MESVAL
project

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MESVAL Partners

Catalonia:

- CTM-UPC (coord.)

Technological Center Manresa-Tecnichal Univ. Catalonia

- AIICA

Leather Technological Center

- CETEMMSA

Textile Technological center

- CIMNE Research Center (Numerical Methods)
- IUCT Technological Center (Green Chemistry,..)
- CU (UPC) Unesco Chair in Sustainability

Càtedra UNESCO de Sostenibilitat
UNIVERSITAT POLITÈCNICA DE CATALUNYA

Tuscany:

- Università di Pisa (UNIPI)
- Ecosistemi

Peloponnesus:

- Messinian Chamber of Commerce and Industry(MCCI)

MESVAL project is based on:

- INDUSTRIAL ECOLOGY
- VALUATION: Waste valuation (lab and pilot test)
- RESEARCH & TECHNOLOGICAL INNOVATION: Different technologies for the same valuation
- SUSTAINABLE INDICATORS (economic, environmental, social): applied to the valuation assays
- NETWORK: Technological centers, commerce chambers, universities. Intra/inter regions
- STRATEGIES: **regional strategies** for eco-industrial development and **methodologies** for appliyng indicators to choose the best valuations

Objectives

1. To promote sustainable development and innovation in the reuse of waste streams

   a) The exchange of waste streams between different industrial sectors

   b) Development of indicators to measure the economic, environmental, and social dimension of sustainability

2. To strengthen the network between technological centres and companies which take part in the MESVAL initiative

   a) Exchange of knowledge and expertise within the network of technological centres

   b) Formulation of regional strategies for waste valuation

3. To disseminate the concept of Industrial Ecology within the region

   a) Definition of waste valuation approaches

   b) Formulation of strategic plans for regional waste management resulting from OMR Ecosind.

Steps undertaken

A. **A1.** Development of quantitative **flow diagrams** of raw material and waste streams of different industrial sectors have been drawn.
A2. Analysis of the opportunities to **match residual flows** between different industries

B. Laboratory **valuation assay**s and assessment

C. **C1.** Design a set of **sustainability indicators**
C2. Application to the valuation assays results in order to identify **the most sustainable valuation**

D. Contacts with firms in order to develop a **pilot project** of a chosen valuation

E. Creation and update of a MESVAL **web page**

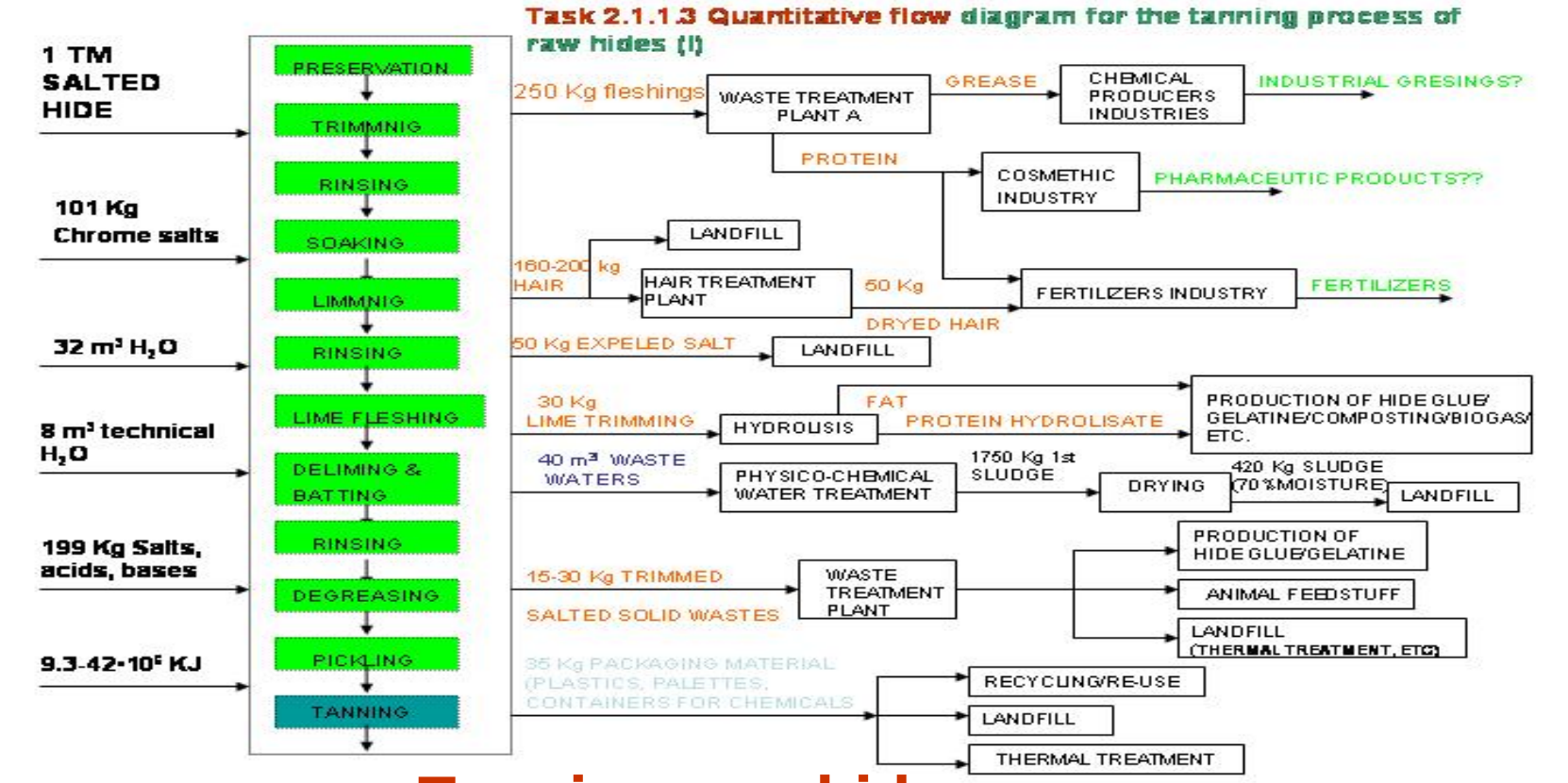
F. Strengthening the **interregional network** through meetings, etc.

