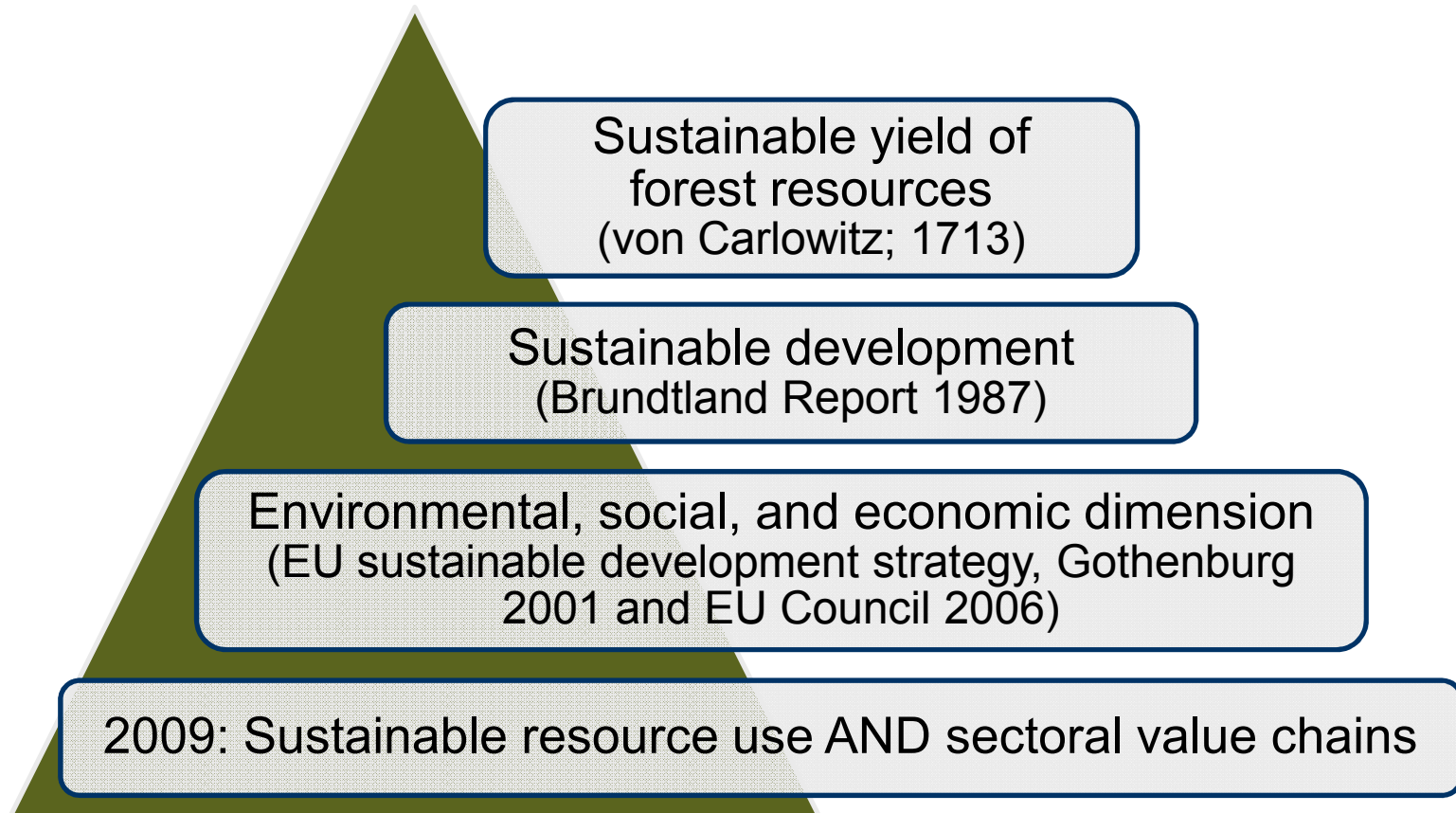


Indicators for sustainability impact assessment

- Quantification of impacts on sustainability
- Balanced set of indicators:
- Economic, environmental and social indicators
- Universal and chain-part specific indicators
- Split up into several sub-indicators
- Can be freely selected – dependent on the focus of interest

