



Welcome to the LIFE's Program

LIFE: Force of the Future (Forture)
New circular business concepts for the predictive and dynamic
environmental and social design of the economic activities

Davide Settembre Blundo

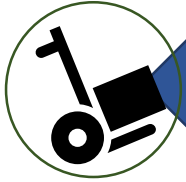
Gruppo Ceramiche Gresmalt S.p.A (Sassuolo - Italy)

Project Manager - Coordinating Beneficiary



26th May 2018 – Padua (Italy)

2. BACKGROUND AND CRITICAL ISSUES



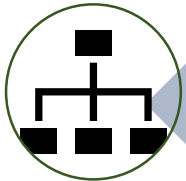
One of the biggest challenges for **European industry** is to introduce **sustainability** principles into **business models**.



The present state of knowledge **lacks** a comprehensive **operational tool** for industry to support **decision-making** processes geared towards sustainability.



This is particularly important in raw material and energy intensive manufacturing sectors such as the **Italian ceramic district of Sassuolo**.



Industrial districts (ID) are the structures where the interaction between territories and companies in the **supply chain** is best observed.



However, in the analysis of ID, the **relationship** between **companies** and their **local context** has long lacked a fundamental dimension in the logic of sustainability.



3. PROJECT OVERVIEW



FORTURE
FORCE OF THE FUTURE



Coordinating Beneficiary:



Expertise in the industrial production of ceramic tiles, among the main Italian manufacturers (Top 10).

Associated Beneficiary:



UNIMORE
UNIVERSITÀ DEGLI STUDI DI
MODENA E REGGIO EMILIA

Expertise in ceramic materials science and technology and impact assessment methods.

Associated Beneficiary:



Universidad
Rey Juan Carlos

Expertise in business science, competitive strategy and organization design.

With the contribution of the LIFE financial instrument of the European Community.

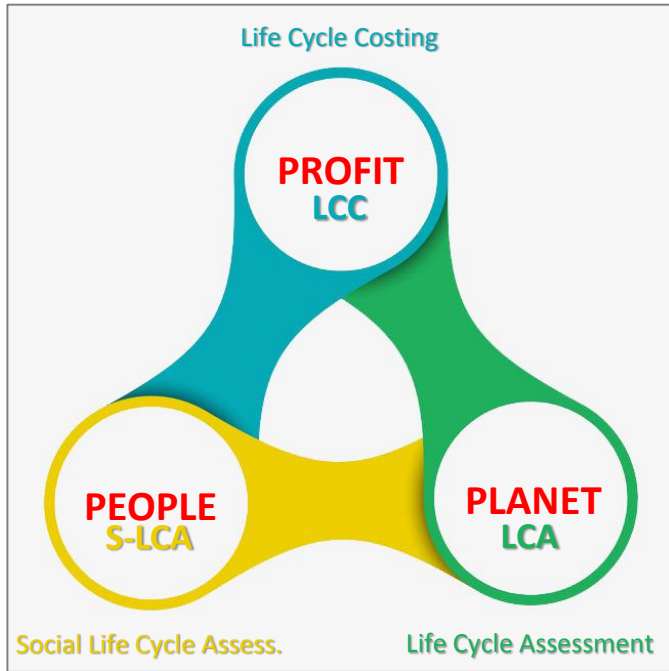
Project Duration: October 2017 – September 2020

Consultants Partners:



4. PROJECT OBJECTIVES: RESPONSES TO CRITICAL ISSUES

Life Cycle Sustainability Assessment LCSA



$$\text{LCSA} = \text{LCA} + \text{LCC} + \text{S-LCA}$$

ISO
14040
14044

ISO
15686

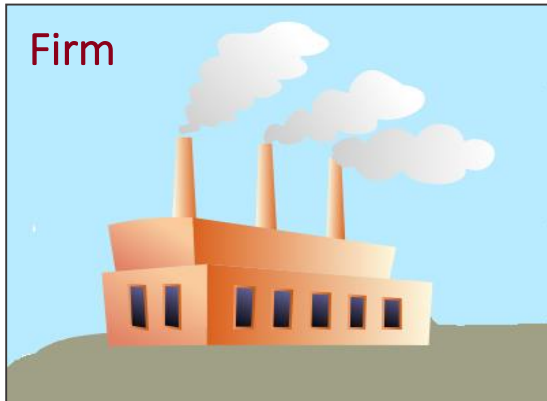
Guidelines

1. To integrate all **three pillars of sustainability** (environment, economy and society) into the **company's business model**.
2. To transform impact assessments from **static actions** carried out on final results (looking back, e.g. from the previous year), to an analysis performed moment by moment (looking ahead) in a **dynamic way**.
3. To add to the **company quality system** the parameters of sustainability in order to manufacture products with a lower environmental, social and economic impacts.
4. Validate the model through the design and production of a new collection of **ceramic tiles** with a **high level of sustainability**.
5. To transfer the results of **technological innovation** to the **European ceramic industry** and more generally to the **building industry**.

