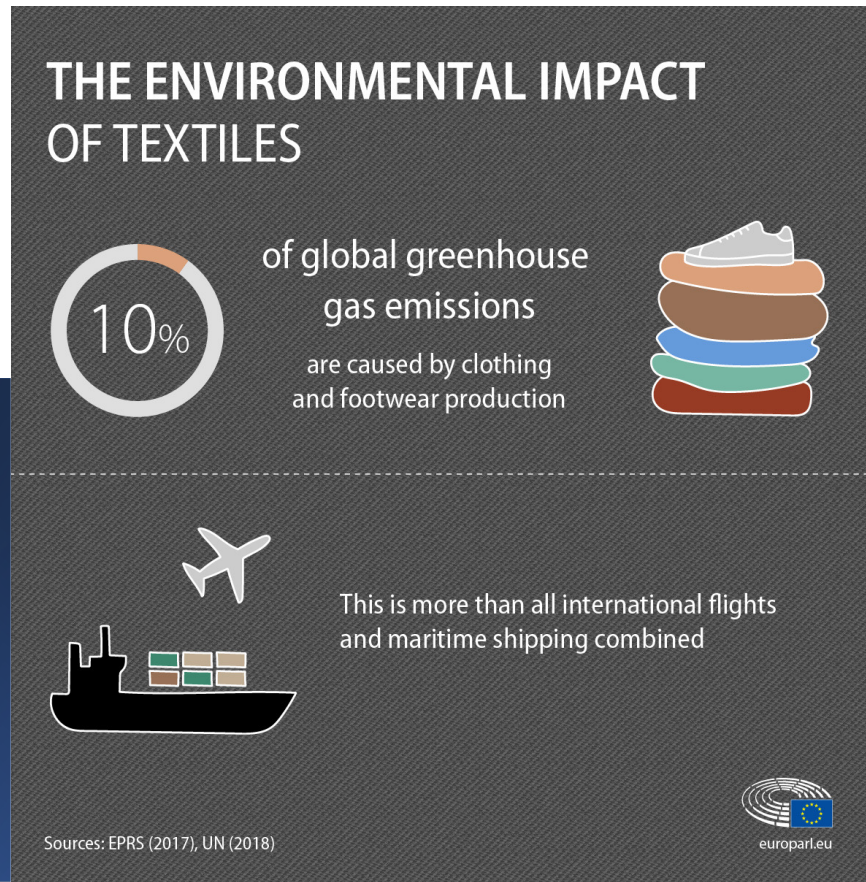
Life Cycle Assessment on fashion industry: four case studies

Marco Ciro Liscio [1,4], Paolo Sospiro [1,2,3,4]

1 C.I.I./Dipartimento di Ingegneria dell'Informazione, Università Politecnica delle Marche, Ancona, 60131, Italy
2 Università Telematica eCampus, Novedrate (CO), Lombardia, 22060, Italy
3 CREAR/Dipartimento di Ingegneria Industriale, Università di Firenze, Firenze, Toscana, 50139, Italy
4 EUAbout, Bruxelles, Bruxelles, 1000, Belgium

- RAW MATERIAL: **1.3 Tons**
- WATER CONSUMPTION: **104.000 L**
- CO2: **654kg**
- NEW CLOTHES: **26kg**
- CLOTHES THROWN AWAY: **11kg**

INTRODUCTION ON THE FASHION INDUSTRY



PREVIOUS STEP ON THE TOPIC

ELSEVIER

Sustainable Chemistry and Pharmacy
Volume 32, May 2023, 100968

State of the art on the Nexus between sustainability, fashion industry and sustainable business model

Caterina De Ponte [a], Marco Ciro Liscio [a b], Paolo Sospiro [a b c d]

