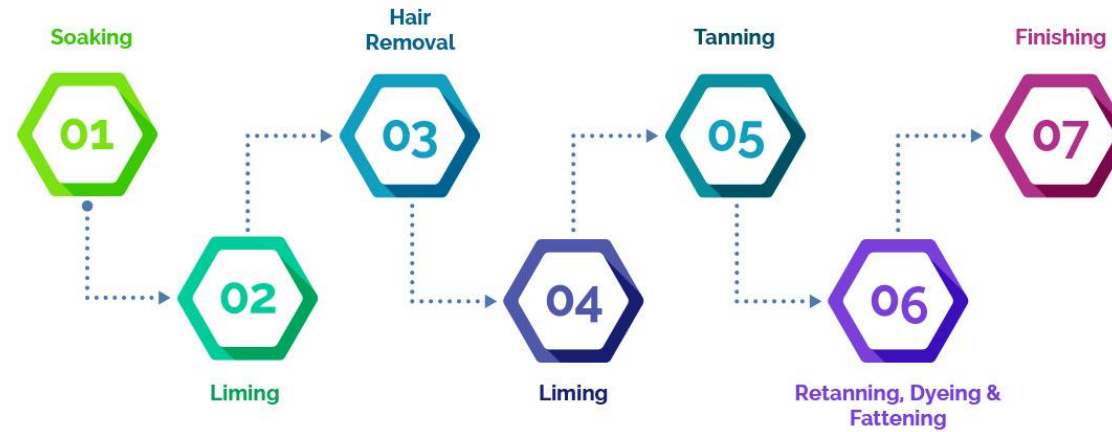


# Bio-Mass Valorization for high value chemicals

Prof. PhD Valentina BEGHETTO





## *Manufacturing new concept*

### LINEAR ECONOMY

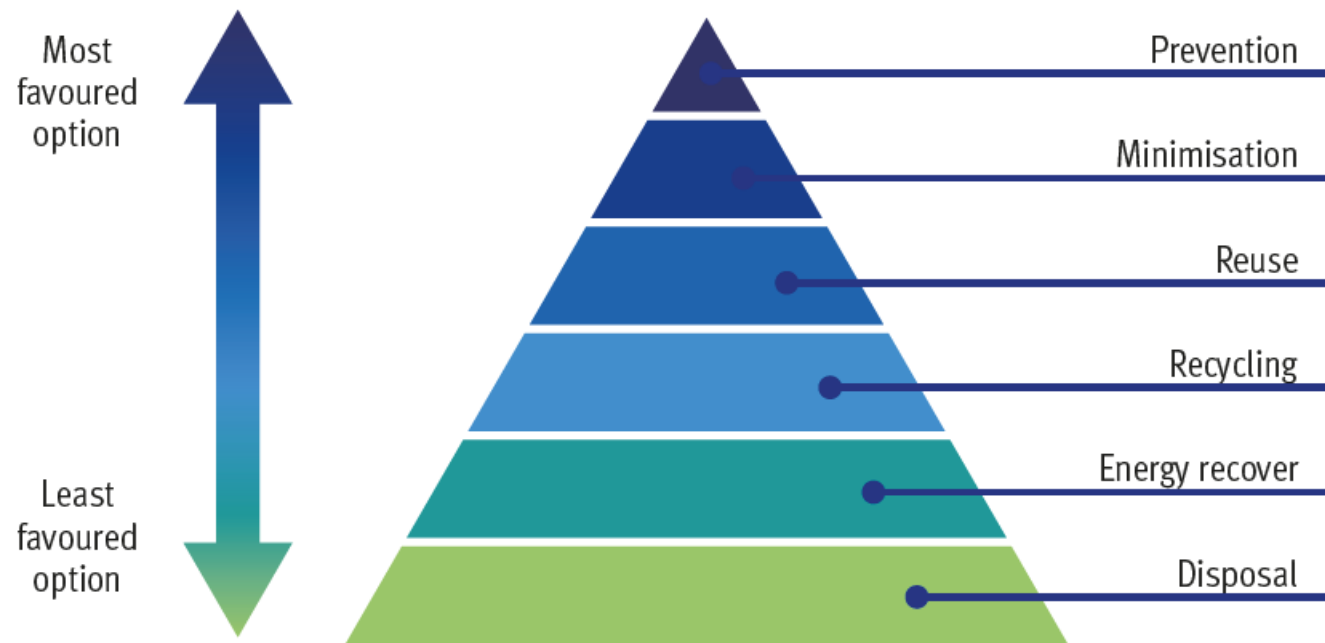


### CIRCULAR ECONOMY





# Waste Pyramid



IPCC (Intergovernmental Panel on Climate Change) in 2021 stated

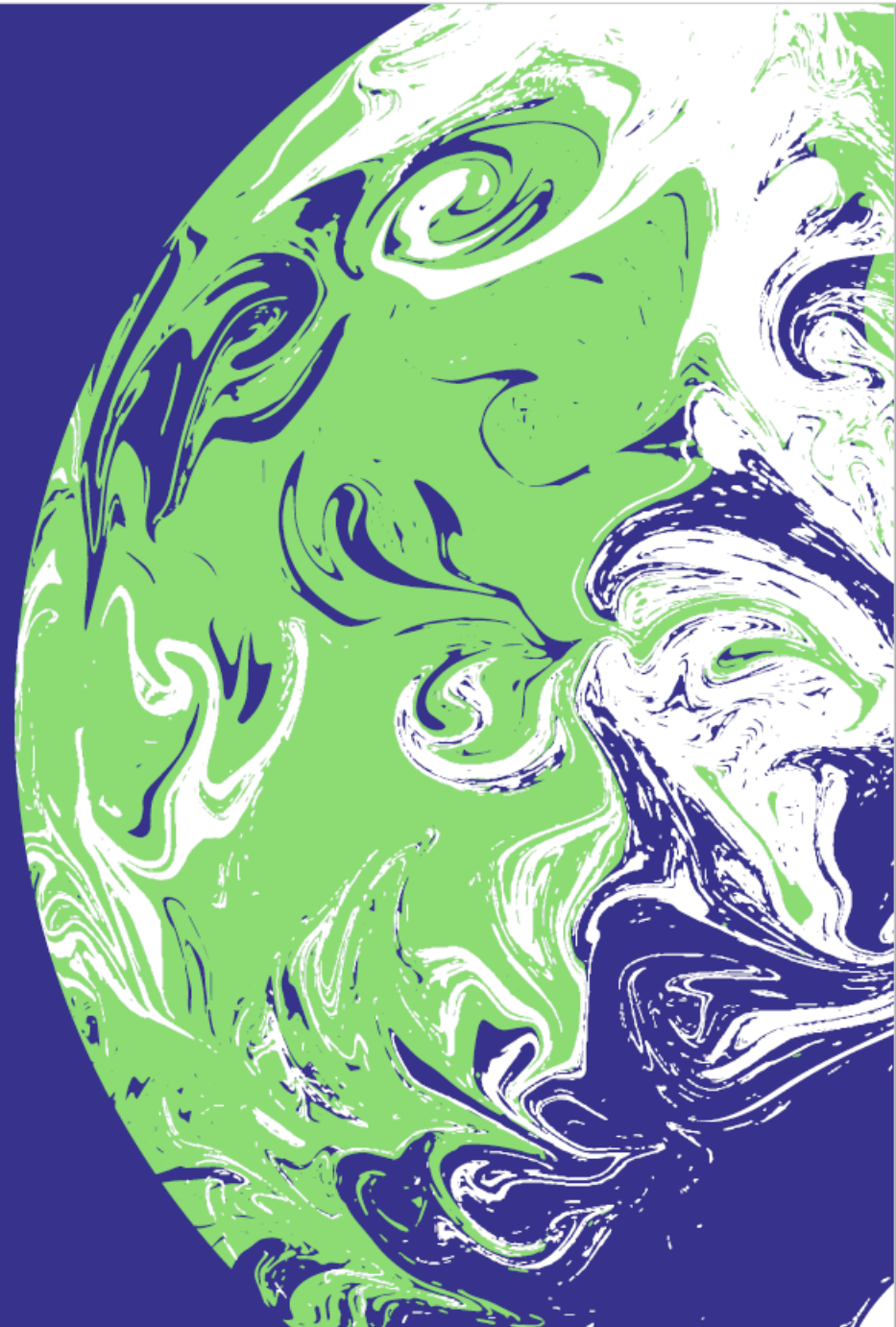
**“Emissions of greenhouse gases from human activities are responsible for approximately  $1.1^{\circ}\text{C}$  of warming since 1850-1900, and finds that averaged over the next 20 years, global temperature is expected to reach or exceed  $1.5^{\circ}\text{C}$  of warming. “**