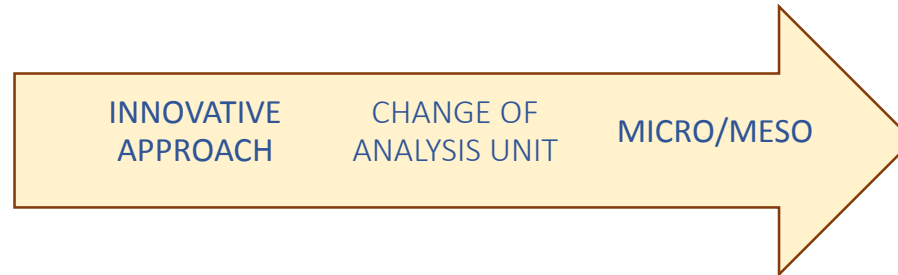
5. A METHODOLOGICAL INNOVATION

Normally the LCSA method is used for the analysis of processes or phases of a **single process**. In this study, and for the first time, the model was applied not at firm level but at sector level using **aggregated data**:

SASSUOLO CERAMIC DISTRICT



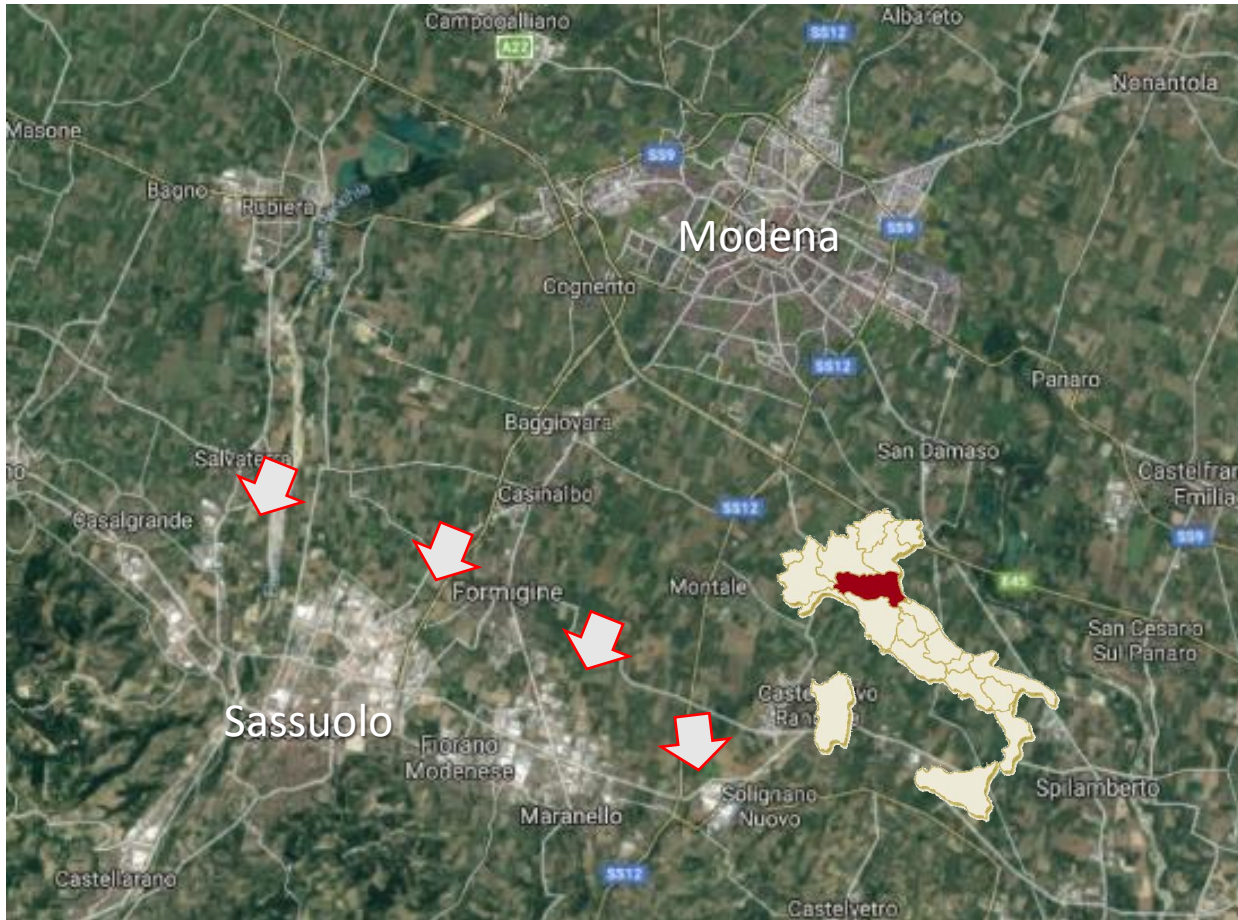
MICRO LEVEL



MESO LEVEL

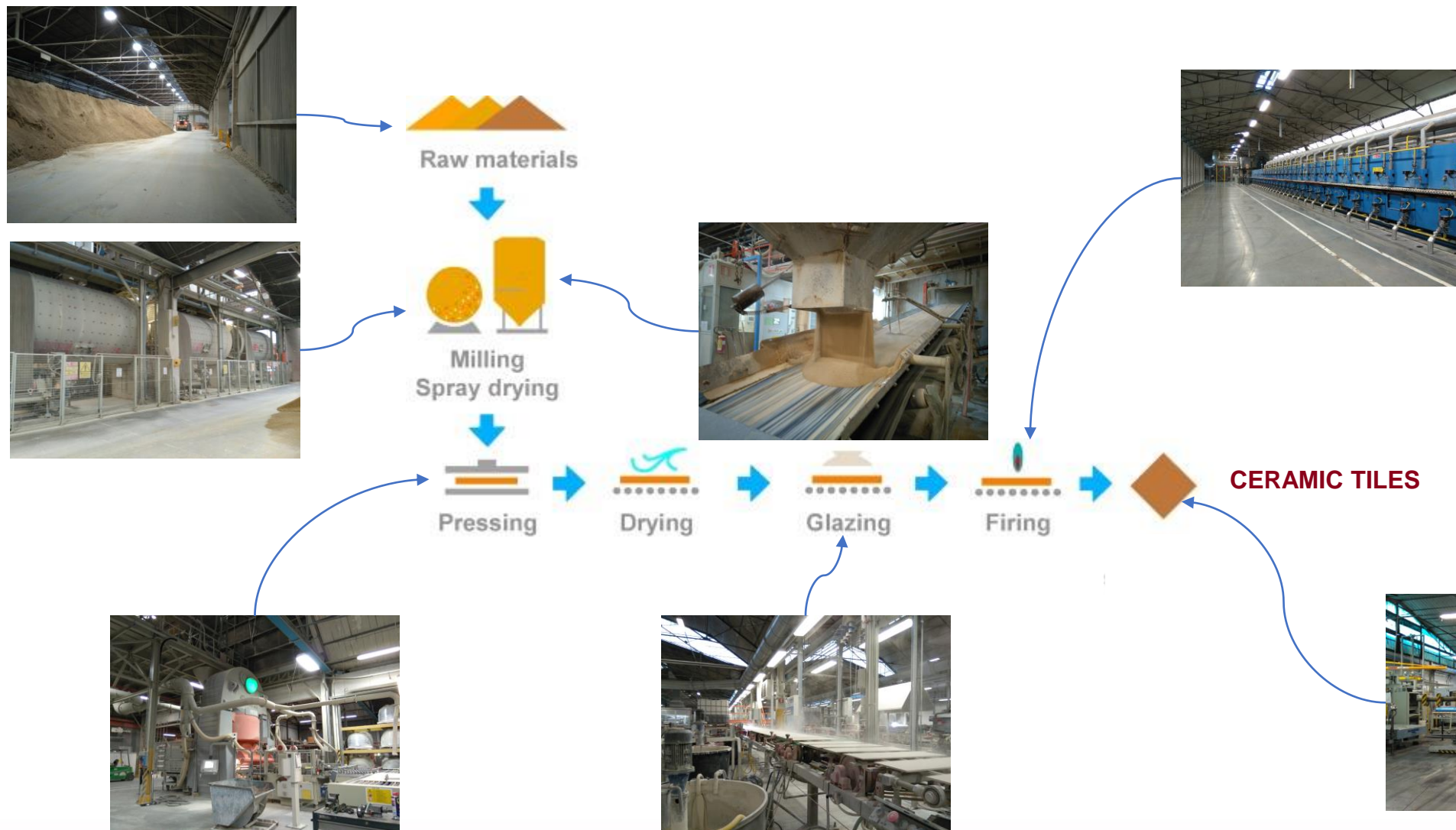
- With the change the analysis unit the **externality** from individual (firm) will become **collective internality**, of district.
- In this way, **costs** could be **internalized** which would not normally be taken into account.

6. SASSUOLO CERAMIC DISTRICT



- ❑ Network of **79 firms** that manufacture ceramic tiles.
- ❑ **341 million** square metres of ceramic tiles produced in 2016.
- ❑ Turnover of **5.4 billion** euros in 2016.
- ❑ **19,000** employees in 2016.
- ❑ **2** Provinces, **10** municipalities.
- ❑ Population: more than 120,000.

7. TILES MANUFACTURING PROCESS



8. MAIN PRODUCTION TYPE

- 1. Porous double-fired wall tile.** Characterized by high porosity (greater than 10 wt% water absorption), brilliance of the glazes and definition of colours. (6% of the total production).
- 2. Porous single-fired wall tile.** The product is porous (greater than 7 wt% water absorption) with aesthetic effects of smoothness and brightness on the surface and it is suitable for indoor wall covering (3% of the total production).
- 3. Glazed porcelain stoneware.** The product is suitable for indoor areas thanks to their stain and chemical attack resistance, making the surface easy to clean and to maintain (60% of the total production).
- 4. Unglazed porcelain stoneware.** The product is resistant to frost, chemical attack, have a high mechanical resistance and hygienic (31% of the total production).