CATEGORIES ANALIZED

TEXTILE	FOOTWEAR	LEATHER

Treatment Technologies

Sustainable Processes

Organizational Strategies

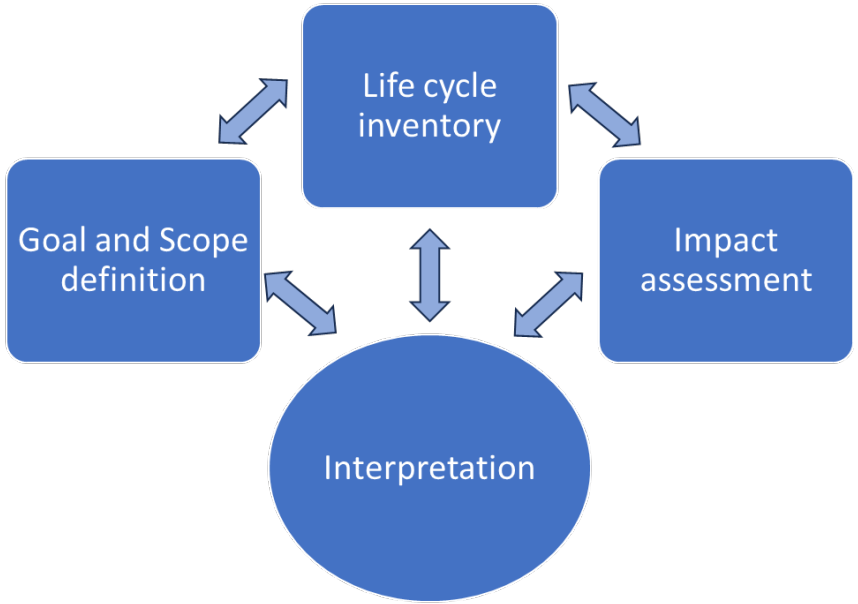
RESEARCH FOR BEST PRACTICES AND SCIENTIFIC WORKS ABOUT FASHION INDUSTRY:

- Scientific Literature research
- Firm best practices research

CONCLUSIONS

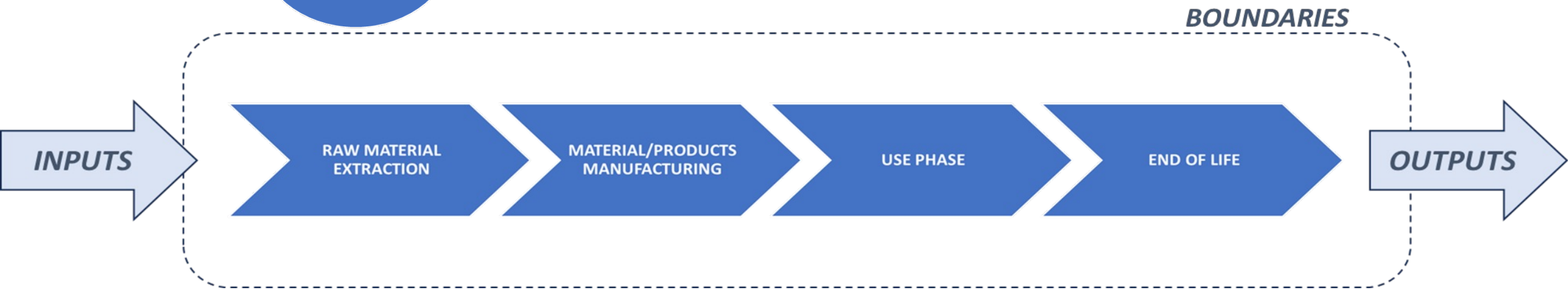
- Urgency to switch towards Circular Economy models in the fashion industry
- Growing interest on the theme in developing countries
- Scientific literature and firms' best practices aligned

LIFE CYCLE ASSESSMENT - LCA



ISO 14040: principles and framework

ISO 14044: requirements and guidelines



METHODOLOGY

SPAR-4-SLR (Paul J., 2021)