<https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/>

# **COP26** **THE GLASGOW** **CLIMATE PACT**

**UN CLIMATE  
CHANGE  
CONFERENCE  
UK 2021**

IN PARTNERSHIP WITH ITALY

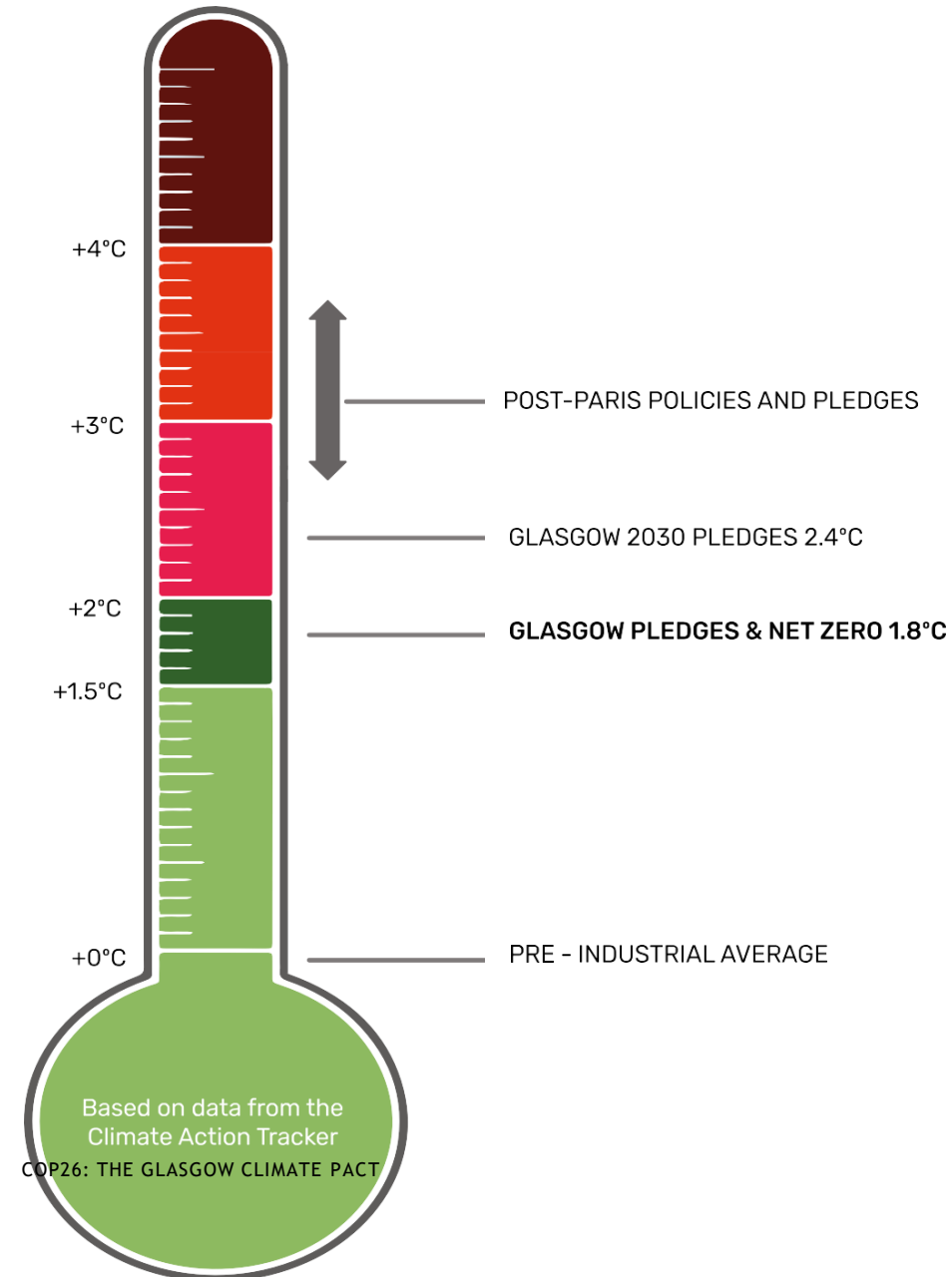


<https://ukcop26.org/the-conference/cop26-outcomes/>

# GLASGOW HAS KEPT 1.5°C IN REACH BUT FURTHER ACTION NEEDED

Ahead of Paris, some scientists said that there was a chance that temperatures could ultimately rise by up to 6°C. The pledges made under the Paris Agreement had the world on track to a 2.7-3.7°C rise.

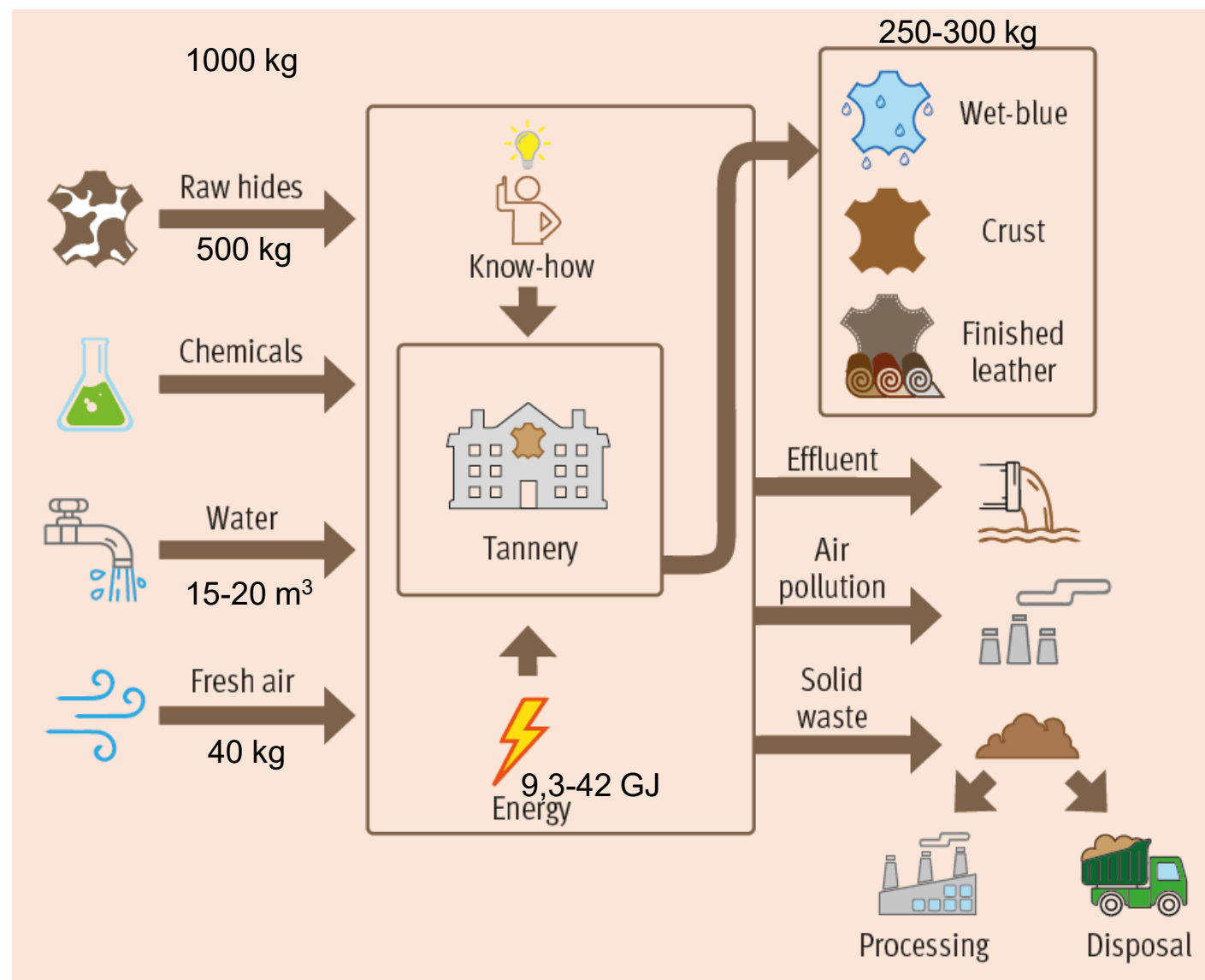
If the pledges made at Glasgow are fully implemented, warming will be kept below 2°C; and with the commitment to further action over the next decade we have kept 1.5°C in reach.