G. Dissemination

H. Writing the **valuation strategies document** and contributing to ECOSIND **guide**

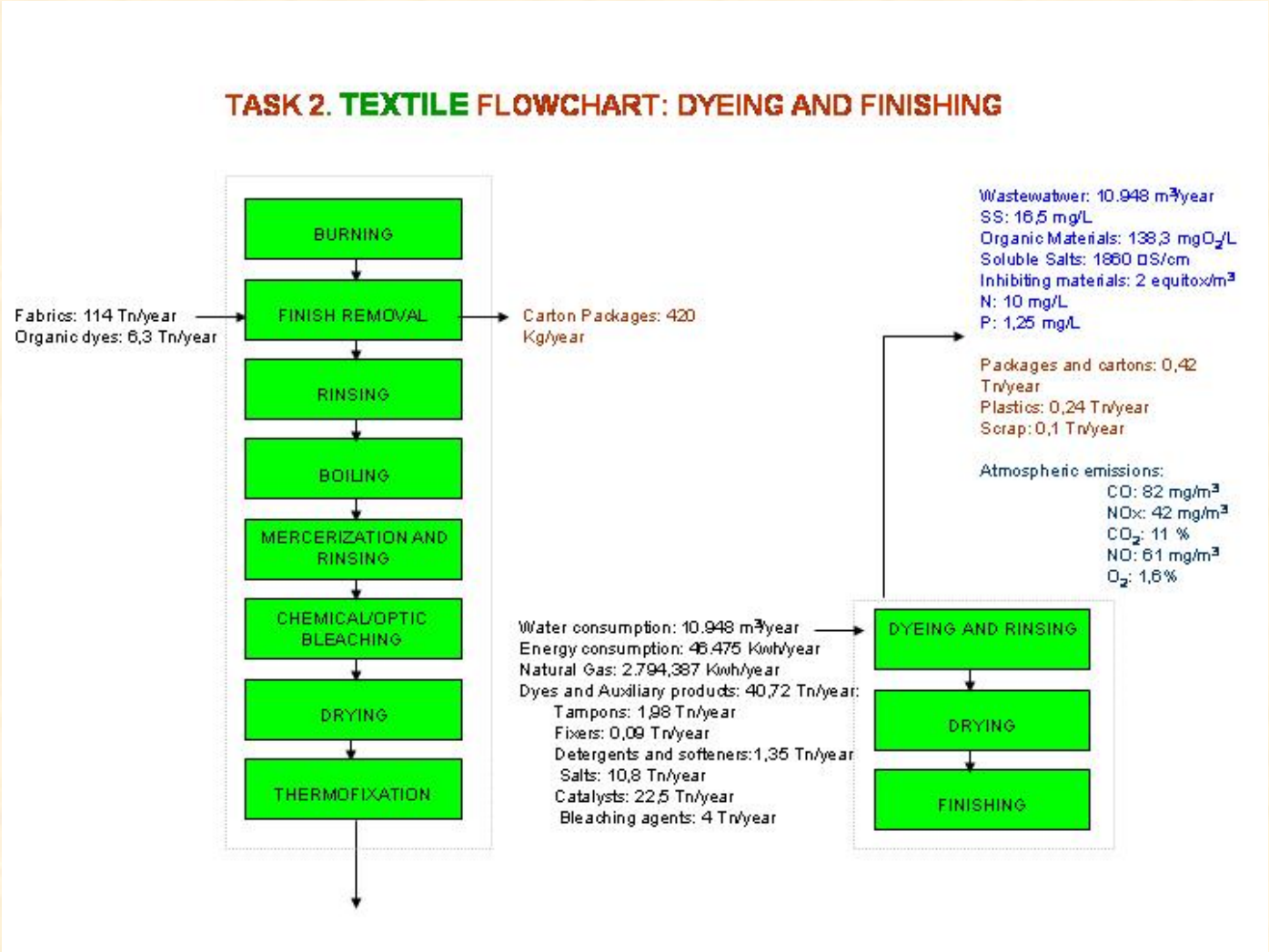
A1. Constructing the flow diagrams

- Flow diagrams of the processes: surface treatment, tanning, olive oil production, textile