1



2



3



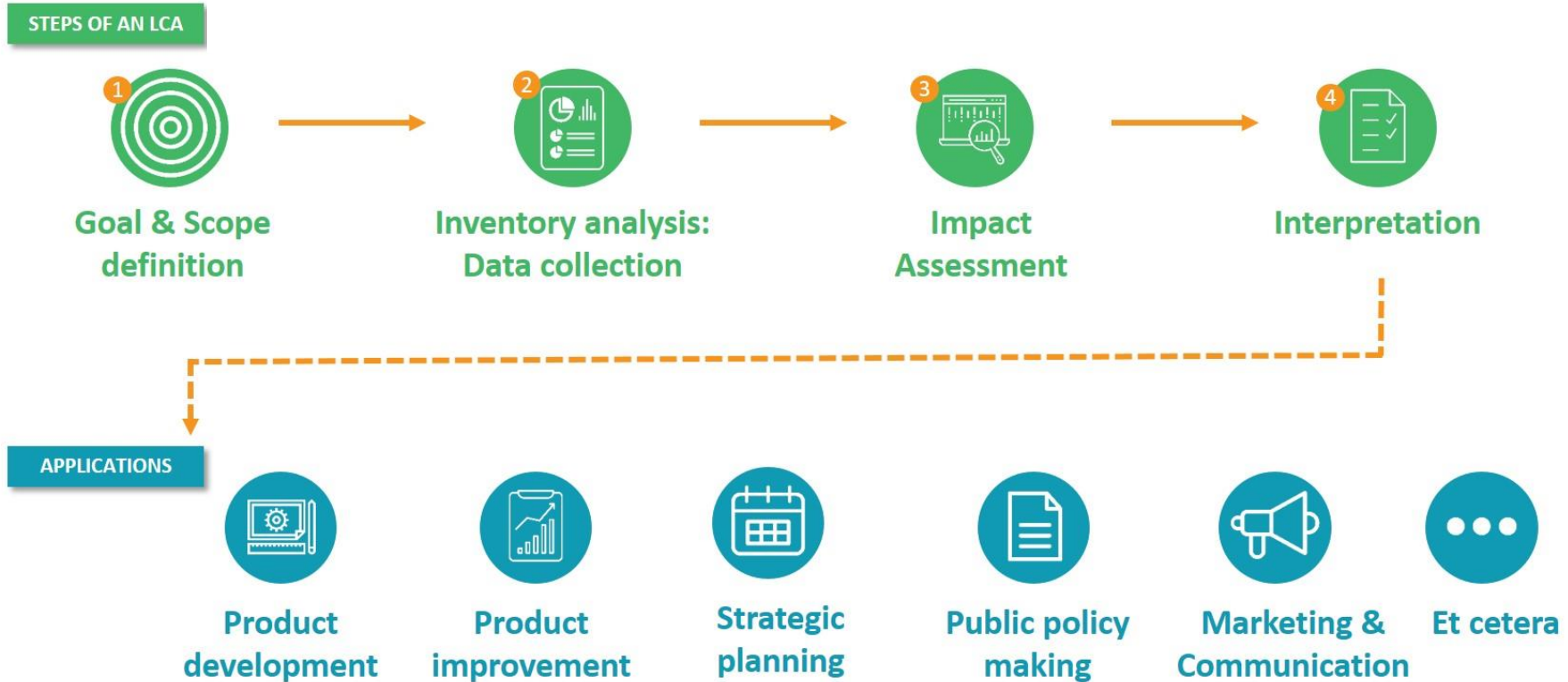
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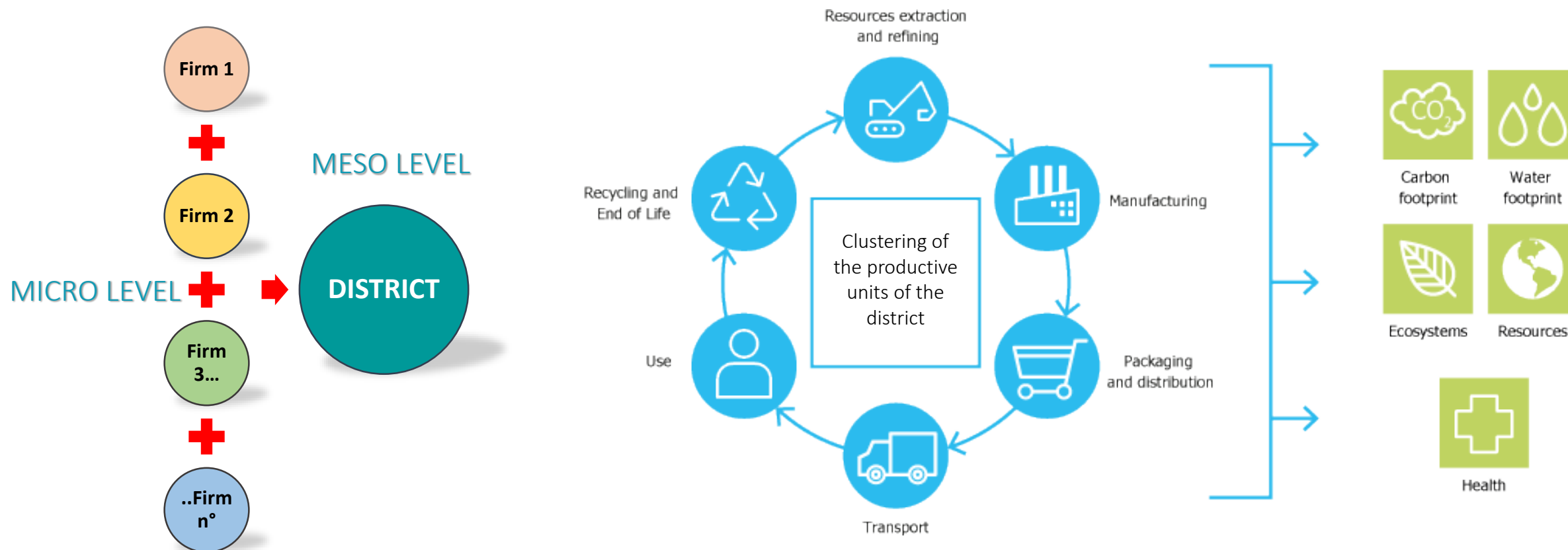
9. ISO REFERENCE FRAMEWORK

Steps of LCA & LCC

How to assess the environmental and economic impacts?