## *Manufacturing mass balance*



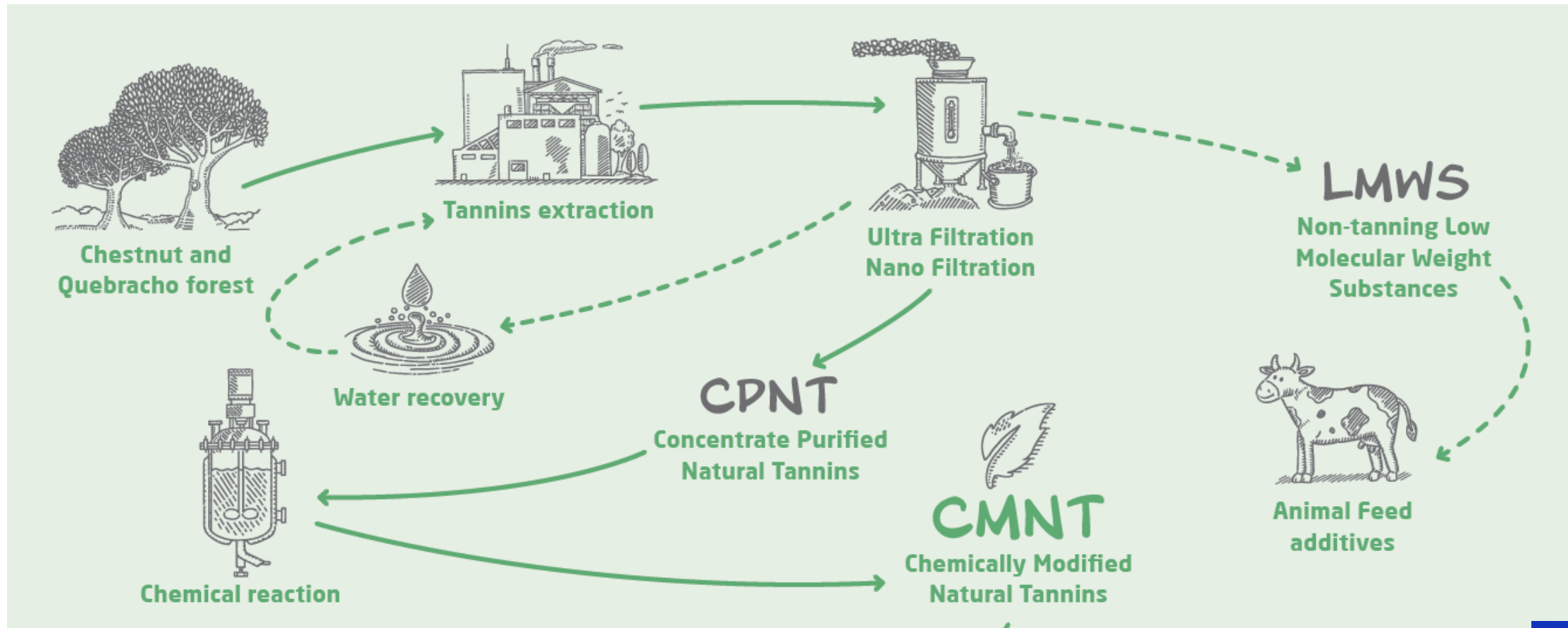


# Our Successful Case Studies

## Innovative Chemically Modified Tannins

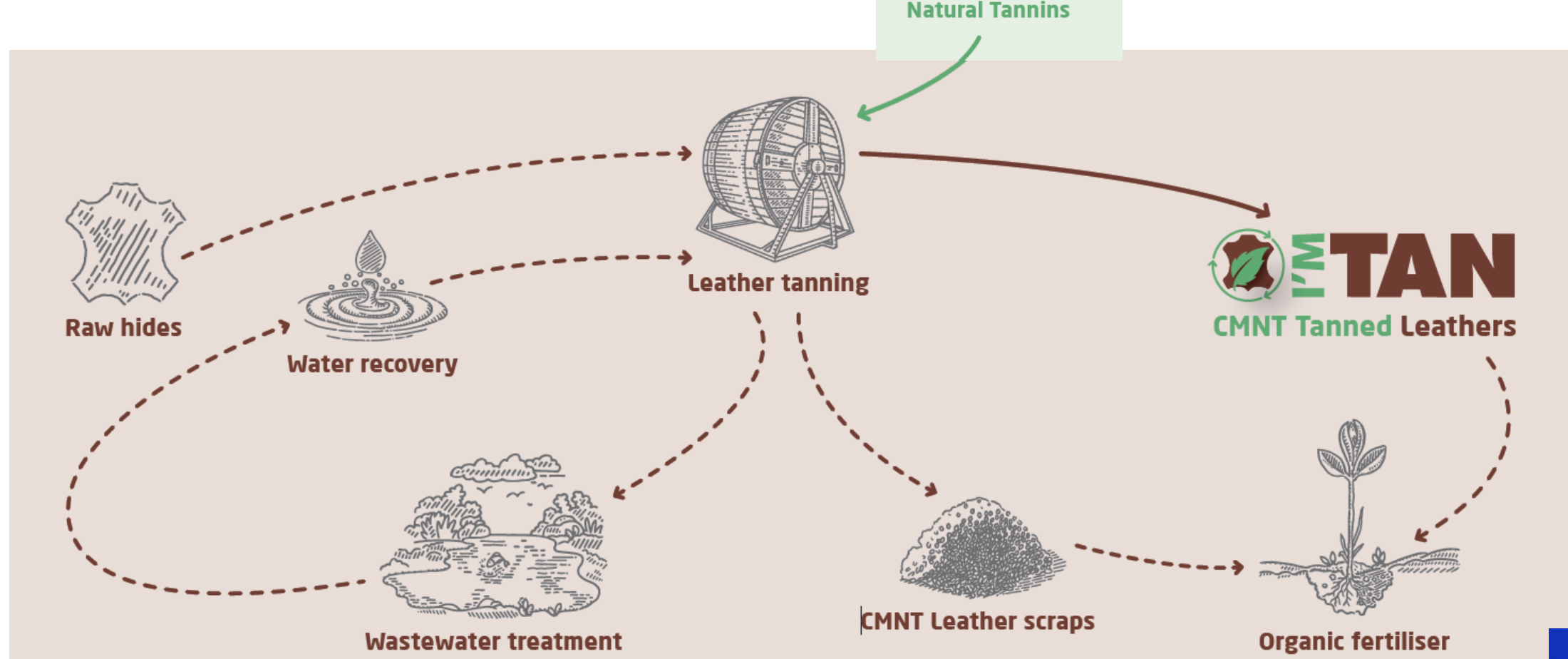


## Overall scheme and key actions





## Overall scheme and key actions



## Environmental objectives

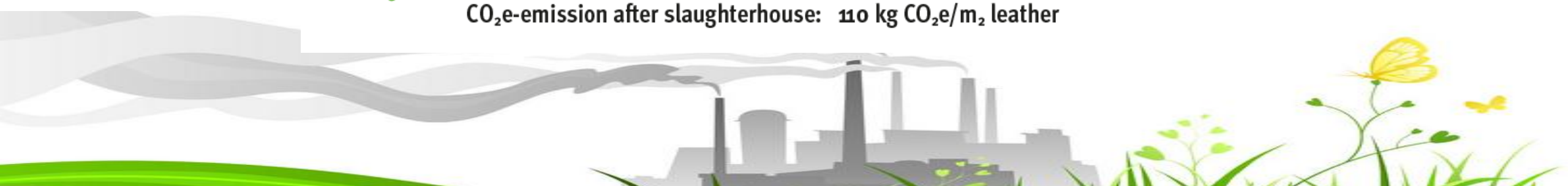
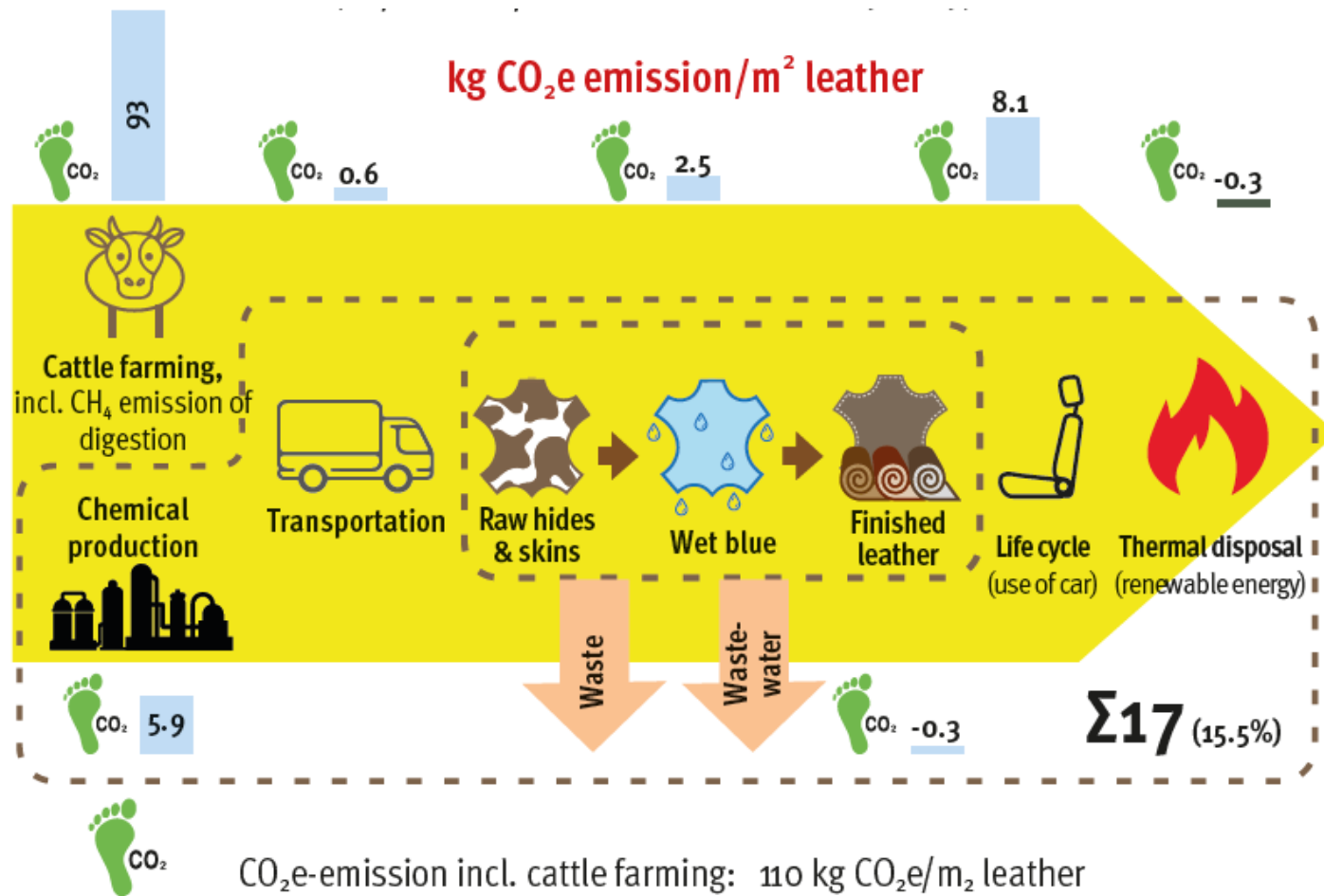
- 1) 0 % hazardous chemicals
- 2) -25 % COD/BOD in tannery effluents