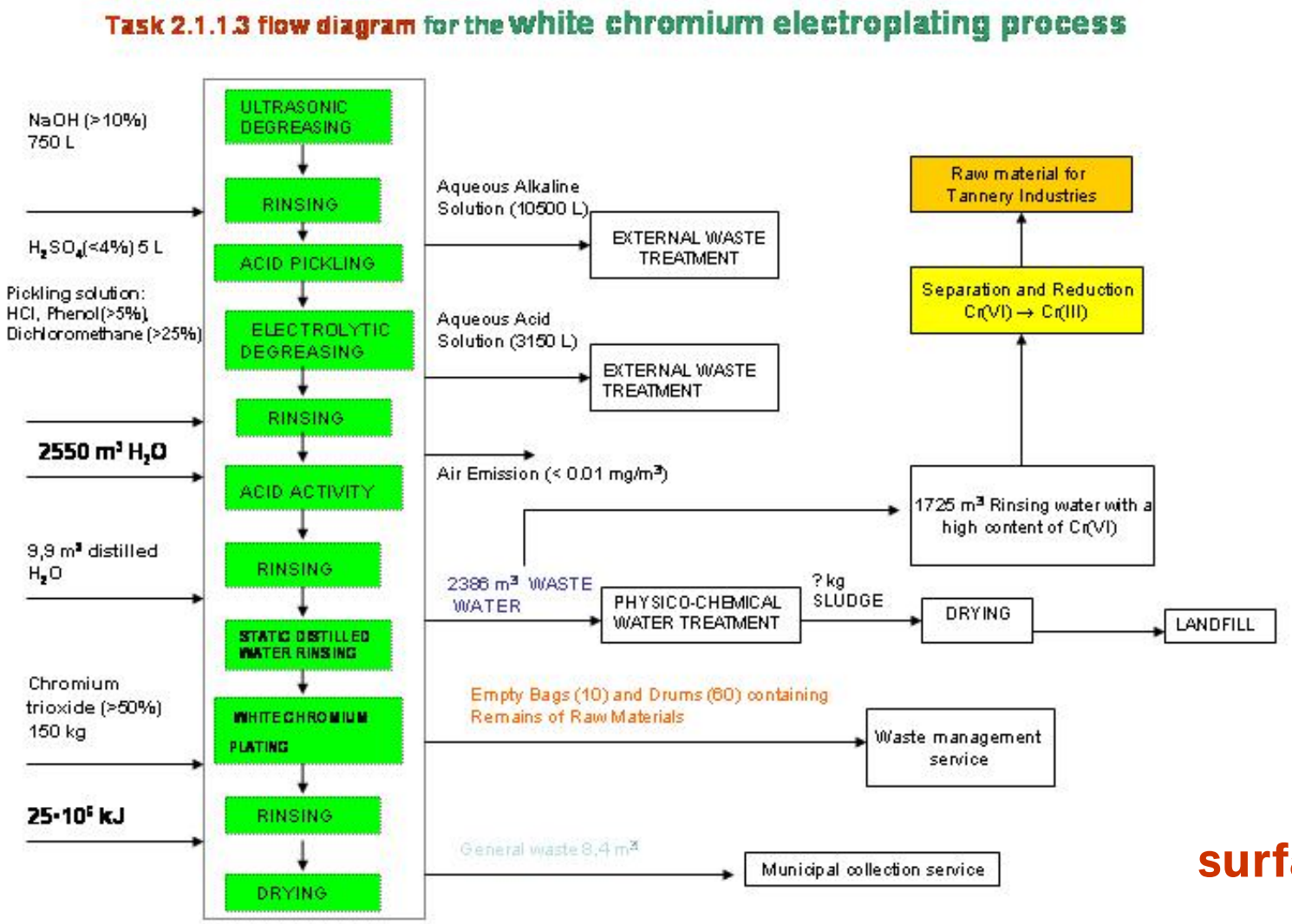
Tanning raw hides

A1. Constructing the flow diagrams (2)