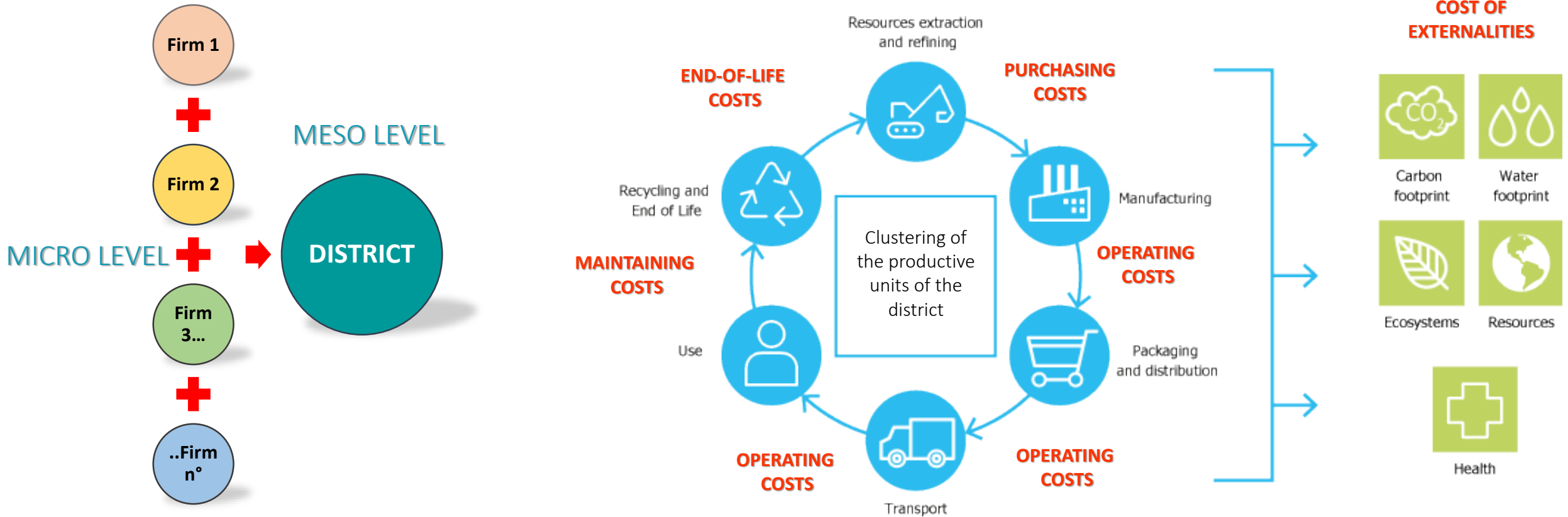


10. ENVIRONMENT



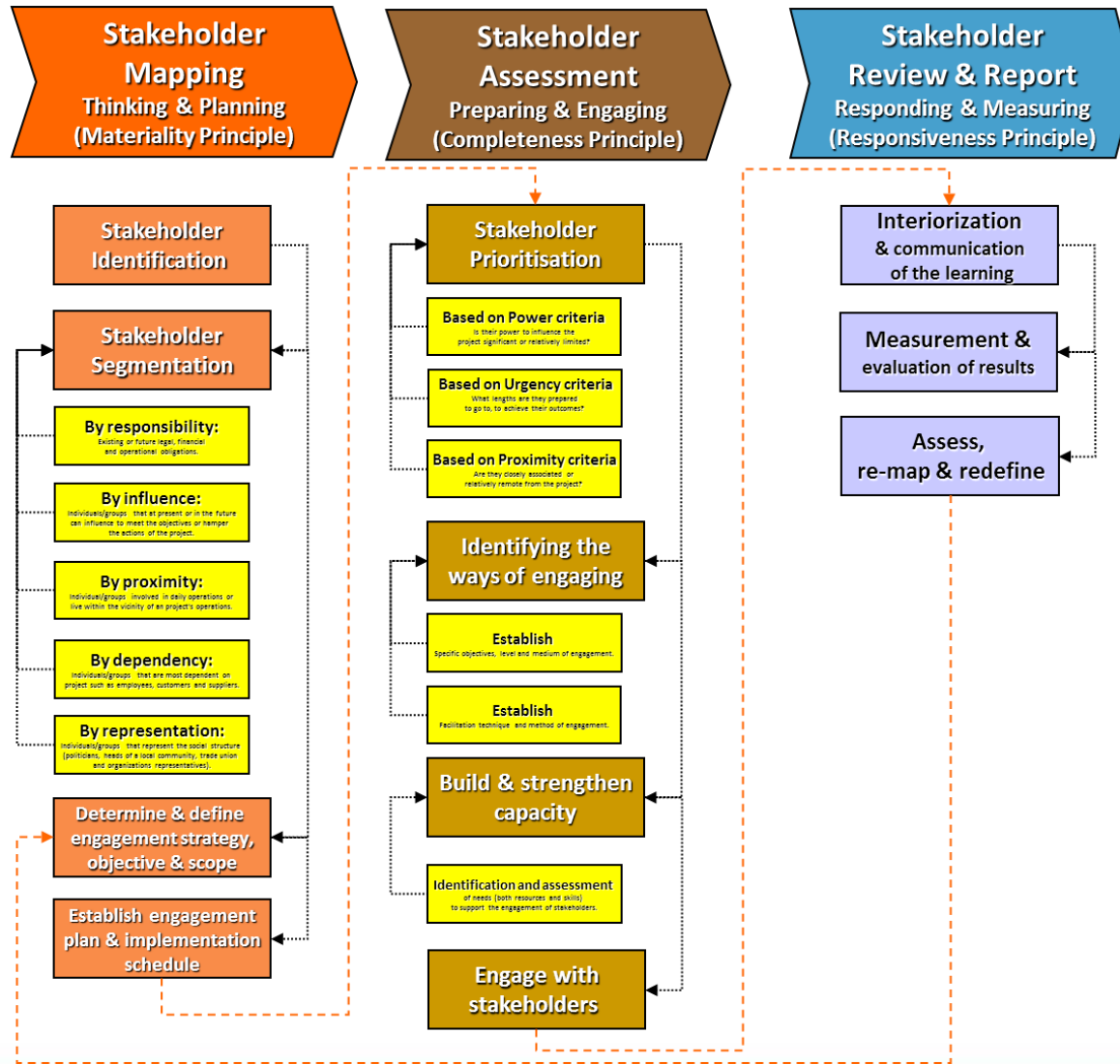
Life Cycle Assessment (LCA) is the main tool of analytical environmental accounting. Quantifies environmental impacts over the life cycle of a product or service (from cradle to grave).