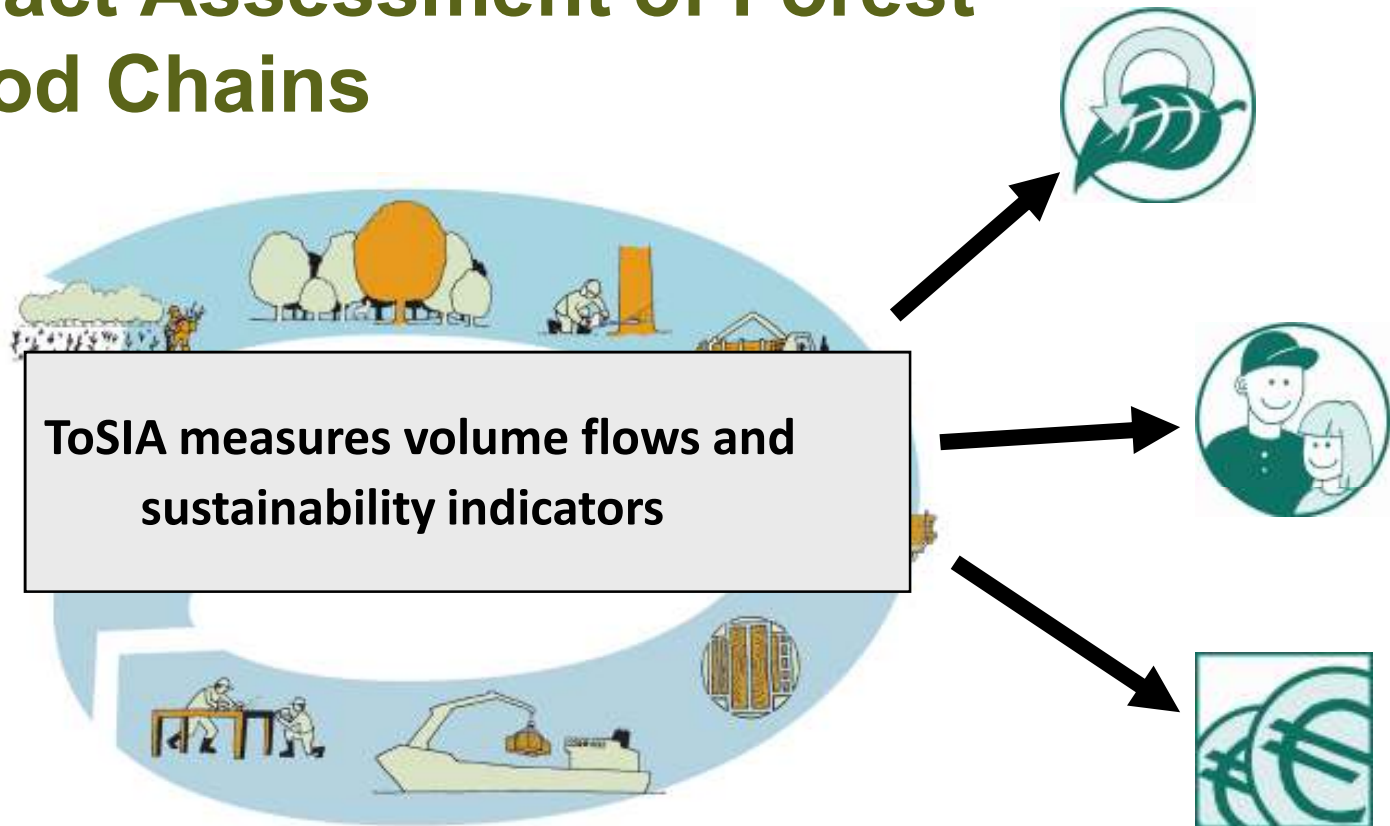


The sustainability concept evolved over the centuries





ToSIA approach to Sustainability Impact Assessment of Forest- Wood Chains





Sustainability Indicators



Economic

- Gross value added
- Production costs
- Trade balance
- Resource use
- Total production
- Investment and R&D
- Productivity



Environmental

- Energy generation and use
- GHG emissions & carbon stocks
- Transport distance and freight
- Water use
- Emissions to water and air
- Generation of waste
- Biodiversity
- Forest resources
- Soil condition