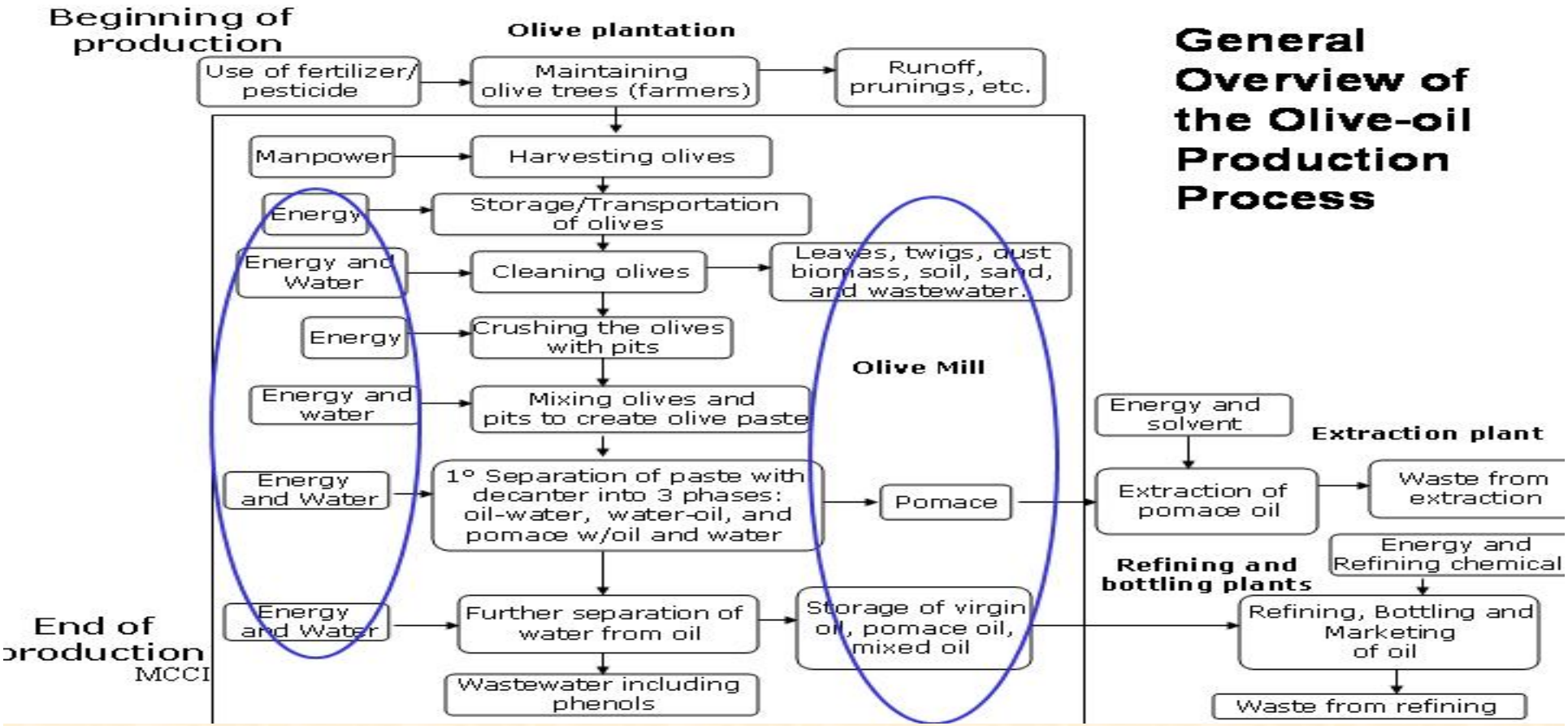
textile

A1. Constructing the flow diagrams (3)



surface treatment

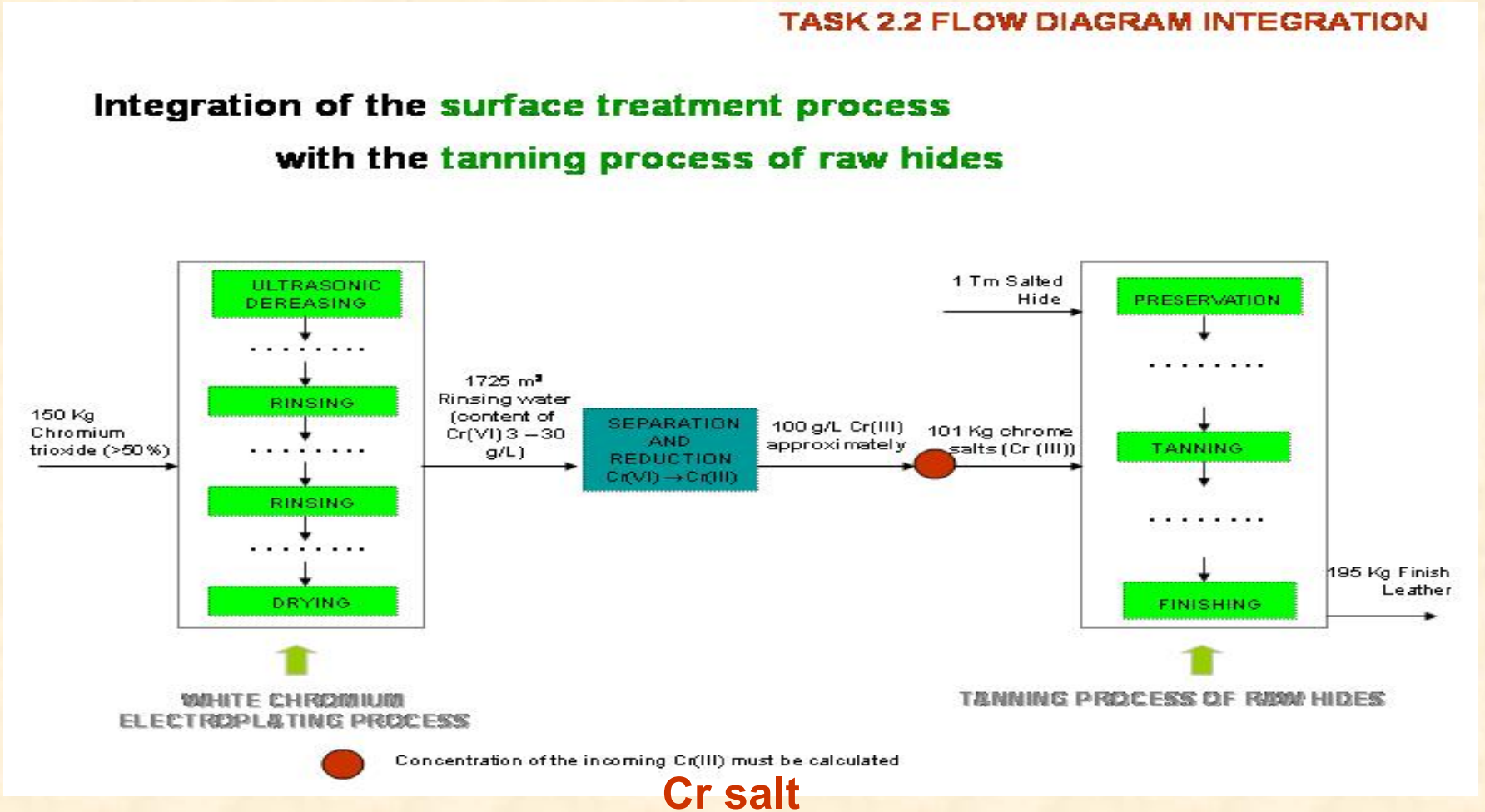
A1. Constructing the flow diagrams (4)