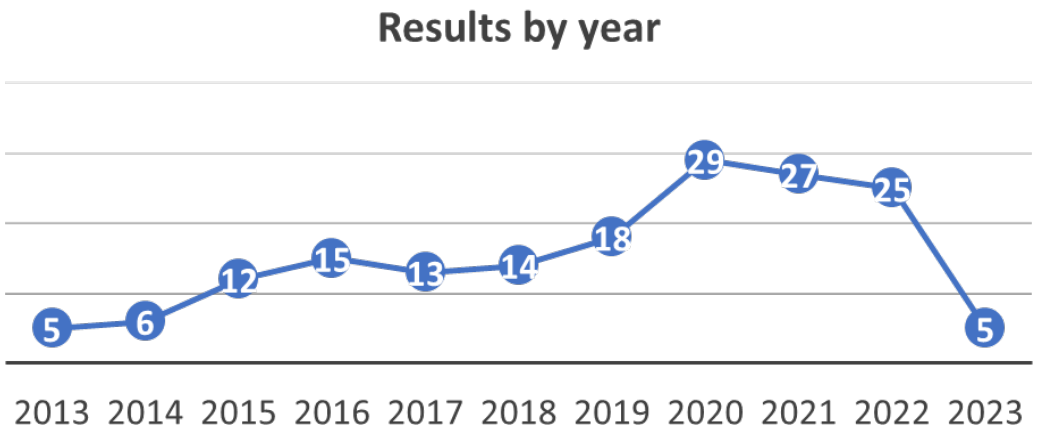
Scientific Procedures and Rationales for Systematic Literature Reviews

