

# Managerial, Social and Environmental Aspects of the Forest-based Sector for Sustainable Development: 40th Anniversary Conference for 4.05.00

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## Sustainability impact assessment of forest-wood supply chain: an experience from Italy

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## The 2030 Agenda for Sustainable Development

Adopted in September 2015 at the UN summit for Sustainable Development, as a new global development framework for the next 15 years (2015-2030)



- **17** Sustainable Development Goals (SDGs) and **169** targets

## The 2030 Agenda for Sustainable Development

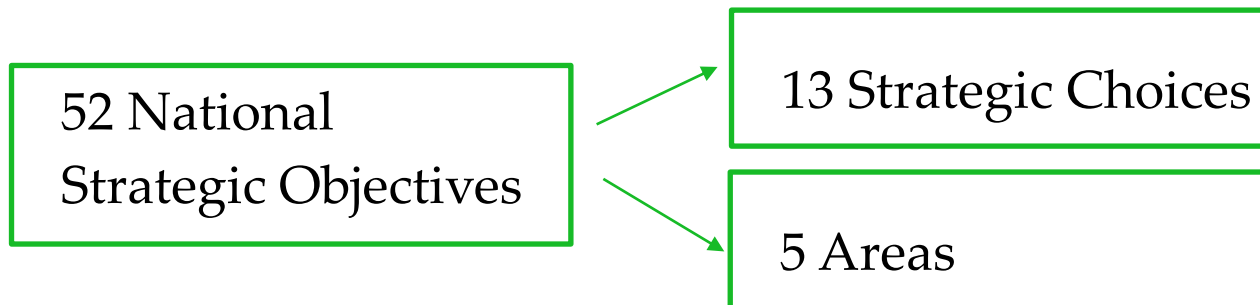
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- ✓ The universal agenda targeting both developing and developed world
- ✓ The 2030 Agenda has at its core the integration of **economical, social, and environmental impacts**



# The National Strategy for Sustainable Development (SNSvS)

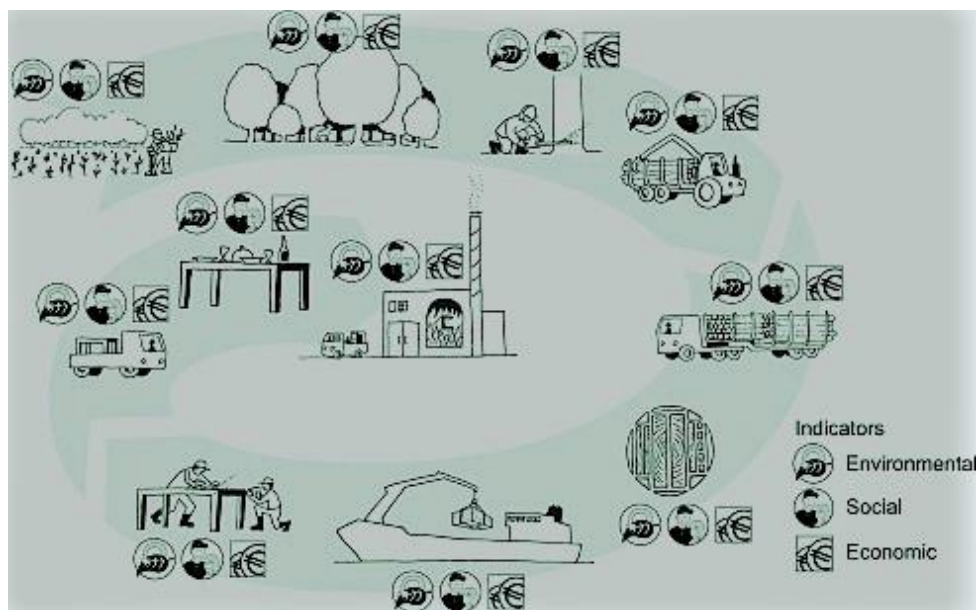
Developed in 2017 adopting a bottom-up approach based on the direct involvement of institutional actors (Ministries, public administrations, universities and research institutes) and the consultation of civil society.



The **forest-based sector** plays a key role ensuring the sustainable and balanced environmental, economic, and social development through the use of bio-based resources in a “circular bioeconomy”

## Sustainability impact Assessment (SIA)

Among the tools to support the evaluation of policies taking account of sustainability. SIA is a process to identify and assess the impacts of strategies and single operations with a systematic, integrated, and iterative approach.