- 3) -30 % water consumption in leather tanning

## Eco-design & circular economy objectives:

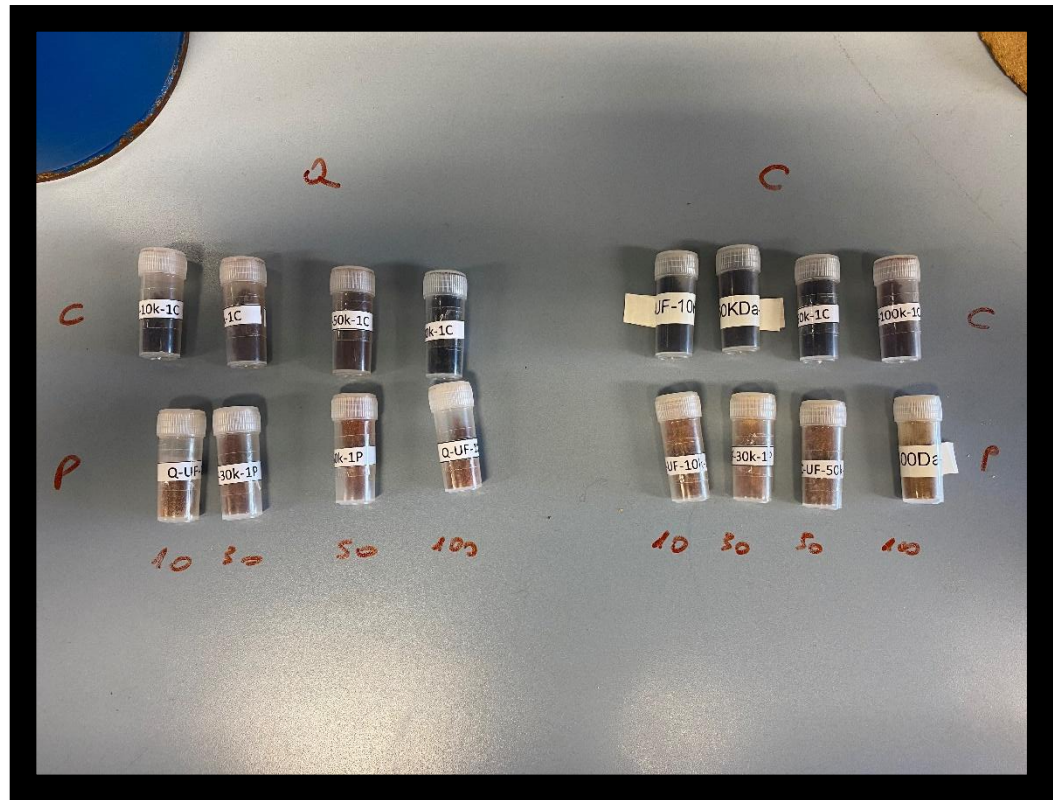
- 4) Recovery/recycle of leather scraps to produce fertilizers
- 5) Co-products as additives for animal nutrition
- 6) Recovery/reuse of lignocellulosic waste



# Carbon Footprint of the Tanning Process







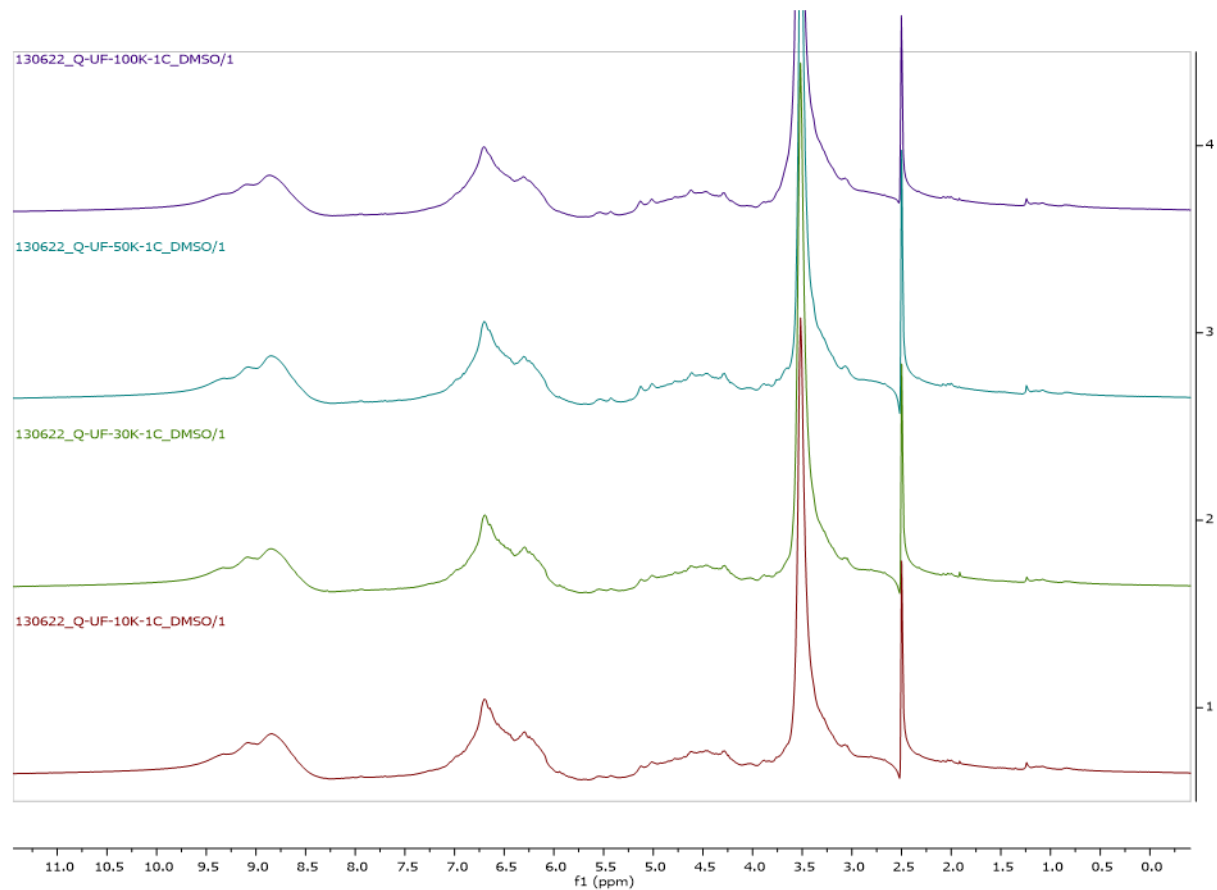
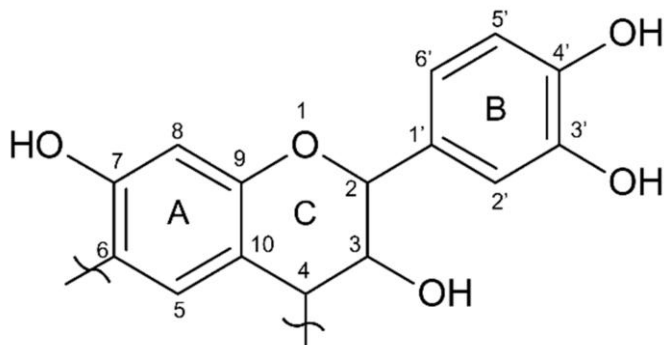