Olive oil production

A2. Flow diagram integration (1)

1st. Flow diagram of the feasible exchanges



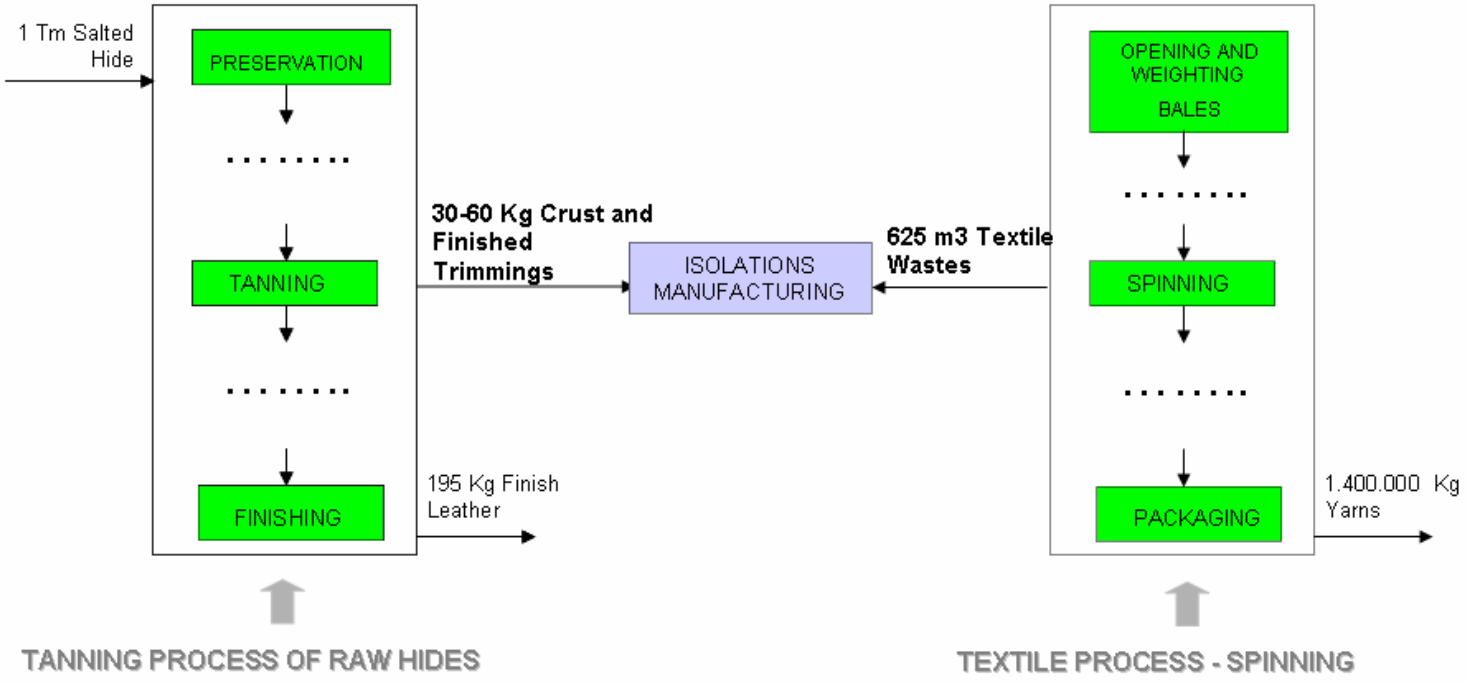
Surface treatment —— **Cr salt** ——→ **tanning process**

A2. Flow diagram integration (2)

TASK 2.2 FLOW DIAGRAM INTEGRATION

Integration flow diagram

Integration of tanning process of raw hides and textile process (spinning)

