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Circular Economy and fashion sector: a best practice from Tuscany Region, the case of tannery industrial cluster of S. Croce sull'Arno (Pisa)

Barcelona, October 10th/2017, Tiberio Daddi, Italy

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Case study: the tannery cluster of S.Croce sull'Arno

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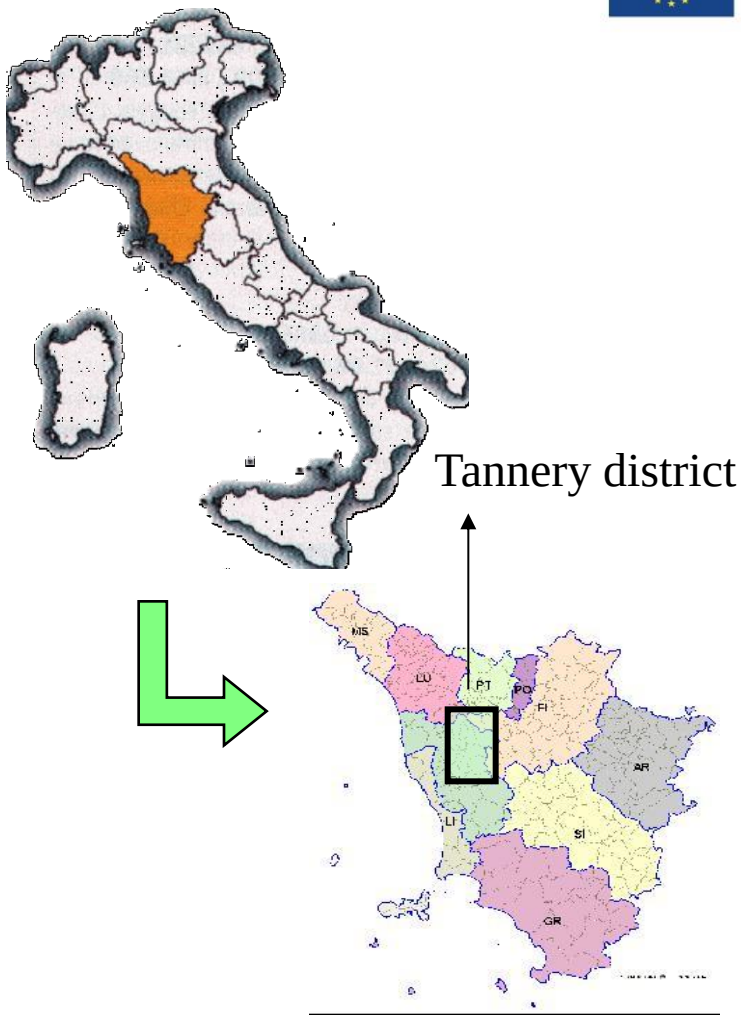
Italy provides **66% of EU production** tanned leather (**15% worldwide**), it is the most important location in EU

S.Croce is the biggest tannery cluster in Italy providing **35%** of the Italian production of **tanned leather** and **98%** of the Italian production of **sole leather**.



- Location: Tuscany Region (prov. Pisa)
- Territorial area: 4 municipalities, 240km^2
- Employment: 800 firms, 10.000 employees
- Size: 90% of enterprises have less than 9 employees

Tannery cluster of S.Croce: the challenges of sustainability

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- the tanning process has always been associated with odours and other important impacts on air, surface and ground water and solid waste (*environmental challenges*);
- in the last years eco-innovation is perceived as a driver for competitiveness, especially to face up to competitors operating in third countries, as India and Pakistan (*economic challenges*);
- in the territorial area of S.Croce sull'Arno, local communities have showed over time a high awareness and sensitiveness on environmental issues (*social challenges*);

EMAS is spread among tanneries of the industrial cluster

Tannery cluster of S.Croce: circular economy initiatives

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In the tannery cluster of S.Croce sull'Arno there is a large presence of circular economy initiavies:

1. *Aquarno wastewater treatment plant* receives about 3.600.000 m3 of industrial water emissions per year, with a pipeline send 100.000 tons of *sludge* per year to *Ecoespanso plant* that recover the sludge for *construction sector*;
2. *Cuoiodepur wastewater treatment plant* receives about 1.700.000 m3 of industrial water emissions per year and it recoveries its sludge as fertilizers;
3. *Chromium recovery plant*: plant located in the industrial cluster receives yearly until 70.000 tons of exhaust chromium from the tanneries and regenerate them to re-use in the cluster;
4. *Shavings and flashings waste recovery plant*: it receives from the tanneries about 80.000 tons per year of waste shavings and flashings. The plant recovers the fat and proteins which is then sold out of the cluster;

Open questions about these circular economy initiatives

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RQ1: Which kind of environmental benefits are producing these initiatives grounded on the circular economy principles?

RQ2: Can these benefits be quantified with a LCA?