11. ECONOMY



Life Cycle Costing (LCC) is a methodology to assess the costs over the whole life cycle of a product, from production to disposal, and the costs of the associated environmental impacts (**externalities**).

12. SOCIETY



Social Life Cycle Assessment (S-LCA) is a method for assessing the negative and positive social impacts that are generated by a product throughout its life cycle and with regard to the different **stakeholder** groups engaged.

REFERENCE:

- Guidelines for Social Life Cycle Assessment of Products, UNEP/SETAC, 2009.
- AA1000 standard

13. LCA OF THE DISTRICT

LCA MICRO LEVEL	POROUS DOUBLE-FIRED WALL TILES		POROUS SINGLE-FIRED WALL TILES		GLAZED PORCELAIN STONEWARE		UNGLAZED PORCELAIN STONEWARE	
Human Health	2,34E-04	41,5%	2,31E-04	40,8%	2,92E-04	40,1%	3,94E-04	44,9%
Ecosystem Quality	4,35E-05	7,7%	4,19E-05	7,4%	5,24E-05	7,2%	5,69E-05	6,5%
Climate Change	1,36E-04	24,1%	1,39E-04	24,6%	1,82E-04	25,0%	2,02E-04	23,0%
Resources	1,50E-04	26,6%	1,54E-04	27,2%	2,02E-04	27,7%	2,25E-04	25,6%
TOTAL	5,64E-04	100,0%	5,66E-04	100,0%	7,28E-04	100,0%	8,78E-04	100,0%
	21%		21%		27%		32%	

Impact of production in absolute value (Pt) and expressed in % for each category of damage at **micro** (firms) and **meso** (district) level.

LCA MESO LEVEL	POROUS DOUBLE-FIRED WALL TILES		POROUS SINGLE-FIRED WALL TILES		GLAZED PORCELAIN STONEWARE		UNGLAZED PORCELAIN STONEWARE	
Human Health	5,38E+03	41,5%	3,13E+03	40,8%	6,91E+04	40,1%	4,81E+04	44,9%
Ecosystem Quality	1,00E+03	7,7%	5,68E+02	7,4%	1,24E+04	7,2%	6,94E+03	6,5%
Climate Change	3,13E+03	24,1%	1,88E+03	24,6%	4,31E+04	25,0%	2,46E+04	23,0%
Resources	3,45E+03	26,6%	2,09E+03	27,2%	4,78E+04	27,7%	2,74E+04	25,6%
TOTAL	1,29E+04	100,0%	7,67E+03	100,0%	1,72E+05	100,0%	1,07E+05	100,0%
	4%		3%		57%		36%	

Pt= Eco-indicator point, 1 Pt is representative for one thousandth of the annual environmental load of one average European inhabitant.

14. LIFE CYCLE COSTING (LCC)

LIFE CYCLE COSTING	POROUS DOUBLE-FIRED WALL TILES	POROUS SINGLE-FIRED WALL TILES	GLAZED PORCELAIN STONEWARE	UNGLAZED PORCELAIN STONEWARE
PRODUCTION COST				
Production (m ²)	22.978.356	13.545.628	236.734.900	121.954.343
Production Costs (€/m ²)	6,15	7,72	6,85	8,06
TOTAL PRODUCTION COSTS	141.316.889	104.572.248	1.621.634.065	982.952.005
	2.850.475.207			

UTILIZATION COST				
Utilization Costs (€/m ²)	6,56	6,85	8,99	10,01
TOTAL UTILIZATION COSTS	150.738.015	92.787.552	2.128.010.016	1.220.762.973
	3.592.298.557			

EXTERNALITIES				
Human Health	0,11	0,13	0,15	0,17
Ecosystem Production Capacity	0,11	0,14	0,14	0,19
Abiotic Stock Resource	0,54	0,83	0,41	0,50
Biodiversity	0,0014	0,0015	0,0018	0,0023
TOTAL	0,76	1,10	0,71	0,86
TOTAL EXTERNALITIES	17.443.293	14.896.295	168.293.988	104.824.295
	305.457.871			

TOTAL PRODUCT COST €/m ²	13,47	15,67	16,55	18,93
TOTAL COSTS BY CATEGORY	309.498.197,60	212.256.095,04	3.917.938.069,26	2.308.539.272,52
TOTAL	6.748.231.634			

LCC calculation scheme based on inventory data and applying the empirical formula (reported below).