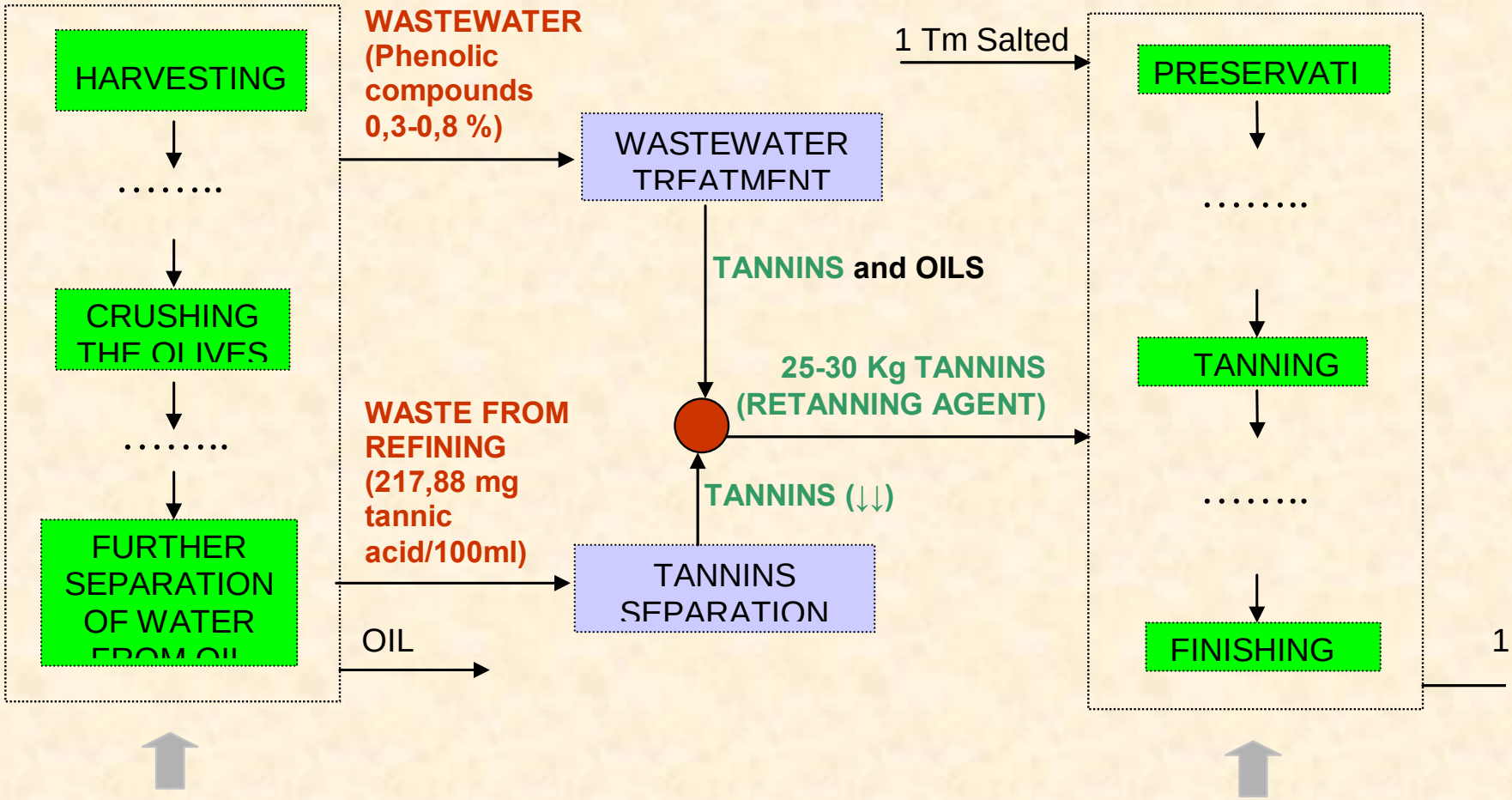


tanning process **textile**

trimmings **Textile wastes**

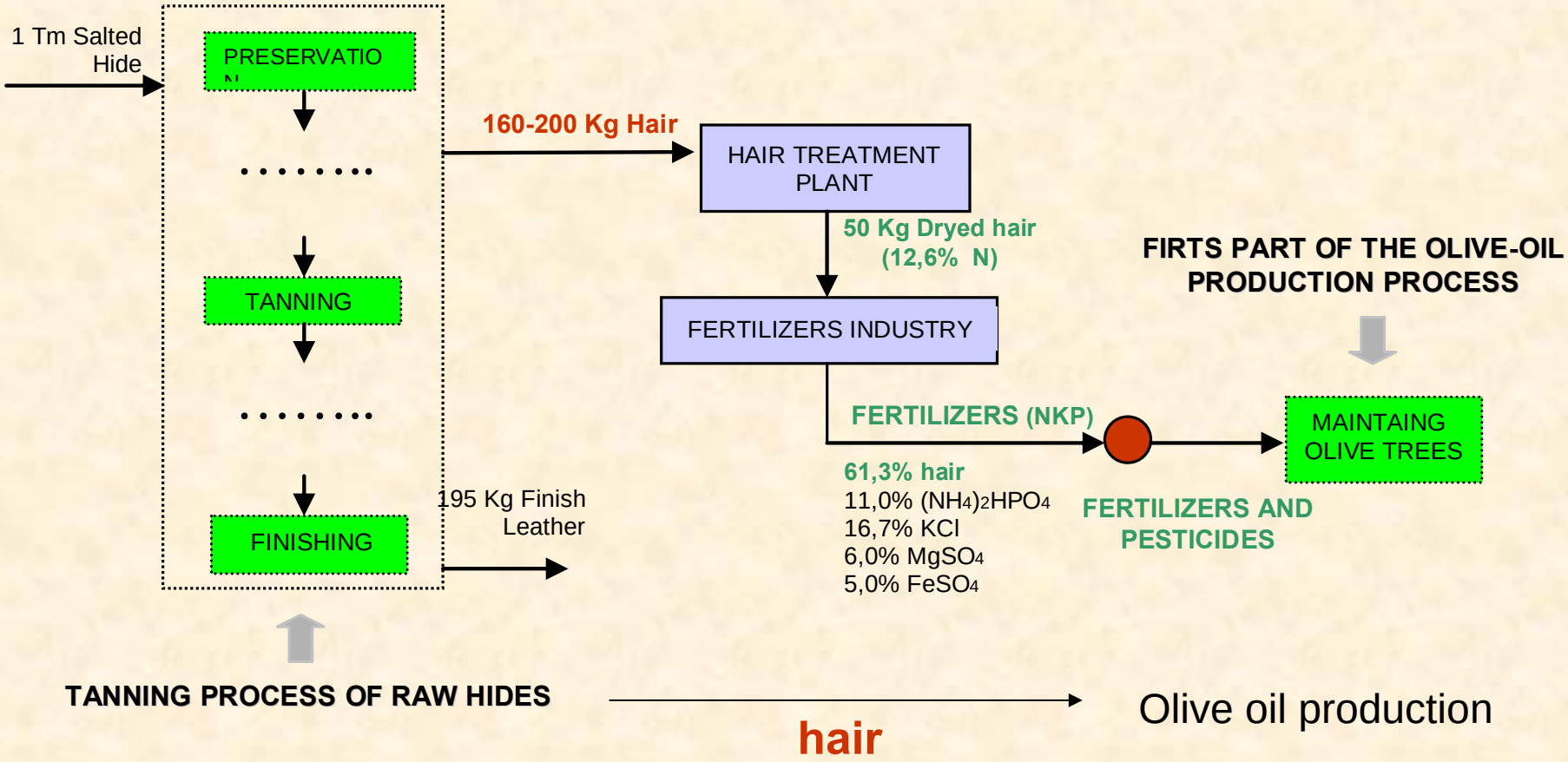