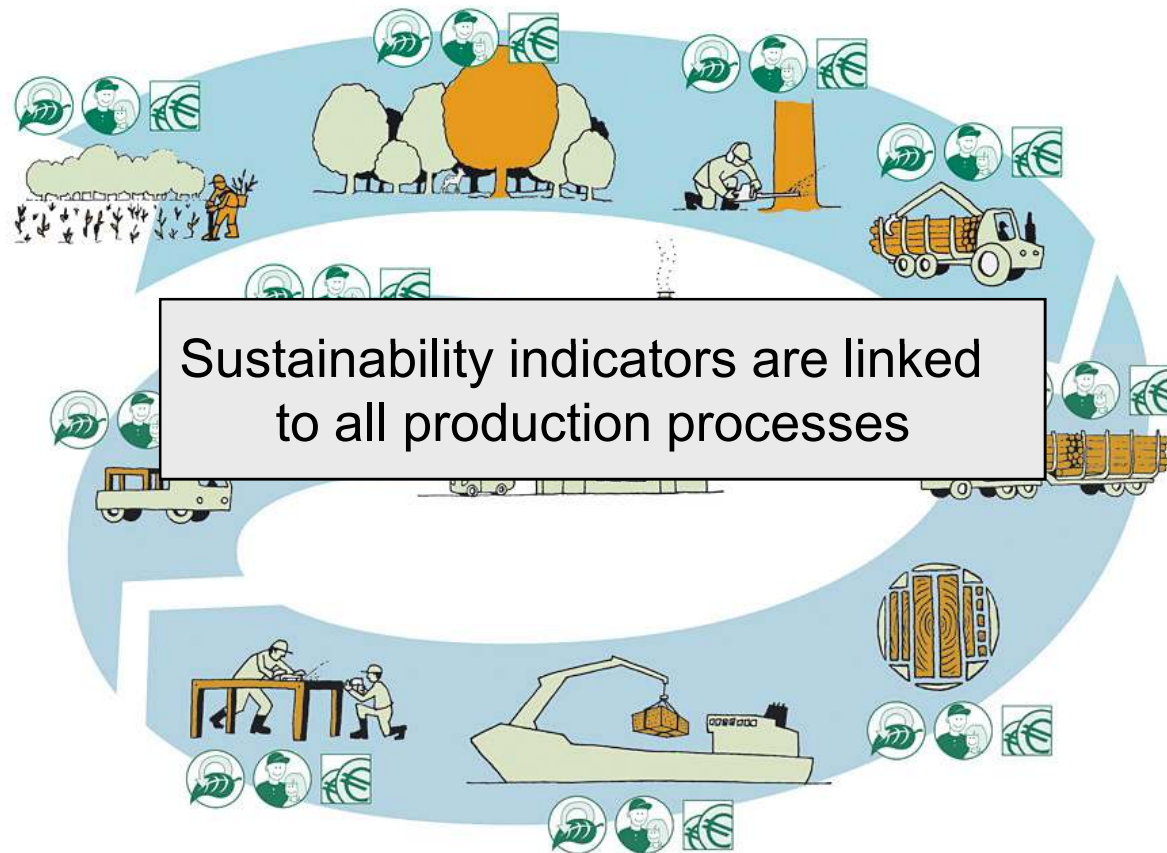


Social

- Employment
- Wages and salaries
- Occupational safety and health
- Quality of employment
- Provision of public forest services