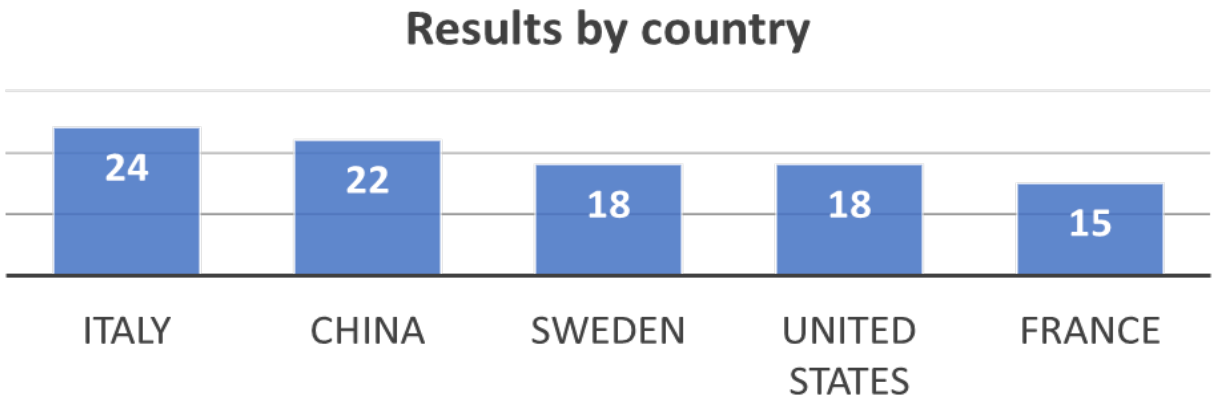
SECONDARY LITERATURE

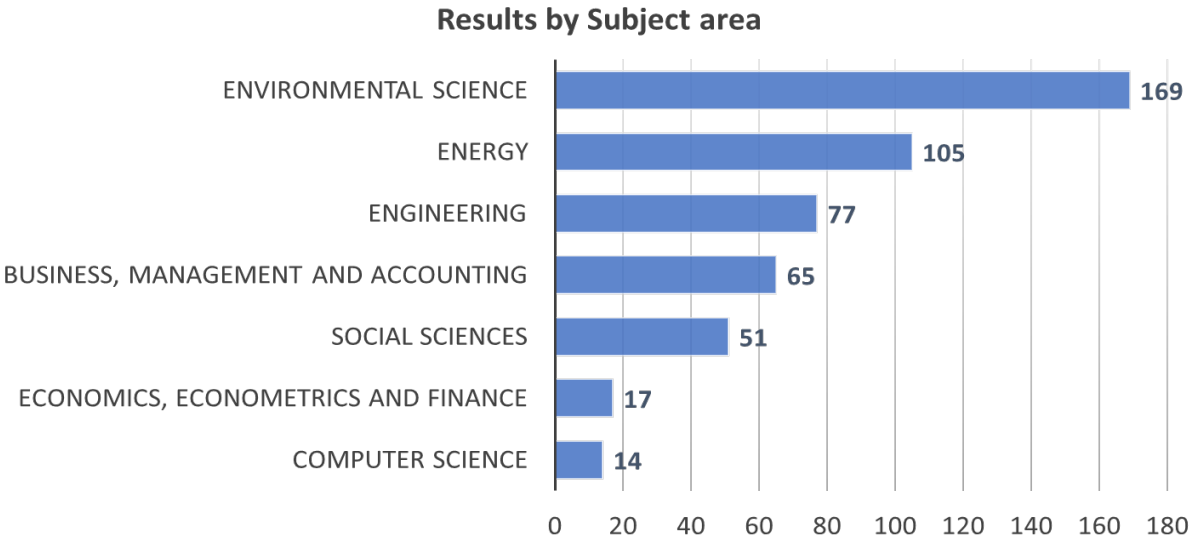
FIRMS INVESTIGATED
LEVI STRAUSS & CO
THE NORTH FACE
NIKE
ICEBUG
PRIMEASIA LEATHER
HILATURAS FERRE
MARKS & SPENCER
CHARGEURS LUXURY MATERIALS

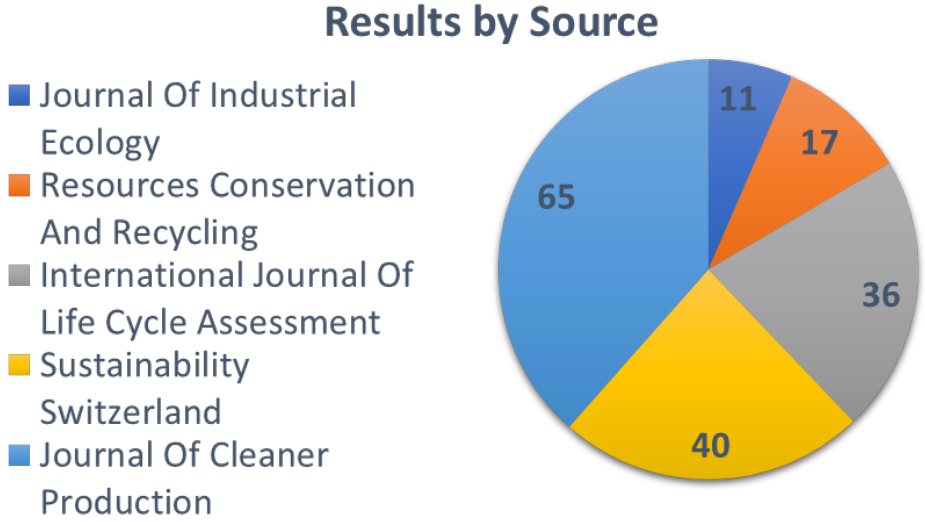
Assembling		**Identification** Research domain: Life Cycle Assessment in the Fashion Industry Research questions: Benefits and Limitations of LCA in Fashion Industry Source: Journals - Scopus
		Acquisition Search period: 2012 - 2023 Search keywords: Boolean search using combination of words in Title, Author keywords and Abstracts. **RESULTS: 885**
Arranging		**Organization** Organizing codes: Language, Documents Type, Source Type, Title and Abstract analysis, #Citations (+ Last year documents)
		Purification English - Research and Review articles - Journals - Correlation with the Research Domain – [> 60 or > 9/y or 2023] **RESULTS: 29**
Assessing		**Evaluation** Analysis method: Contents analysis
		Reporting Reporting convention: words (benefits and gaps) Limitation: Related to data type and topic/sector considered, most cited and relevant, year of publication

RESULTS


Results by year
5
6
12
15
13
14
18
29
27
25
5
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023