## Quebracho S: Concentrate

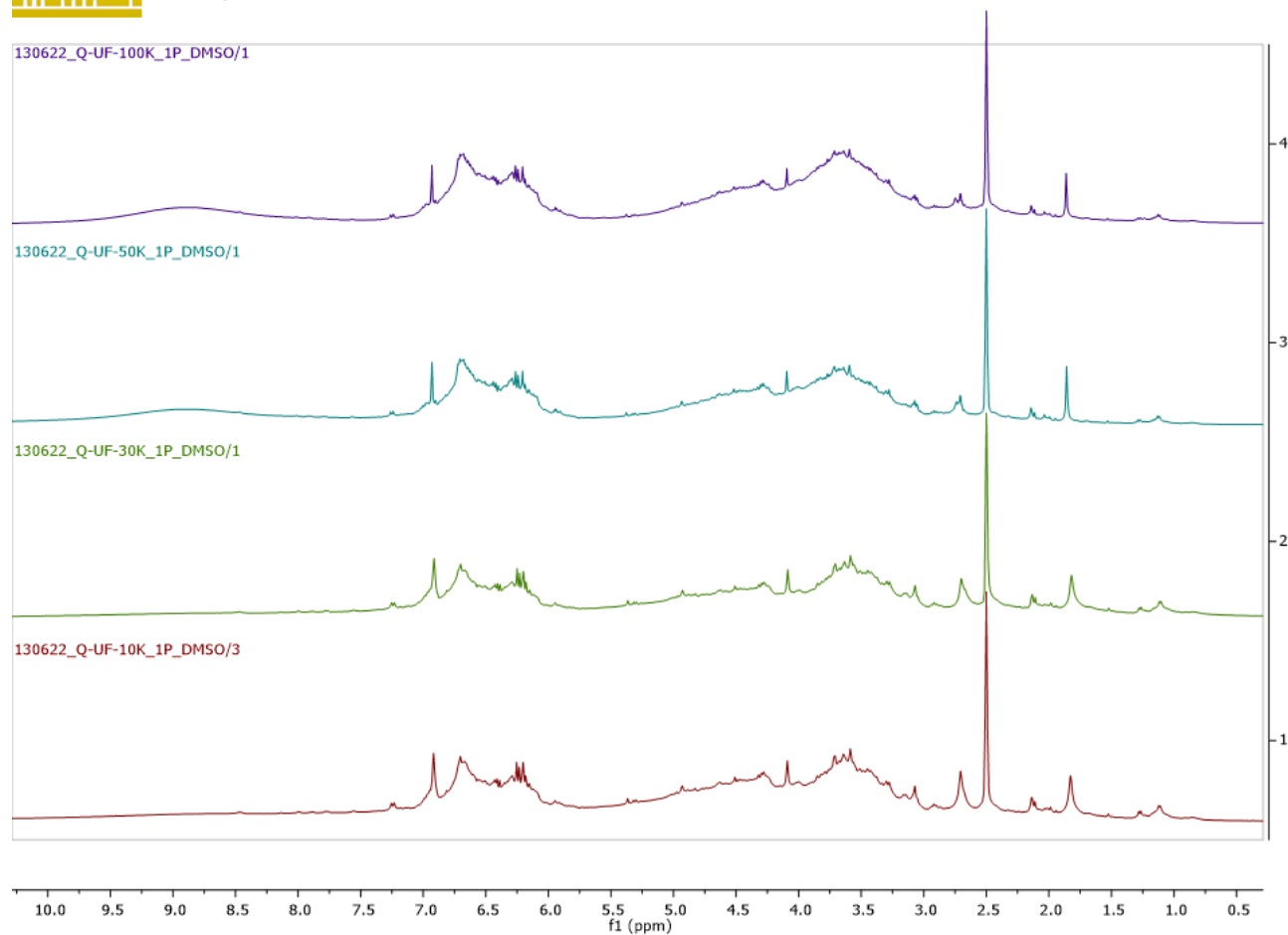
- 100 mg in 600  $\mu\text{L}$  DMSO- $d_6$
- 10,34-8,27 ppm –OH phenolyc
- 7,50-5,77 ppm Aromatic
- 5,75-3,75 ppm Carbohydrate

Ratio AROMATICI/-OH



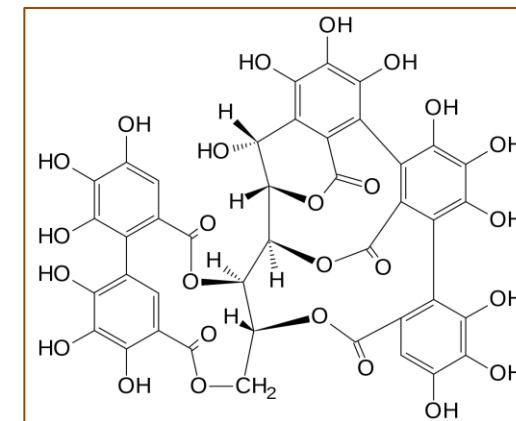
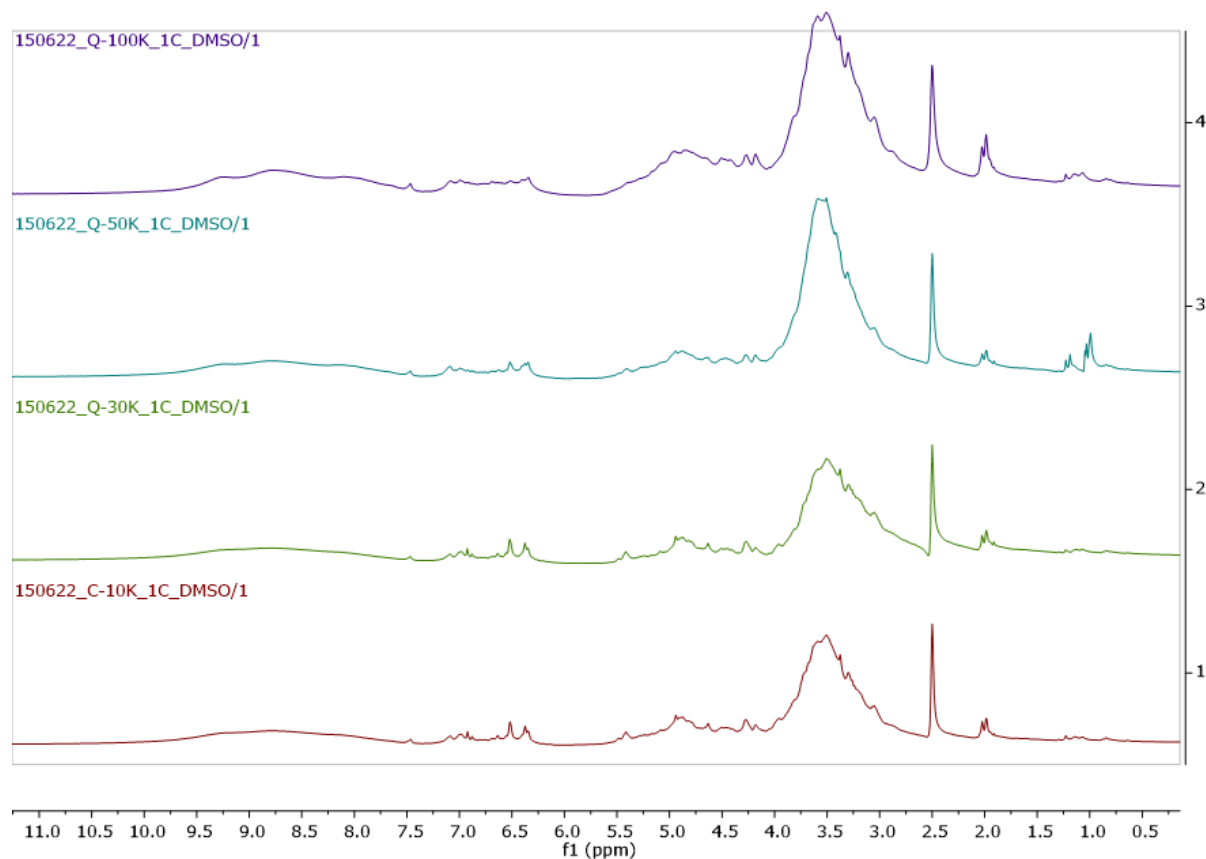