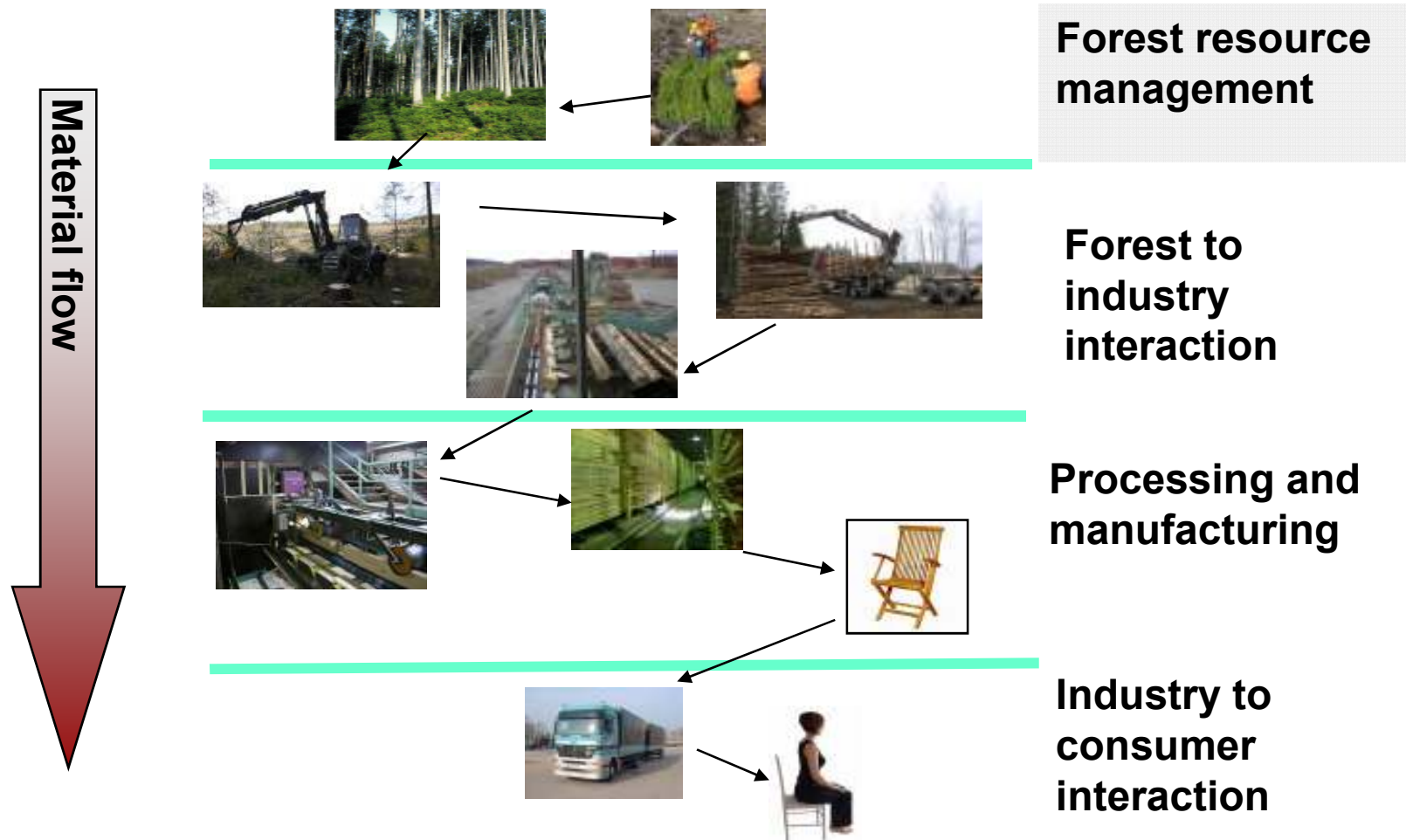


ToSIA approach to Sustainability Impact Assessment of Forest- Wood Chains





Different indicators for different parts of the forest value chain?





General – economic indicators:

Indicator	Sub-indicator	Indicator unit
Revenue		€
Production cost	2.1.1 Raw material	€/m ³
	2.1.3 Labor	€/ha (€/m ³)
	2.1.4 Energy	€/m ³
	2.1.5. Other production costs	€/m ³
	2.1.6. Non productive costs	€/m ³
Transport	20.1.1 Loaded (distance)	km (km/m ³)



General – environmental indicators :

Indicator	Sub-indicator	Indicator unit
Biodiversity	25.1 tree species distribution	Number per ha
	25.2 Volume of deadwood	m ³ per ha
	25.3 Protected area according to MCPFE	% of protected forests
GHG emission and Carbon stock	19.1 Greenhouse gas emissions in total	Kg CO ₂ equivalents per reporting unit
	19.2 Carbon stock in total	Kg CO ₂ equivalents per reporting unit
	Carbon trading potential	EURO
Energy use	18.2.2 Direct fuel use (fossil sources)	Fuel in MJ per reporting unit
Resources	22.1 and other wooded land area per process	Ha
	22.2 Standing volume per process	m ³ /ha



General - social indicators:

Indicator	Sub-indicator	Indicator unit
Employment	10.1 Number of persons employed in total	Absolute number
	Employment in the region (area referred, not timber exclusively)	Employees/ha?
Marketing and PR	[qualitative indicator?]	
	Numbers of publications (advertisements)	Number
	Extension of marketing area	% or countries/regions?
	Attractiveness of the region (tourists)	Visitors
	Attractiveness of the region work-wise	Inhabitants? employees ?
Occupational health and safety	12.1 accidents	Absolute numbers pr reporting unit
Education and training	13.1 level of education of employees	Number of employees pr reporting unit
	13.2 training time per employee	Average hours per reporting unit