Insulating pannels

A2. Flow diagram integration (3)



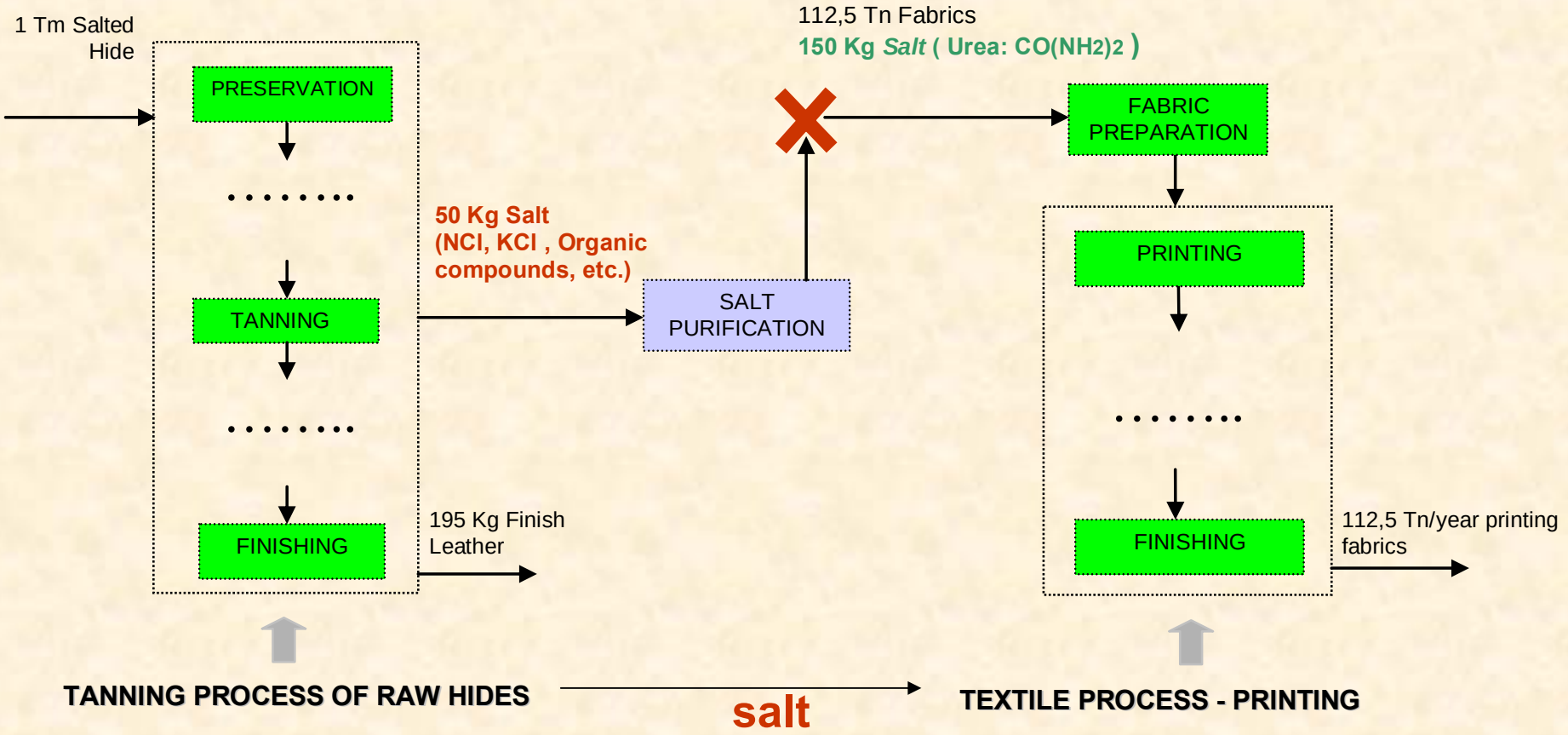
tannins

A2. Flow diagram integration (4)