**Quebracho S: LMWS**

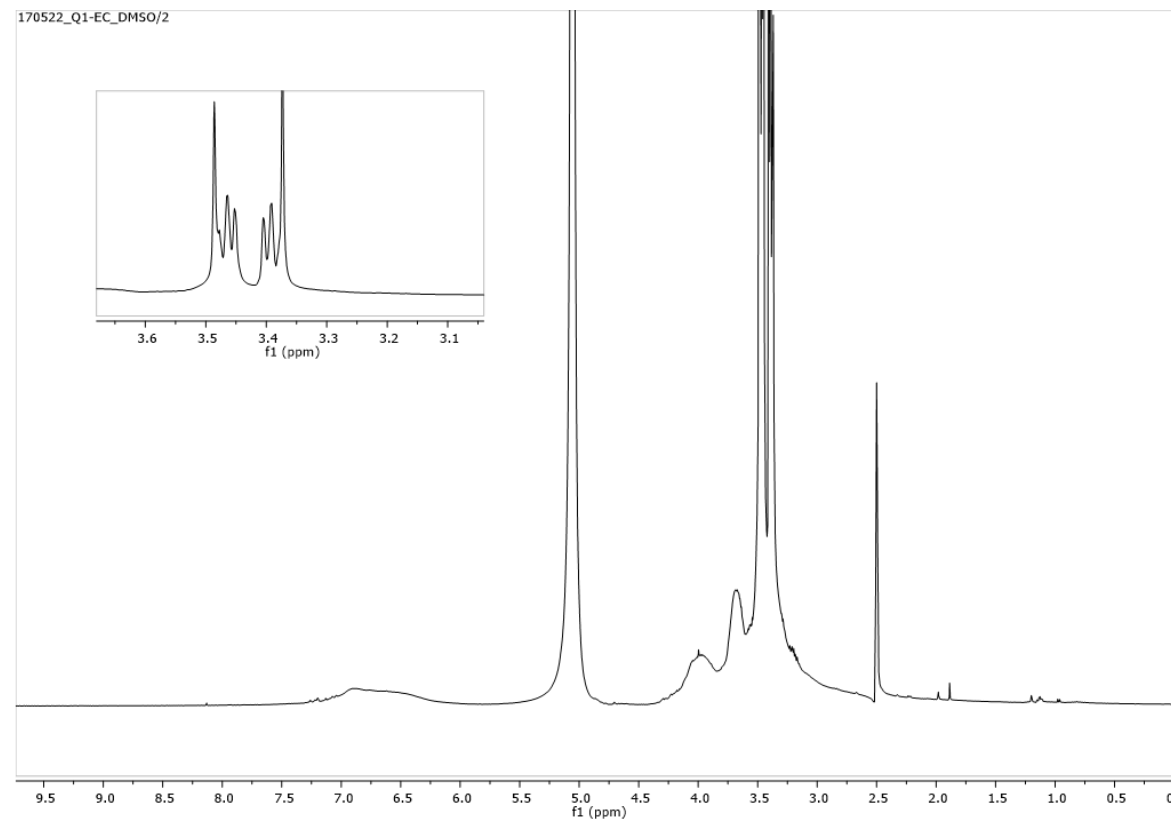
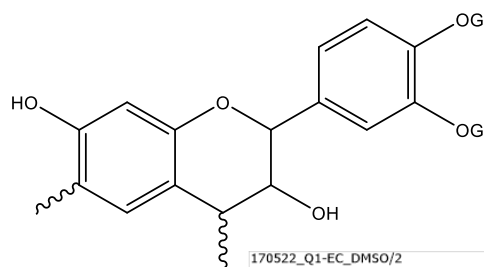
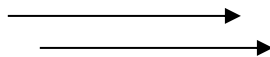
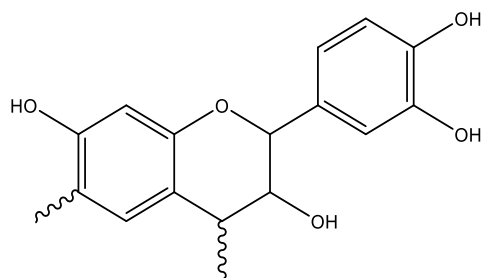