Externalities are expressed in euro/m².

$$LCC_{TOT} = \text{Production Costs} + \text{Utilization Costs} + \text{Externalities}$$



The sum of the externalities of the individual firms, becomes the internality of the district.

15. SOCIAL LIFE CYCLE ASSESSMENT (S-LCA)

STAKEHOLDER CATEGORIES	STAKEHOLDER SUBCATEGORIES	STAKEHOLDER DETAILS
1.Human Resources	1.1 Staff Personnel	1.1.1 Blue-collar Workers
		1.1.2 Employees
		1.1.3 Managers
		1.1.4 Top Management
	1.2 Trade Unions	1.2.1 Confederal Trade Unions
		1.2.2 Independent Trade Unions
2.Local Community	2.1 Local Public Institutions	2.1.1 Regional Governments
		2.1.2 Provincial Governments
		2.1.3 Municipalities
3.Society	3.1 Private Business	3.1.1 Company's Shareholders
		3.1.2 Association of Manufacturing and Service Companies
		3.1.3 Chambers of Commerce
	3.2 Public and Private Organization	3.2.1 Regulatory Authorities
		3.2.2 Research Community
		3.2.3 National and International Public Institutions
		3.2.4 Civil Society Organizations
	3.3 Environment	3.3.1 Natural Environment
		3.3.2 Future Generations
	3.4 Media	3.4.1 Newspapers
		3.4.2 Professional Magazines
		3.4.3 TV and Radio
		3.4.4 Internet
4.Consumers	4.1 Trade Channel Operators	4.1.1 Resellers
		4.1.2 Trading Partners
		4.1.3 Business Customers
	4.2 Final Consumer	4.2.1 Private Customers
		4.2.2 Consumers Associations
5.Value Chain Actors	5.1 Suppliers	5.1.1 Large-Scale Suppliers
		5.1.2 Small-Scale- Suppliers
	5.2 Partners	5.2.1 Practitioners and Professionals
	5.3 Competitors	5.3.1 Direct Competitors
		5.3.2 Indirect Competitors

Stakeholder list involved in the ceramic production of Sassuolo District (Source: our elaboration based on the SETAC/UNEP guidelines and the AA1000 standard).

16. S-LCA: ENTREPRENEURIAL PERSPECTIVE

SCENARIO 1

STAKEHOLDERS	Power Criterion	Urgency Criteria	Proximity Criteria	Total Prioritization Index	Deviation %
Staff Personnel	7	7	10	24	20
Trade Unions	6	6	7	19	37
Local Public Institutions	10	5	5	20	33
Private Business	10	10	10	30	0
Public and Private Organization	2	2	3	7	77
Environment	5	6	4	15	50
Media	1	1	1	3	90
Trade Channel Operators	9	10	9	28	7
Final Consumer	8	8	7	23	23
Suppliers	9	8	10	27	10
Partners	6	4	7	17	43
Competitors	9	5	7	21	30
MAXIMUM PRIORITIZATION	10	10	10	30	0

Mapping

Priority	STAKEHOLDERS	Total Prioritization Index	Weighting Factor	Priority Group
1	Private Business	30	1,0	Priority Group 1 WF ≥ 0,9
2	Trade Channel Operators	28	0,9	
3	Suppliers	27	0,9	
4	Staff Personnel	24	0,8	Priority Group 2 WF ≥ 0,7
5	Final Consumer	23	0,8	
6	Competitors	21	0,7	
7	Local Public Institutions	20	0,7	Priority Group 3 WF ≥ 0,5
8	Trade Unions	19	0,6	
9	Partners	17	0,6	
10	Environment	15	0,5	Priority Group 4 WF ≤ 0,2
11	Public and Private Organization	7	0,2	
12	Media	3	0,1	

Prioritization

17. S-LCA: WORKER'S PERSPECTIVE

SCENARIO 2

STAKEHOLDERS	Power Criterion	Urgency Criteria	Proximity Criteria	Total Prioritization Index	Deviation %
Staff Personnel	10	10	10	30	0
Trade Unions	9	9	10	28	7
Local Public Institutions	8	4	4	16	47
Private Business	9	8	9	26	13
Public and Private Organization	1	1	1	3	90
Environment	4	5	2	11	63
Media	1	1	2	4	87
Trade Channel Operators	1	4	5	10	67
Final Consumer	1	1	1	3	90
Suppliers	2	1	5	8	73
Partners	1	1	1	3	90
Competitors	4	1	1	6	80
MAXIMUM PRIORITIZATION	10	10	10	30	0