Method

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1. Calculate an **average LCA** of a representative m2 of finished leather of the industrial cluster in the current situation with large presence of “circular economy initiatives” (SCENARIO 1)
2. Identify the **LCA impact categories** values of SCENARIO 1
3. Suppose a **second scenario** (SCENARIO 2) where the circular economy initiatives are less developed or not present
4. Identify average **LCA impact categories values of scenario 2**
5. **Compare the difference** between LCA results of **scenario 1 and scenario 2**

SAMPLE

22 tanneries representing 6.300.104 m² of finished leather

(*14% of the total cluster production and around 5% of Italian production*)

Method: graphical representation

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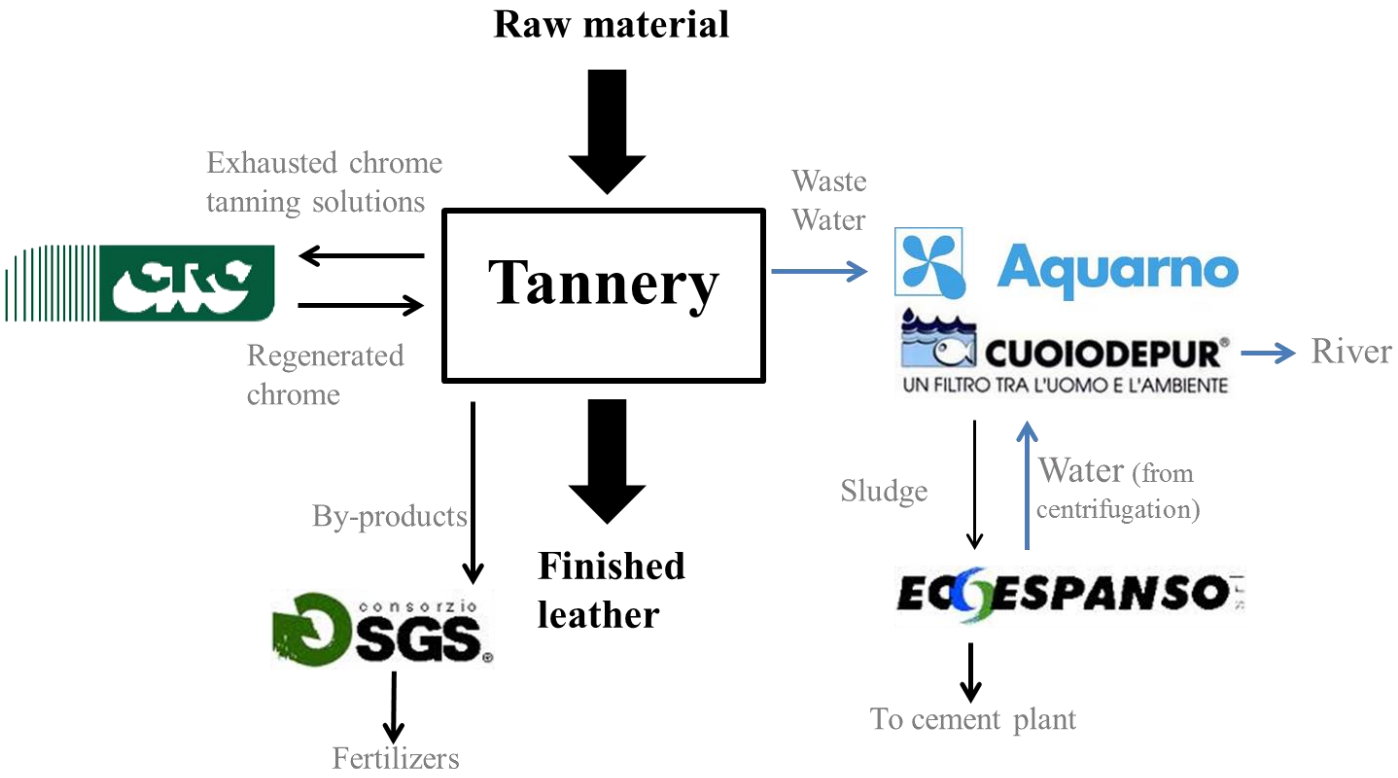
Sectoral LCA of the current scenario (SCENARIO 1)