**Chestnut C**



# Chemical Modification of CPNT to CMNT





## DSC

- ~ 10 mg
- 25°C-250°C, 10°C/min
- 3 ripetute
- Tg media

N°	Tipo concia	Tg (°C) (DSC)
1	CMNT1	92,87
2	CMNT2	85,59
3	CMNT3	90,15

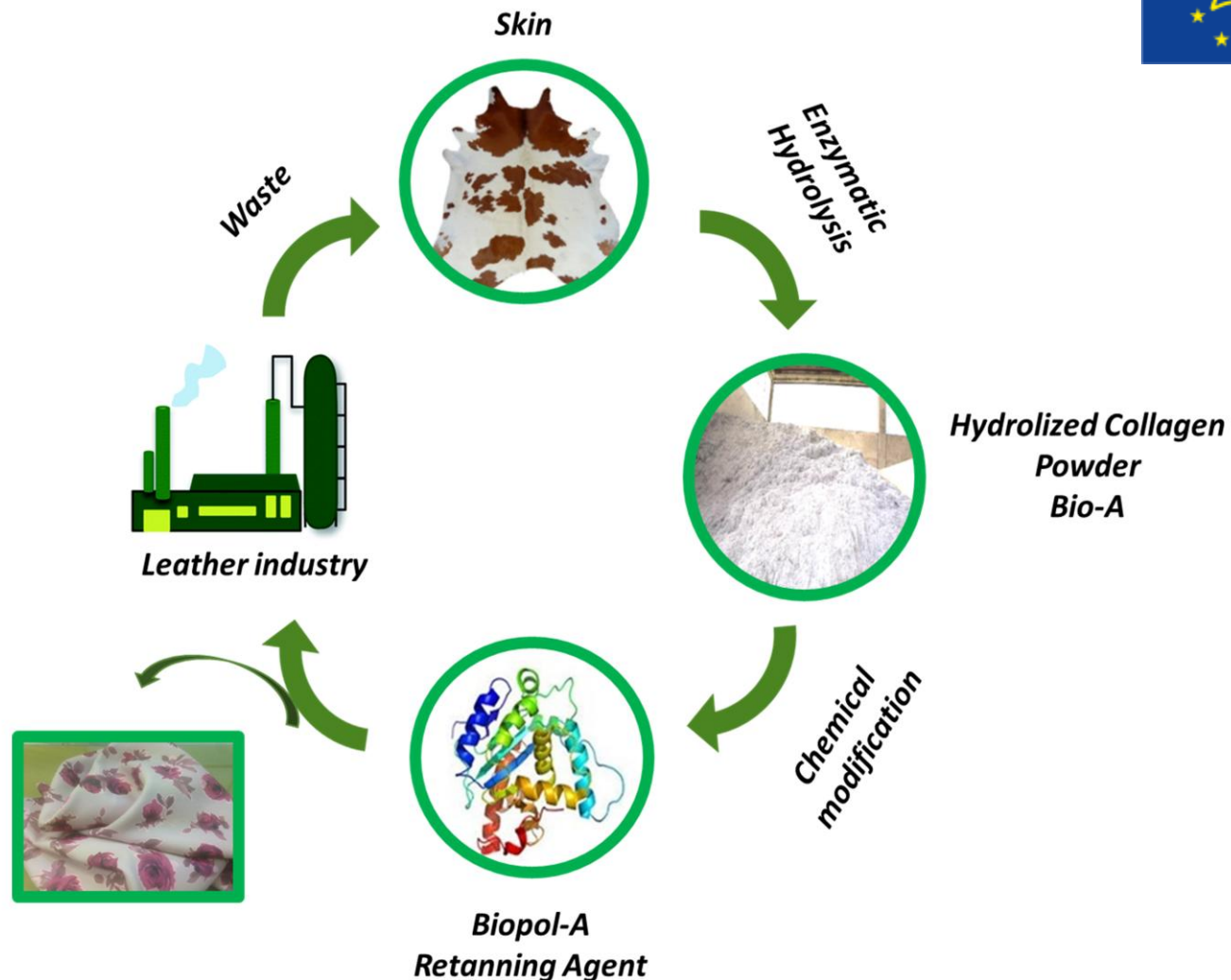
***COD/BOD reduction around 20-30%***

## Recovery and Recycle of Agricultural Waste for the Leather Industry



## The Leather Industry







## The Beer Industry

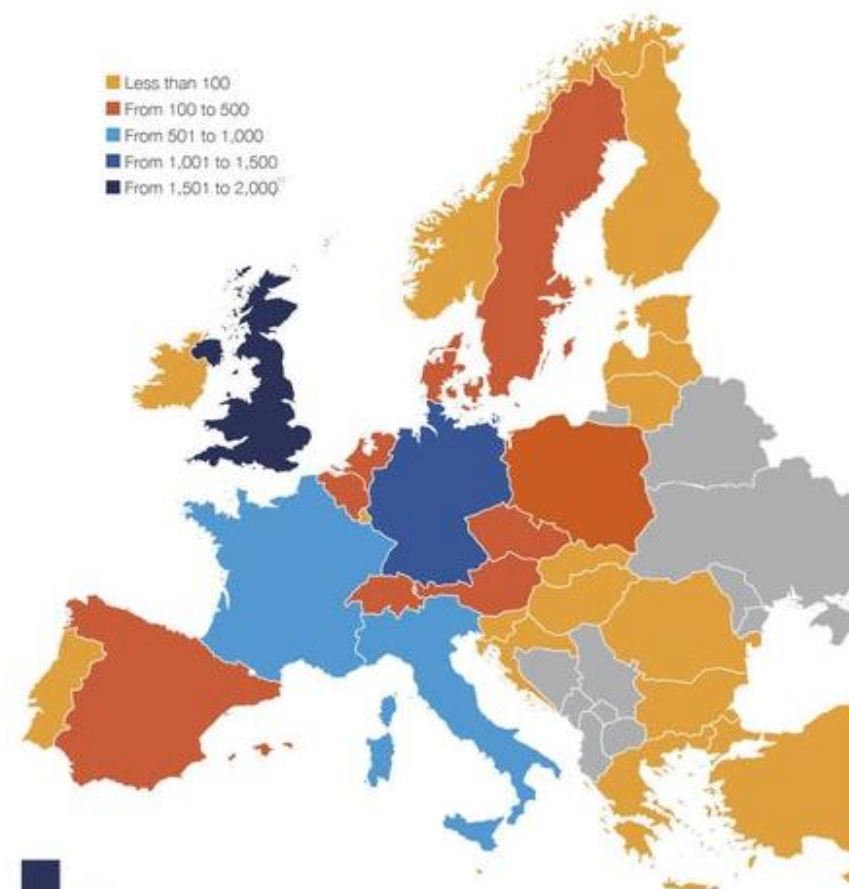
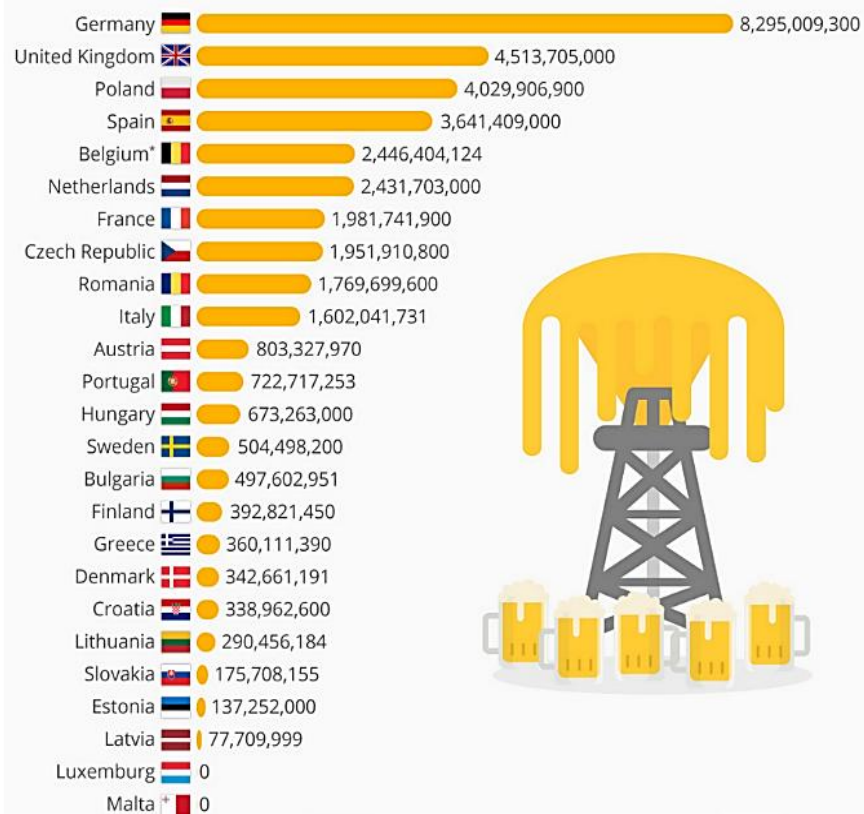


- LIFE RESTART: Recovery and Recycle of Beer Spent Grain for Bioplastics

## The Beer Industry

### Europe's Biggest Beer Producers

Beer production by country in 2018 (in litres)

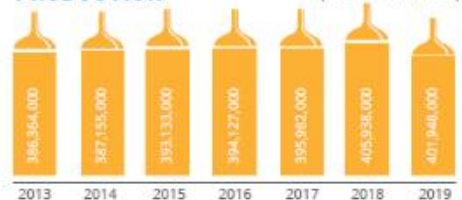


### KEY FIGURES 2019

EUROPEAN UNION



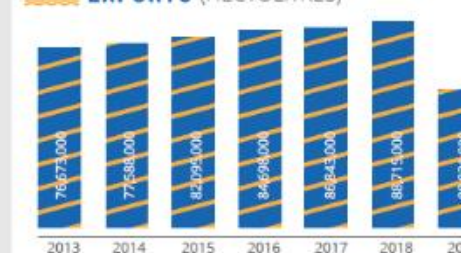
#### PRODUCTION (HECTOLITRES)



#### CONSUMPTION (HECTOLITRES)



#### EXPORTS (HECTOLITRES)

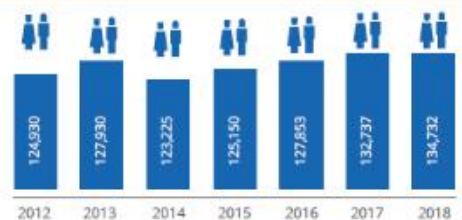


CONSUMPTION  
ON-TRADE VS OFF-TRADE  
34% | 66%



CONSUMPTION  
PER CAPITA

72 LITRES / YEAR



DIRECT EMPLOYMENT



The Brewers of Europe

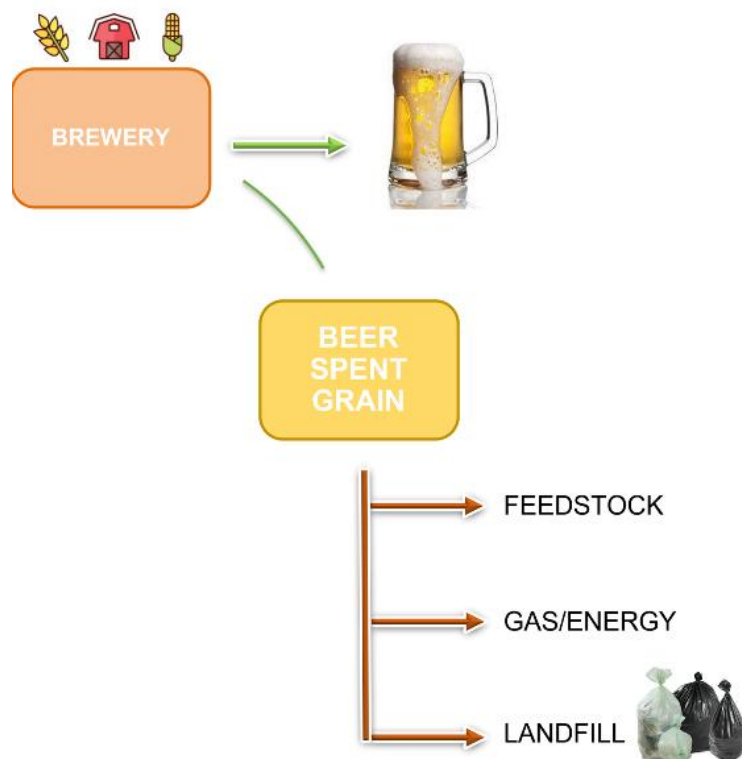
NUMBER OF  
ACTIVE  
BREWERIES

11,048



## The Beer Industry

a)



b)