# SIA approach in the forest-based sector : a case study in Italy

The process is structured in 4 phases



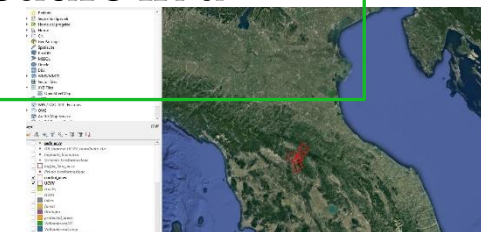
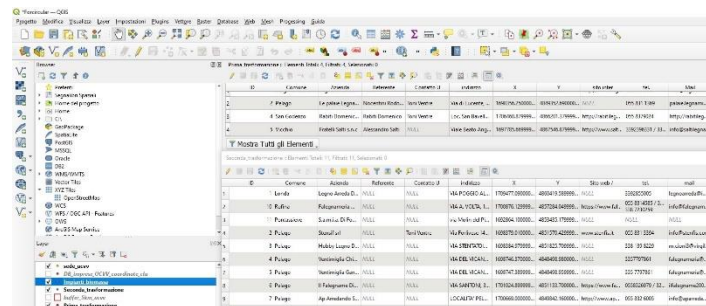
1. Review- Set of indicators

2. Involvement of actors of forest-wood chain



3. Development of a GIS-Based procedure

4. Implementation and testing of the GIS-Based procedure in a pilot area

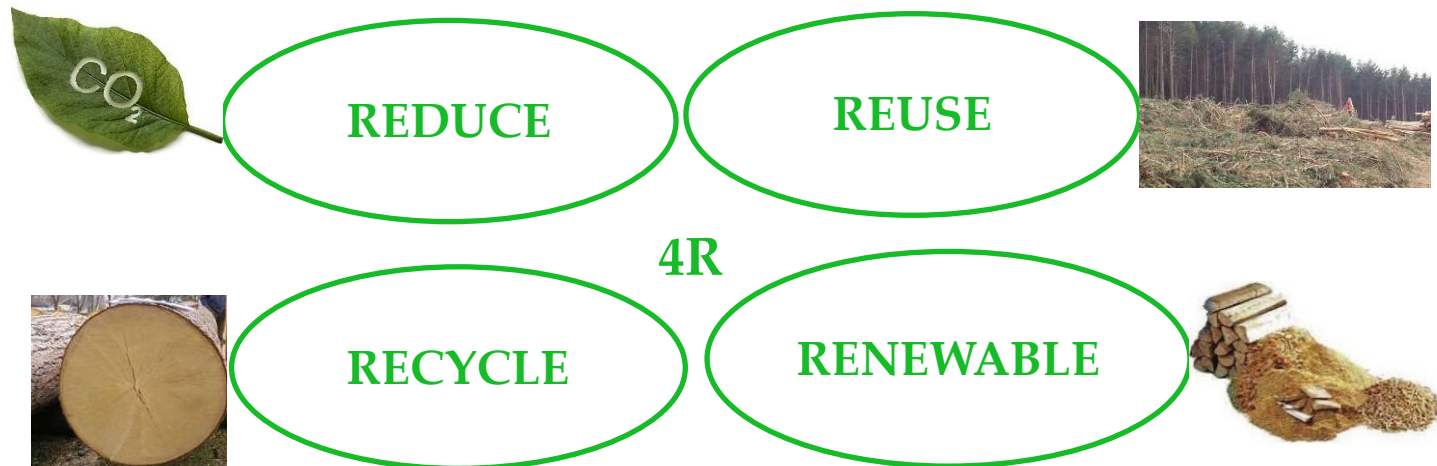


## SIA process- 1<sup>st</sup> Step: Literature review

Literature review - A set of indicators suitable to assess the forest-wood chain



14 Indicators are identified and divided into four groups corresponding to the 4R of circular bioeconomy



# SIA process -2<sup>nd</sup> Step: Online questionnaire and evaluation of indicators

- ✓ 30 actors of the forest-based sector have been involved through a **questionnaire**. Actors identify and weight indicators.

## Criteria used to assess the indicators:

- **Efficiency** in achieving the goals
- **Applicability** to the forest-wood supply chain
- **Replicability** in other forest contexts



The screenshot shows a web-based questionnaire interface. At the top, there is a header with the logo 'FORC'RCULR' and a background image of a forest. The main title of the survey is 'Indagine per un Sistema di Supporto alle Decisioni della filiera foresta-legno Toscana'. Below the title, there is a field for the user's email address, 'benaghi.elfredia@gmail.com', with a 'Cambia account' link. A red asterisk indicates that the email field is mandatory. The form is divided into sections, with the first section titled 'Informazioni generali e personali'. This section contains a dropdown menu for 'Sorgi' and two numbered questions: '1.1. Nome della Vs. organizzazione' and '1.2. Ruolo svolto all'interno della Vs. organizzazione', each followed by a text input field and a 'La tua risposta' label.



## SIA process -2<sup>nd</sup> Step: Online questionnaire and evaluation of indicators

- ✓ At the end of the evaluation process, 7 of the 14 indicators were selected to be included in the development of the DSS.