Results by country
24
22
18
18
15
ITALY
CHINA
SWEDEN
UNITED STATES
FRANCE


Results by Subject area
ENVIRONMENTAL SCIENCE
169
ENERGY
105
ENGINEERING
77
BUSINESS, MANAGEMENT AND ACCOUNTING
65
SOCIAL SCIENCES
51
ECONOMICS, ECONOMETRICS AND FINANCE
17
COMPUTER SCIENCE
14
0 20 40 60 80 100 120 140 160 180


Results by Source
Journal Of Industrial Ecology
Resources Conservation And Recycling
International Journal Of Life Cycle Assessment
Sustainability Switzerland
Journal Of Cleaner Production
11
17
36
40
65

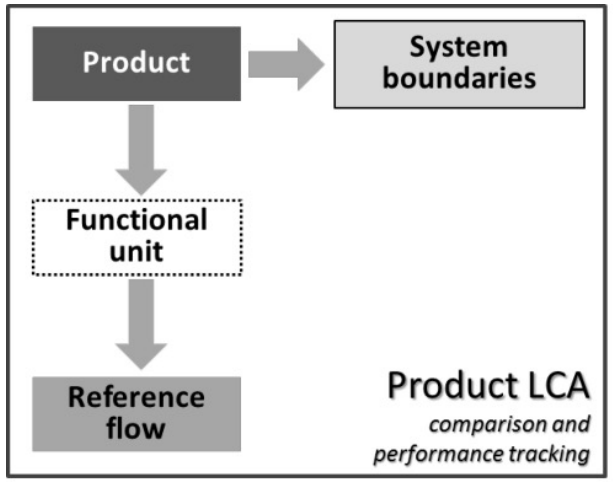
PRIMARY LR

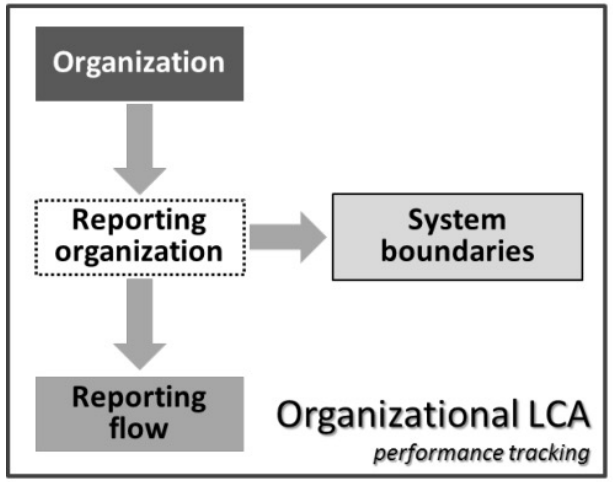
Fields of application	Benefits	Limitations
• FIRMS • POLICIES • MARKETING • ACADEMIA	• Guide actions against environmental impact • Supports SC and waste management • Supports green marketing • Facilitate decision-making processes • Supports policy-making processes • Increase process efficiency	• Difficulty to get primary data • Could present uncertainty of the results • Need precise conditions • Is case dependent