Mapping

Priority	STAKEHOLDERS	Total Prioritization Index	Weighting Factor	Priority Group
1	Staff Personnel	30	1,0	Priority Group 1 WF ≥ 0,9
2	Trade Unions	28	0,9	
3	Private Business	26	0,9	
4	Local Public Institutions	16	0,5	Priority Group 4 WF ≥ 0,3
5	Environment	11	0,4	
6	Trade Channel Operators	10	0,3	Priority Group 4 WF ≤ 0,2
7	Suppliers	8	0,3	
8	Competitors	6	0,2	
9	Media	4	0,1	Priority Group 4 WF ≤ 0,1
10	Public and Private Organization	3	0,1	
11	Final Consumer	3	0,1	
12	Partners	3	0,1	

Prioritization

18. S-LCA: PUBLIC INSTITUTIONS' PERSPECTIVE

SCENARIO 3

STAKEHOLDERS	Power Criterion	Urgency Criteria	Proximity Criteria	Total Prioritization Index	Deviation %
Staff Personnel	2	6	8	16	47
Trade Unions	6	8	6	20	33
Local Public Institutions	10	10	10	30	0
Private Business	7	8	8	23	23
Public and Private Organization	9	8	9	26	13
Environment	7	9	6	22	27
Media	9	6	8	23	23
Trade Channel Operators	1	1	2	4	87
Final Consumer	1	2	1	4	87
Suppliers	4	2	4	10	67
Partners	4	5	3	12	60
Competitors	3	2	1	6	80
MAXIMUM PRIORITIZATION	10	10	10	30	0

Priority	STAKEHOLDERS	Total Prioritization Index	Weighting Factor	Priority Group
1	Local Public Institutions	30	1,0	Priority Group 1 WF ≥ 0,9
2	Public and Private Organization	26	0,9	
3	Private Business	23	0,8	
4	Media	23	0,8	Priority Group 1 WF ≥ 0,7
5	Environment	22	0,7	
6	Trade Unions	20	0,7	
7	Staff Personnel	16	0,5	Priority Group 1 WF ≥ 0,3
8	Partners	12	0,4	
9	Suppliers	10	0,3	
10	Competitors	6	0,2	Priority Group 4 WF ≤ 0,2
11	Final Consumer	4	0,1	
12	Trade Channel Operators	4	0,1	

Mapping

Prioritization

19. S-LCA: A NEW UNDERSTANDING

Priority Group	SCENARIO 1 Entrepreneurial Perspective		SCENARIO 2 Worker's Perspective		SCENARIO 3 Public Institutions' Perspective	
	STAKEHOLDER	INDEX	STAKEHOLDER	INDEX	STAKEHOLDER	INDEX
1	Private Business	1,0	Staff Personnel	1,0	Local Public Institutions	1,0
	Trade Channel Operators	0,9	Trade Unions	0,9	Public and Private Organization	0,9
	Suppliers	0,9	Private Business	0,9		
2	Staff Personnel	0,8	Local Public Institutions	0,5	Private Business	0,8
	Final Consumer	0,8	Environment	0,4	Media	0,8
	Competitors	0,7			Environment	0,7
	Local Public Institutions	0,7			Trade Unions	0,7
3	Trade Unions	0,6	Trade Channel Operators	0,3	Staff Personnel	0,5
	Partners	0,6	Suppliers	0,3	Partners	0,4
	Environment	0,5	Competitors	0,2	Suppliers	0,3
4	Public and Private Organization	0,2	Media	0,1	Competitors	0,2
	Media	0,1	Public and Private Organization	0,1	Final Consumer	0,1
			Final Consumer	0,1	Trade Channel Operators	0,1
			Partners	0,1		

MICRO LEVEL

Entrepreneurs, workers and public institutions have a different construction of reality depending on the specificity of their expectations.

INTERPRETATION PROCESS FOR A NEW UNDERSTANDING

1	Private Business	1,0
2	Staff Personnel	1,0
3	Local Public Institutions	1,0
4	Trade Channel Operators	0,9
5	Suppliers	0,9
6	Trade Unions	0,9
7	Public and Private Organization	0,9
8	Final Consumer	0,8
9	Media	0,8
10	Competitors	0,7
11	Environment	0,7
12	Partners	0,6

MESO LEVEL

The new stakeholder list was built by combining scenarios (in columns) with priority groups (in rows) across them and listing them in descending order of priority. The new list of stakeholders can be the basis for defining the most appropriate strategies for engagement.

20. CONCLUSIONS

1

- LCSA approach helps to **incorporate the full social cost of an environmental transaction** into the price of products, avoiding attributing the external costs to the community and responding to market failures.

2

- The correct use of LCSA allows to **quantify the economic, environmental and social impact**, using process data normally available to economic agents and otherwise not always used profitably.

3

- The research bridges the **gap between scholars and practitioners** in the field of integrating sustainability principles into business models and economic and industrial policies for the governance of territories.

4

- The change of the analysis unit, from firms (micro level) to district (meso level), allows to take into account those **externalities** that would otherwise remain outside the "gates" of the economic actors and allows to transform them into sector **internalities**.

5

- LCSA model highlighted that the **transport of raw materials** is one of the **most impacting factors**, but above all it showed that it is not only a transaction cost (transport from the mine to the factories), but also an environmental cost not exclusively attributable to the individual firm, but to the entire district.

21. ACKNOWLEDGEMENTS

Thank you for your attention!
Any questions?



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