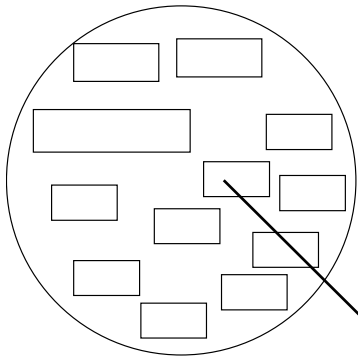


Requirements for the data from point of view of ToSIA

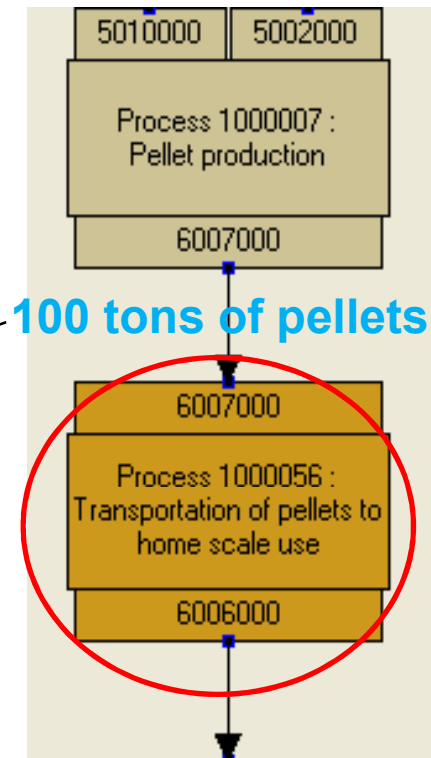
- Balanced set
- Completeness
- Reliability



Linking sustainability indicators to processes



Production cost- Labour cost for the process "TRANSPORT OF PELLETS":
 $100 \text{ tons of pellets} * 2.7 \text{ €/ton of pellet} = 270 \text{ €}$



1. Take *indicator value* per unit of material flow (reporting unit) from static information
2. Multiply with *material flow* in Chain
3. = *sustainability indicator value* for the process