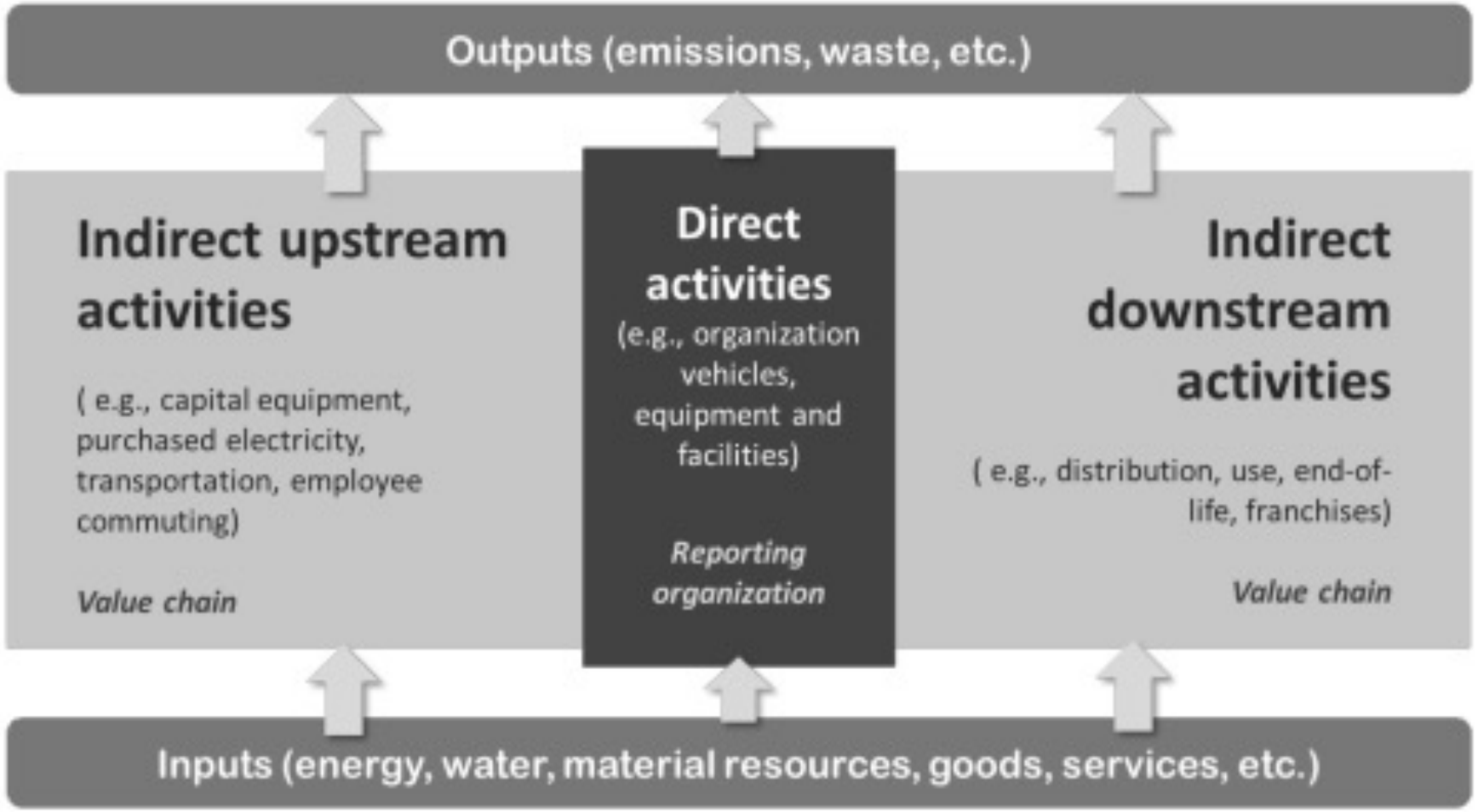
Who	What	Results
LEVI STRAUSS & CO	LCA ON A PAIR OF JEANS	ENVIRONMENTAL IMPACT OF THE PRODUCT AND IDENTIFICATION OF HOTSPOTS
THE NORTH FACE	LCA ON A JACKET	MONITORING OF THE ENVIRONMENTAL IMPROVEMENTS DUE TO CHANGES IN THE PRODUCTION AND GREEN CLAIMS SUPPORT
NIKE	LCA ON GREEN LEATHER AND TRADITIONAL LEATHER	PURCHASE DECISION SUPPORT AFTER COMPARING THE IMPACT OF TWO PRODUCTS AND GREEN CLAIMS SUPPORT
ICEBUG	LCA ON A SHOE	ENVIRONMENTAL FOOTPRINT OF THE PRODUCT
PRIMEASIA LEATHER	LCA ON PRODUCTS OF THE FIRMS	IDENTIFICATIONS THE CRITICAL PHASES AND ENVIRONMENTAL FOOTPRINT OF THE FIRM'S PRODUCTS
HILATURAS FERRE	CRADLE-TO-GRAVE LCA ON ALL OF THE PRODUCTS	GREEN CLAIMS SUPPORT AND CREATION OF A SSC
MARKS & SPENCER	LCA ON TROUSERS IN DIFFERENT SCENARIOS	COMPARISON BETWEEN RAW MATERIALS ALTERNATIVES AND ENVIRONMENTAL FOOTPRINT OF A PRODUCT
CHARGEURS LUXURY MATERIALS	COLLABORATION ON LCA CASE STUDY FOR LCAS OF COMBED WOOL BATCHES USING BLOCKCHAIN	NEW TECHNOLOGIES AS A SUPPORT TO OVERCOME LIMITATIONS OF LCA IN TERMS OF PRECISION AND DATA GATHERING