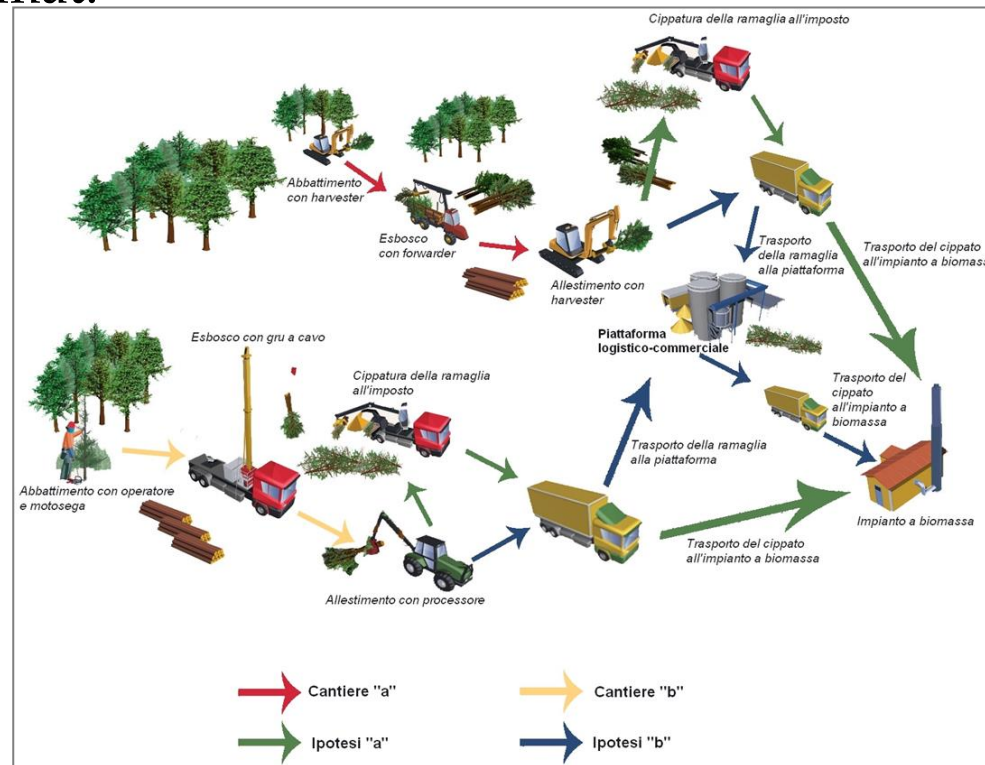
4R	Indicator	Definition
Reduce	I1 - Ratio (on annual basis) between annual value and annual mean volume of harvested mass ( $\text{€}/\text{m}^3 \cdot \text{y}^{-1}$ )	Improving of the process efficiency reducing the utilization of natural resources
	I2 - CO <sub>2</sub> emissions per unit of wood product ( $\text{tCO}_2/\text{m}^3$ )	
Reuse	I3 - Harvested surface ( $\text{ha}/\text{y}$ )	Forest surface yearly harvested
	I4 - Index of reuse ( $\text{m}^3 \cdot \text{years}$ )	The index combines: i) the wood products life span of product; ii) the percentage of wood product / material that can be reused; iii) the number of cycles of wood product reuse
Recycle	I5 - Ratio between the potential economic value of the wood assortment and the real value earned ( $\text{€}/\text{€}$ )	Valorisation of the valuable wood high quality assortments
Recover	I6 - Percentage of wood waste for bioenergy production (%)	Energy recovery from waste wood products
	I7 - Amount of CO <sub>2</sub> emissions saved per unit of energy produced by wood wastes ( $\text{gCO}_2/\text{kWh}$ )	Emissions saved from energy recovery from waste wood products

# SIA process - 3<sup>rd</sup> Step:

## Development of a GIS-Based procedure

Development of a GIS-Based procedure to identify suitable zones for the forest-wood supply chain implementation.

The **DSS** called **r.forcircular** was implemented as add-on of GRASS GIS and is currently available both as beta version of Graphical User Interface (GUI) and bash script format.



## SIA process - 3<sup>rd</sup> Step: Development of a GIS-Based procedure

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Through a multi-step approach, the DSS r.forcircular is able to quantify:

- ✓ **Total potential availability of biomass:** estimation of total wood biomass from a forest area.
- ✓ **Technical availability of biomass** quantified for each forest area where the extraction of wood materials is possible.
- ✓ **Economic availability of biomass** both for traditional wood assortments and for woodchips considering only forest areas with a positive stumpage value.