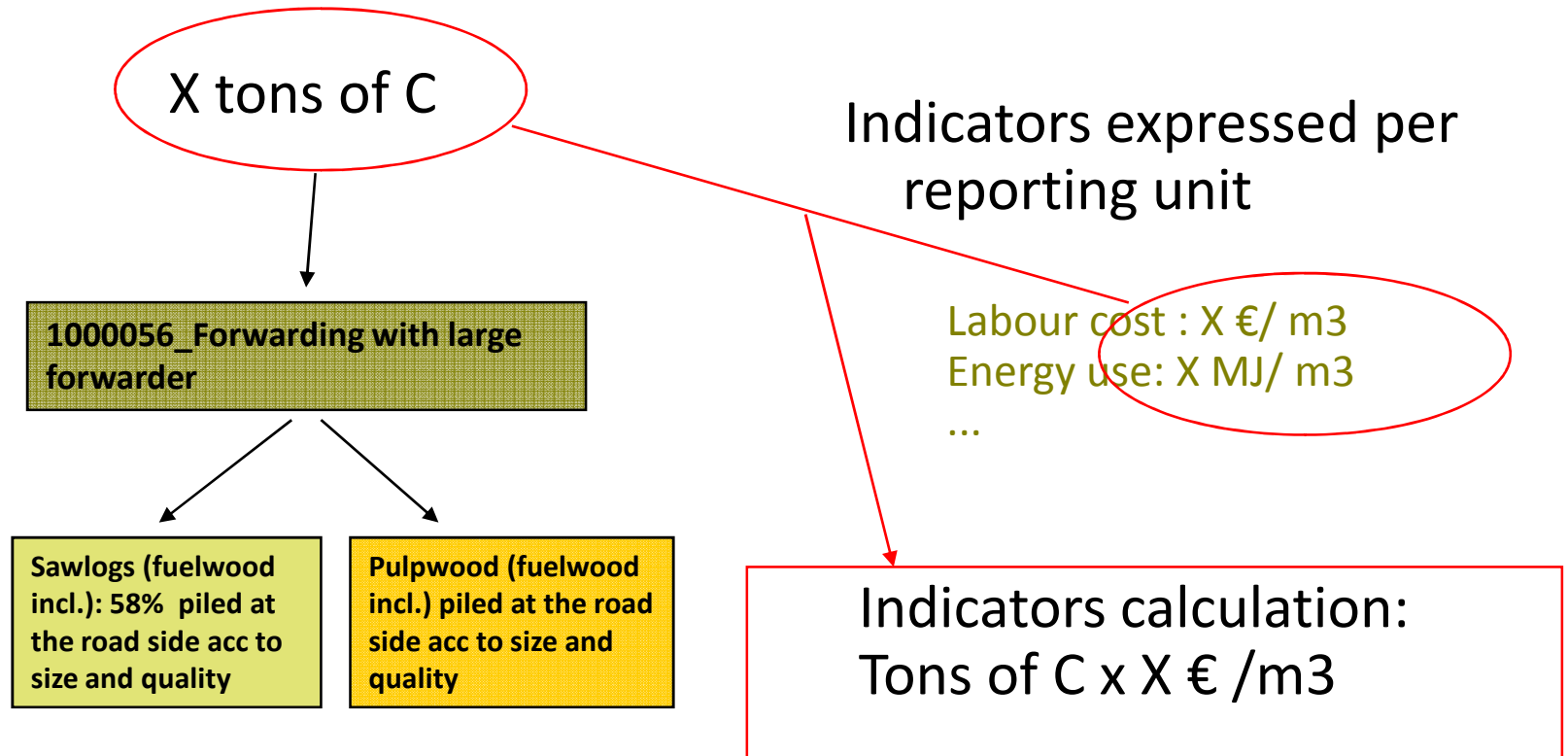


Indicator measurement units

- Definition: Each indicator has a value and a corresponding “Indicator Measurement Unit” and they are expressed on a value per unit of material flow (= per reporting unit).
- E.g. Production cost indicator:
300 € / m³ of wood → € is the *indicator measurement unit*
and m³ of wood is the *reporting unit*
- Unified unit policy for indicator measurement units!
Any deviation creates errors in the aggregation of results!



Units: Calculating indicators values



- To link Indicators and Material flow we need to convert tons of C to the reporting unit used in the process

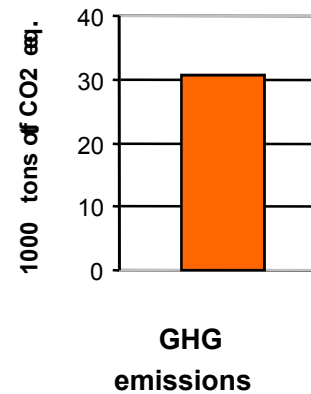
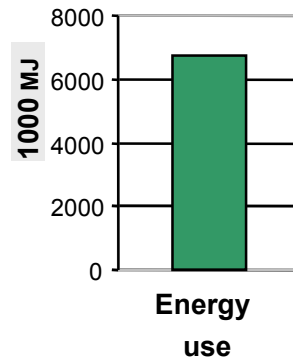
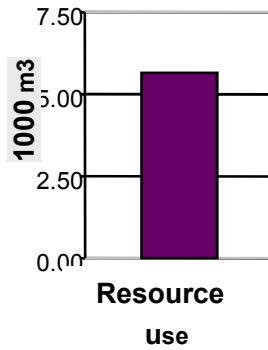
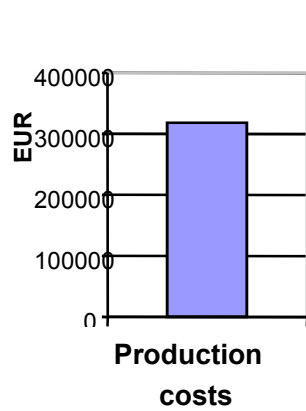


Indicator Calculation

- This indicator value calculation is repeated in turn for each indicator of each process
- After the calculation of indicators for each process, the same indicator can be summed/averaged/etc. for each process, where an indicator value was provided for ToSIA
- Reliability of aggregated values depends on both reliability and correctness but also on coverage and completeness of the reported indicators!



ToSIA aggregates indicator results along the FWC





Thank you for your attention