Method graphical representation

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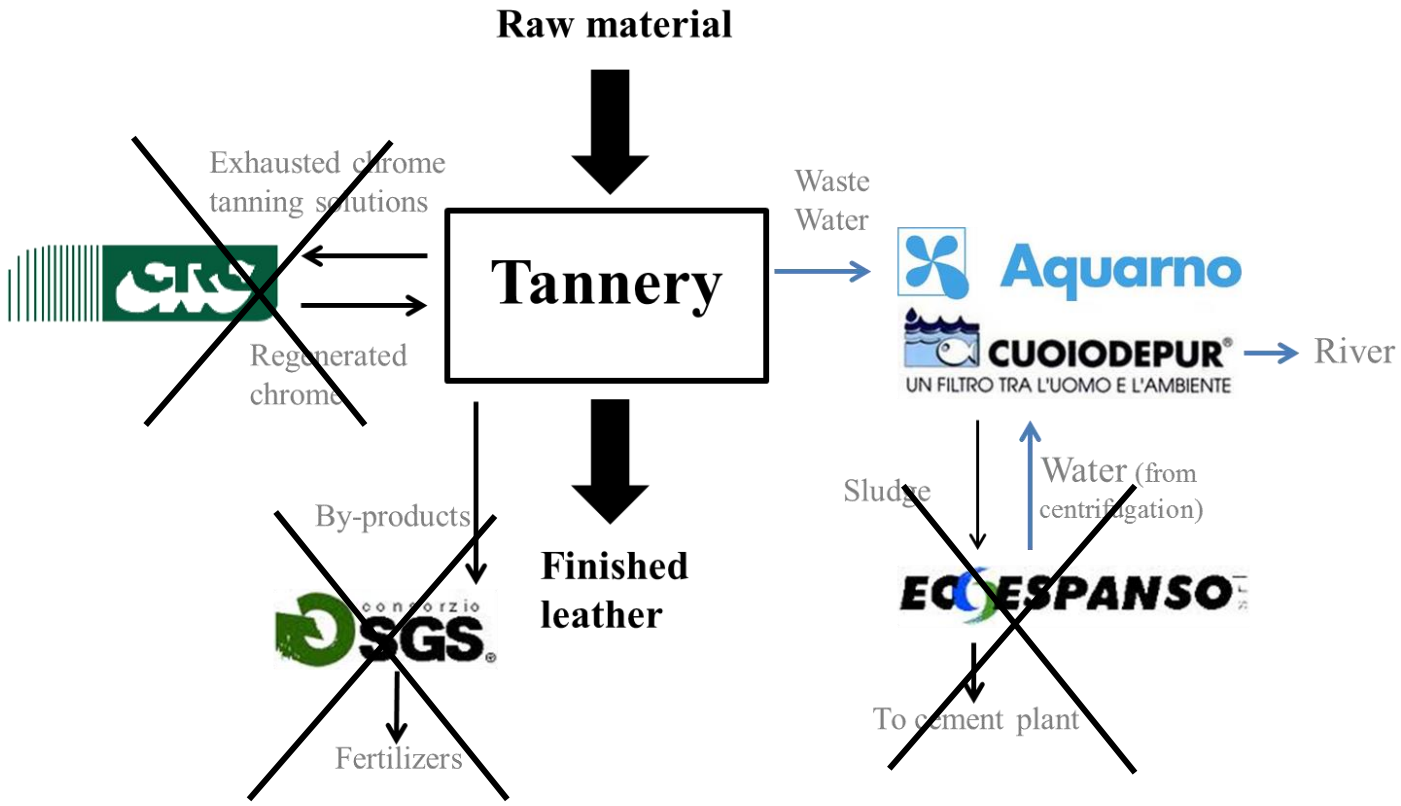
Sectoral LCA of SCENARIO 2 (identified according to the features of other Italian tannery clusters)



Results of average LCAs

Impact category	Unit	1 m² of finished leather		Difference
		SCENARIO 1 *(with circ economy)*	*SCENARIO 2* *(no circular economy)*	
Climate change	*kg CO2 eq*	*12,120*	*16,419*	**-26%**
Ozone depletion	*kg CFC-11 eq*	*9,19E-06*	*9,321E-06*	**-1%**
Particulate matter	*kg PM2.5 eq*	*0,00967*	*0,0118*	**-18%**
Photochemical ozone formation	*kg NMVOC eq*	*0,0537*	*0,0636*	**-15%**
Acidification	*molc H+ eq*	*0,1164*	*0,1416*	**-18%**
Terrestrial eutrophication	*molc N eq*	*0,0780*	*0,1651*	**-53%**
Freshwater eutrophication	*kg P eq*	*0,001109*	*0,001333*	**-17%**
Marine eutrophication	*kg N eq*	*317,92*	*601,265*	**-47%**

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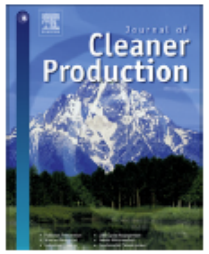

Using Life Cycle Assessment (LCA) to measure the environmental benefits of industrial symbiosis in an industrial cluster of SMEs

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ABSTRACT

Collaborative approach and infrastructures sharing are key industrial symbiosis initiatives adopted in clusters of SMEs. Several studies have dealt with the environmental benefits of industrial symbiosis however only a few have adopted a Life Cycle Assessment (LCA) to assess the benefits of these initiatives