SECONDARY LR

O-LCA







- Images source: UNEP-SETAC

PRELIMINARY CONCLUSIONS

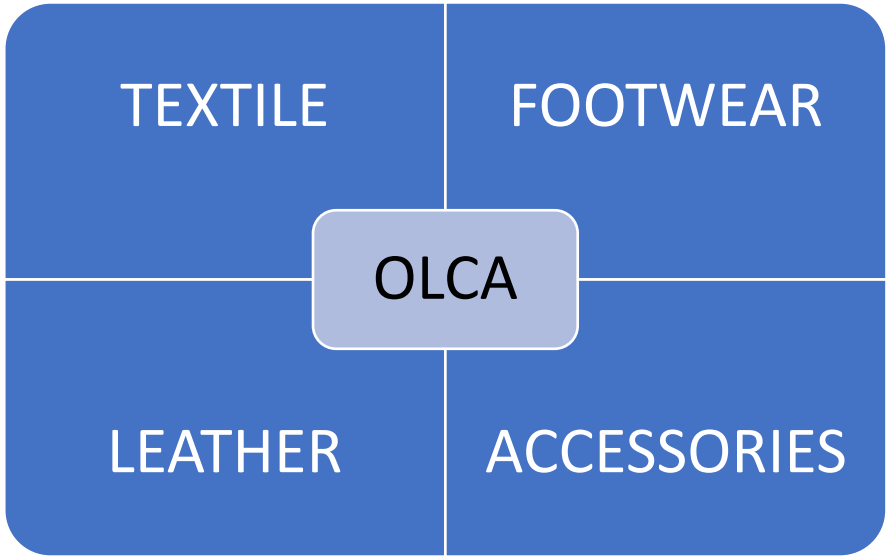
OUTCOME

- **LITERATURE REVIEW**
- **PROMOTION OF LCA AS ENABLER FOR SBM**
- **OLCA TO FACILITATE SMEs ASSESSMENT**

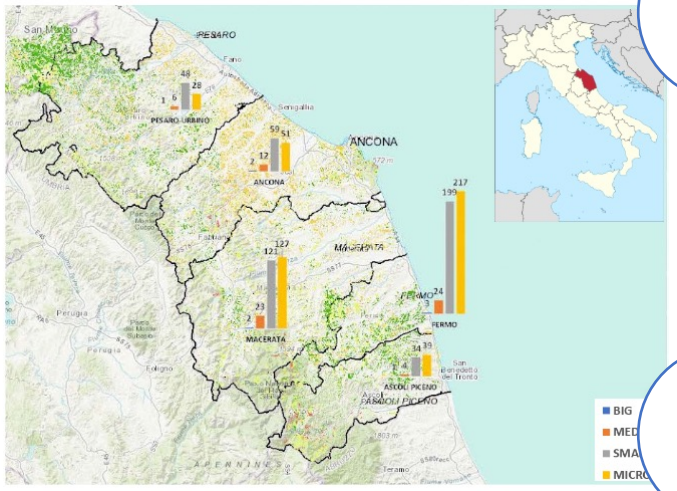
LCA MAIN ADVANTAGES	Get an overview of the overall impacts, to identify hotspots and areas for improvements
	Measure and follow-up the environmental performances
	Provide basis for strategic decisions

NEXT STEPS

FOUR CASE STUDIES



MARCHE REGION



- 6,300 FASHION-RELATED FIRMS
- OVER 37,000 PEOPLE
- FOOTWEAR = 15% REGIONAL MANIFACTURING

Marco Ciro Liscio, PhD student
Università Politecnica delle Marche