# SIA process 4<sup>th</sup> Step: Implementation and testing in a pilot area in Italy (DSS)



**Study area:** Unione dei Comuni Valdarno e Val di Sieve 49,500 hectares with a forest index of 62%.

**Public properties** are characterized by the multifunctional role of forests.

**Private properties** are mainly focused on productive function.

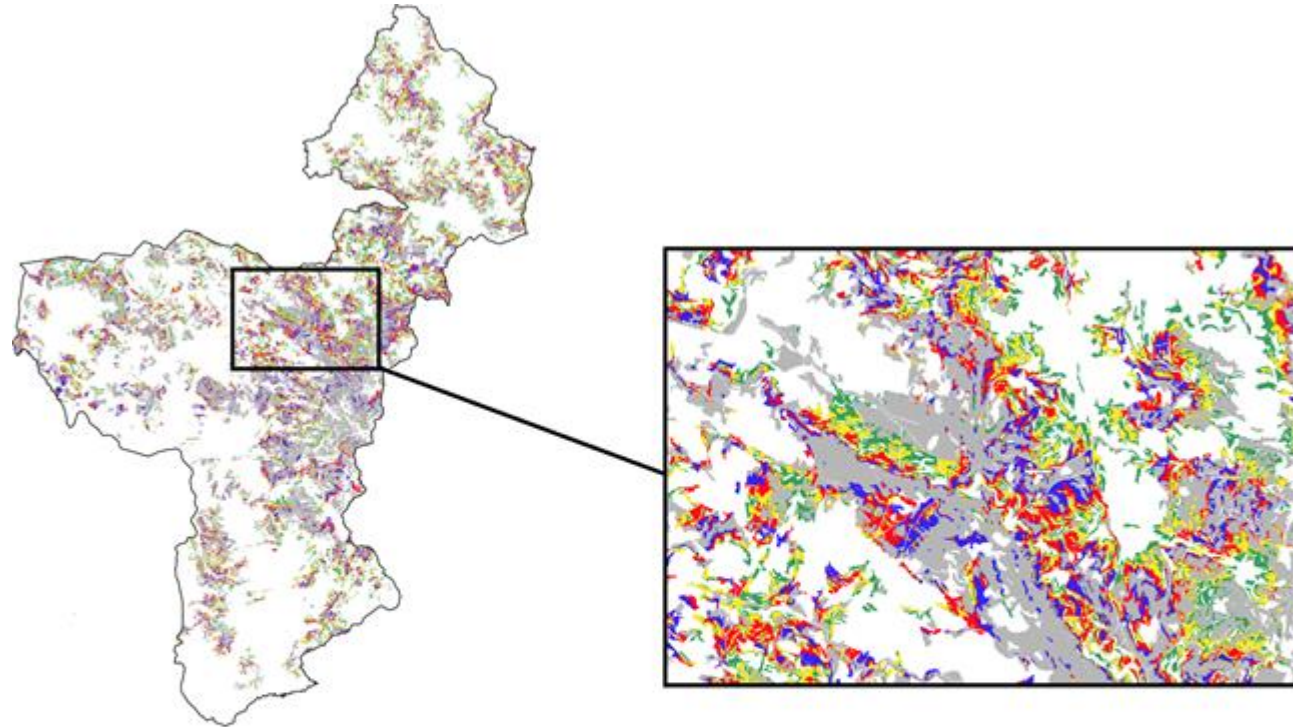
# SIA process 4<sup>th</sup> Step: Implementation and testing in a pilot area in Italy (DSS)



- ✓ Actors involved:
  - 5 district heating plants
  - 4 first wood processing enterprises
  - 11 secondary wood processing enterprises
  - 2 managers (1 public and 1 private)
  - 4 forest enterprises
- ✓ The selected indicators were used for the application of a Decision Support System (DSS): **r.forcircular**

# SIA process - 4<sup>th</sup> Step: Implementation and testing in a pilot area in Italy (DSS)

Starting from the business-as-usual (BAU) scenario, the DSS r.forcircular is able to create different management scenarios to enhance the forest-wood supply chain.



# CONCLUSIONS 1

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- ✓ Simple and easy-to-apply indicators have been identified
- ✓ The indicators require a reduced number of primary data and information
- ✓ The list of indicators was integrated by the decision makers with a bottom-up approach
- ✓ Indicators and tools are updated and adapted to the situations
- ✓ SIA gives important input when defining best forest practices and the main driving factors

## CONCLUSIONS 2

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- ✓ DSS allows to import a series of geodatabases and to set parameters related to the study area boundaries: geographic, forestry and economic variables
- ✓ DSS can be considered one of the first spatial-based tool to facilitate circular bioeconomy quantification in forest sector
- ✓ DSS support managers and decision makers to practically address forest policy and planning goals
- ✓ The open-source and free DSS will be made available to operators to improve the performance of the forest-based sector in a circular bioeconomy perspective





Thank for your attention

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