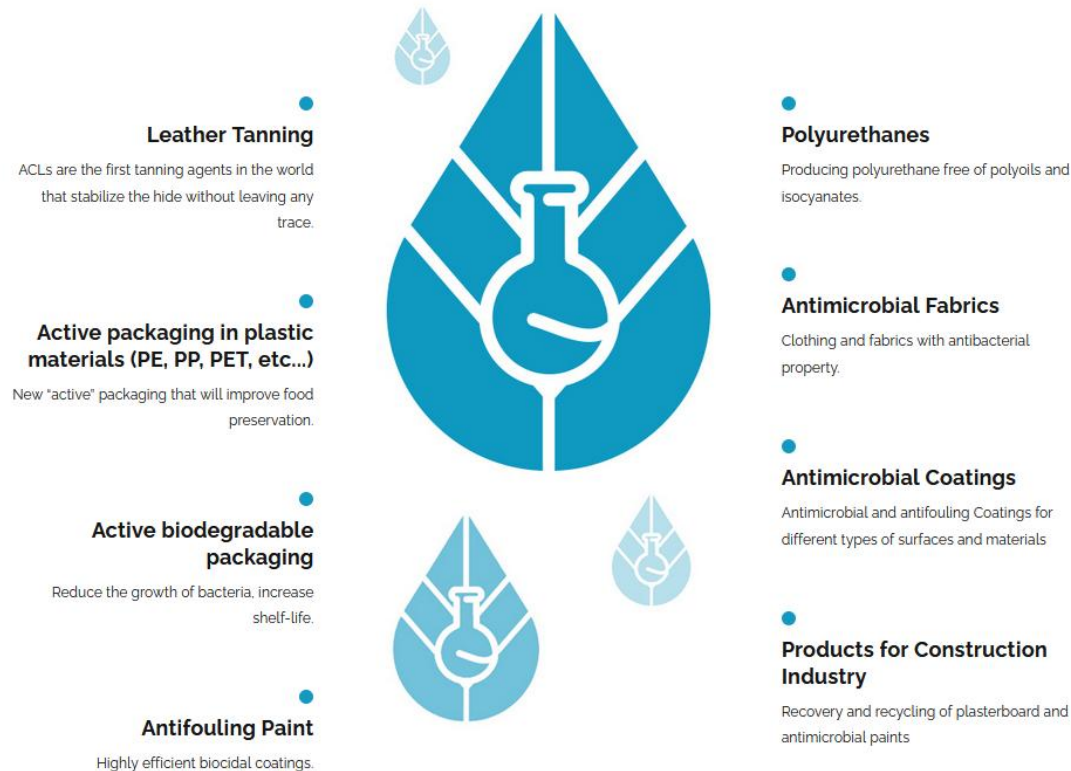




# Product/Process Implementation for a Sustainable Manufacturing

## ACL – Applications

Crossing have the know-how to produce a new class of "activators for cross-linking" or "ACLs" at competitive prices. These compounds can crosslink a multiplicity of materials of natural and/or synthetic origin without leaving any trace in the finished product.



Further sustainability projects on:

- antimicrobial packaging
- new generation preservatives/antibacterial agents
- anti-fouling paints and varnishes hydrophobic/hydrophilic surface treatments
- non-toxic "metal free" leather

<https://www.crossing-srl.com/en/>





LIFE20 ENV/IT/000759  
With the contribution of the LIFE programme of the  
European Union

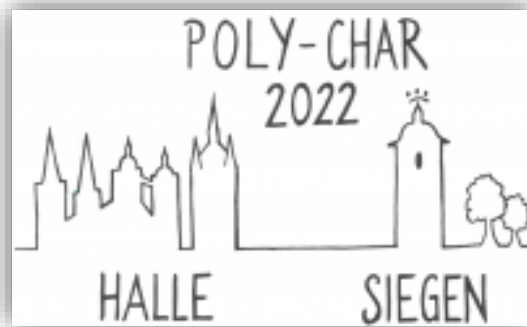


LIFE21-ENV-IT-LIFE RESTART  
LIFE21101074314  
With the contribution of the LIFE programme of the  
European Union



With the contribution of the LIFE Programme of the European Union  
LIFE15 ENV/IT/000654  
With the contribution of the LIFE programme of the  
European Union





22-25 Maggio 2022





**LIFE20 ENV/IT/000759**

With the contribution of the LIFE programme of the  
European Union



**LIFE RESTART**

**LIFE21-ENV-IT-LIFE RESTART**

**LIFE21101074314**

With the contribution of the LIFE programme of the  
European Union



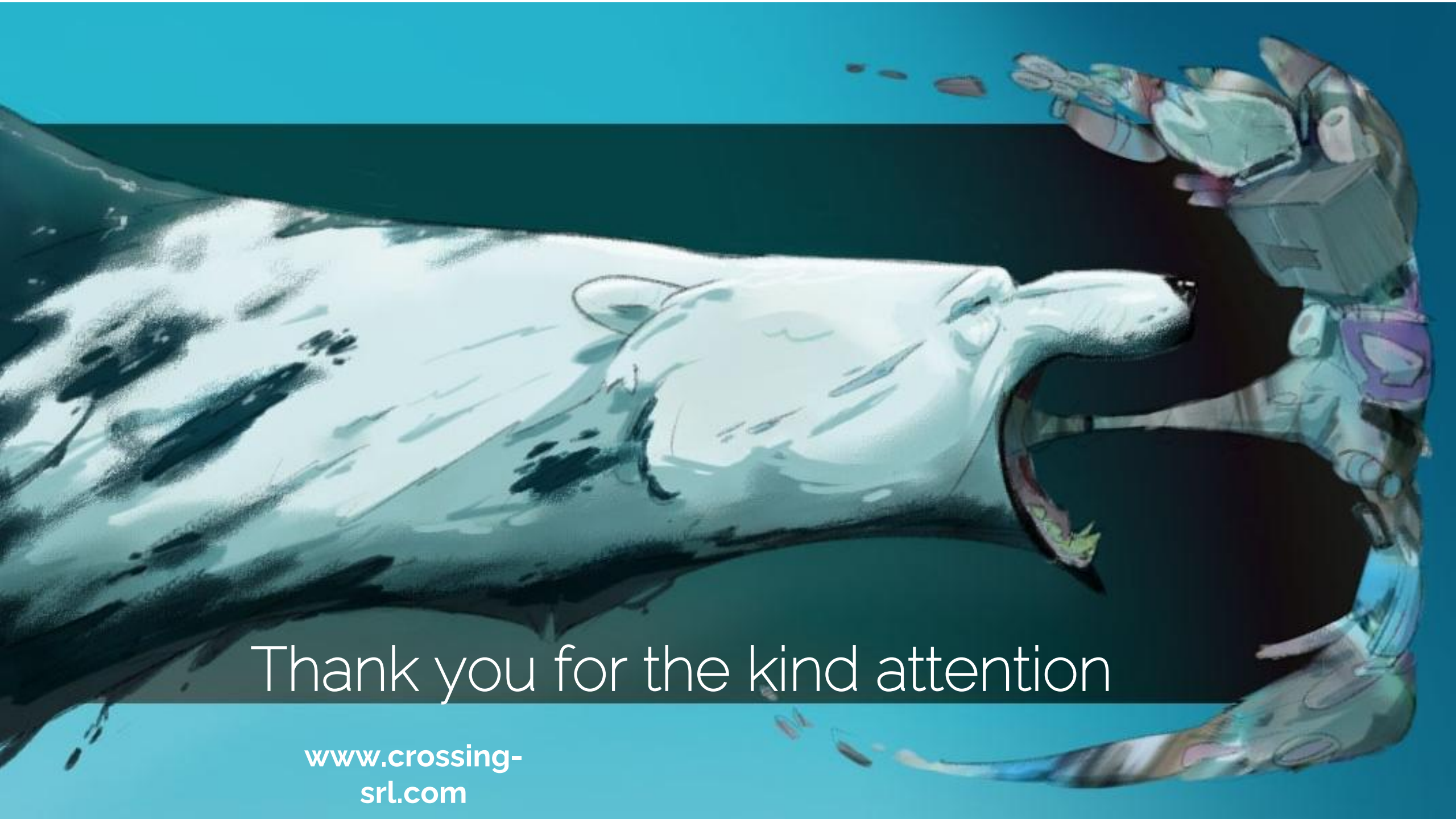
**BI♻POL**

With the contribution of the LIFE Programme of the European Union

**LIFE15 ENV/IT/000654**

With the contribution of the LIFE programme of the  
European Union





Thank you for the kind attention

[www.crossing-srl.com](http://www.crossing-srl.com)