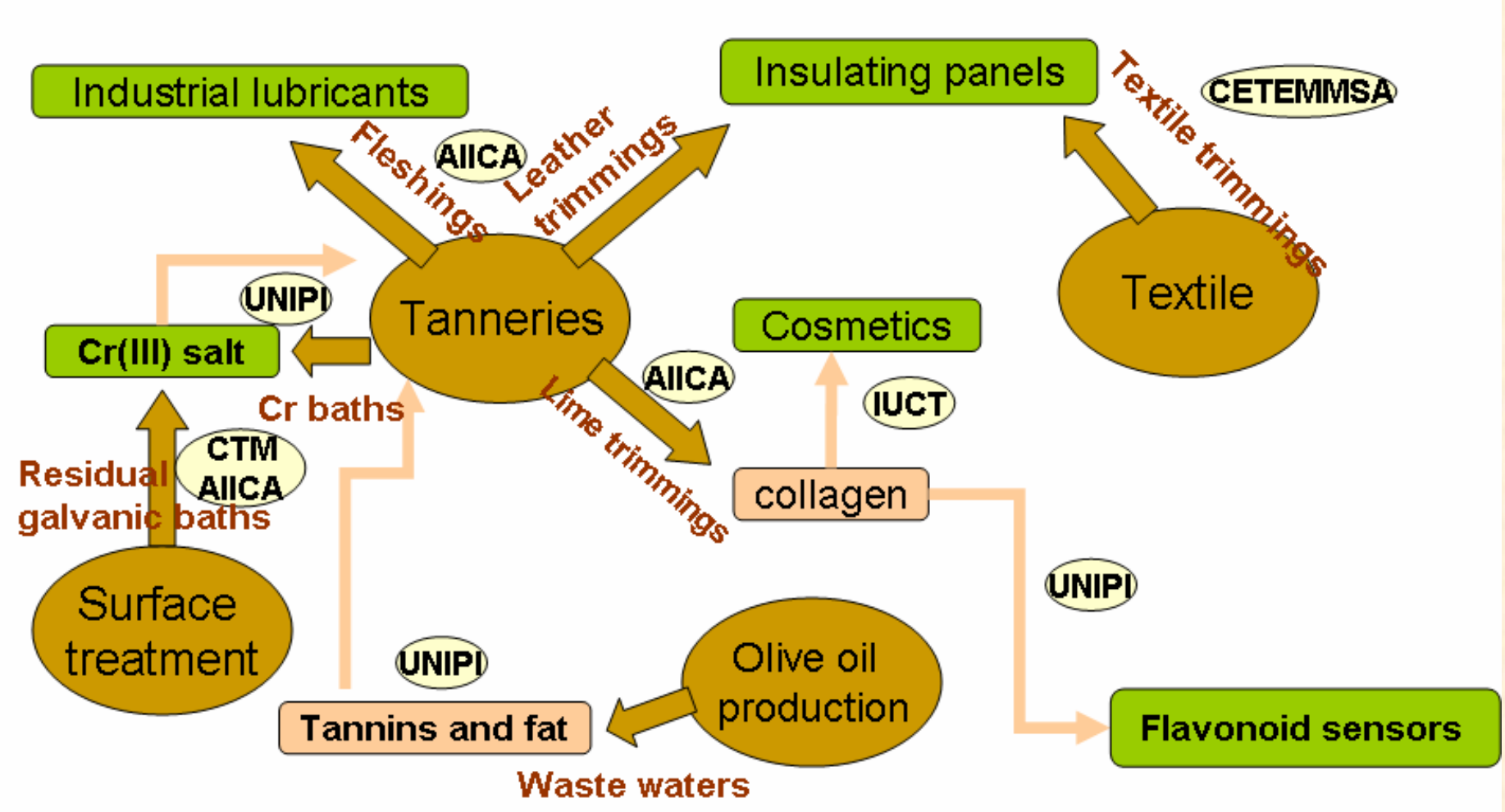
A2. Flow diagram integration (5)

2nd. Discovering exchanges that aren't feasible



A2. Flow diagram integration (6)

3rd. Decision of which valuations and exchanges must be chosen



B. Valuation laboratory assays (1)

Origin	Waste flow	Product obtained	Destination
Surface treatment	galvanic rinsing waters	Cr(III) salt	Tanning, chemical
tanning	tanning exhausted liquors	Cr(III) salt	Tanning, chemical
tanning	fleshings	industrial lubricants	Tanning, others
tanning	fleshings	protein	Fertilizers
Tanning	finished trimmings	insulating pannels	Building
Textile	Textile wastes	insulating pannels	Building
tanning	Lime Trimmings--collagen	protein based analytical sensors	food
tanning	Lime Trimmings--collagen	cosmetics	Cosmetics
Olive oil prod.	olive oil waste waters	Tannins, oil	Tanning

B. Valuation laboratory assays (2)

Investigated processes	Results
Residual galvanic baths from surface treatment industries and residual Cr baths from tanneries as a source of Cr(III) salt	**Optimisation of chromium and liquor recovery**
Leather and textile trimmings to produce insulating panels	**Good properties of gelatin/leather trimmings materials**
Wastewater from olive oil production as a source of tannins and oils	**Improvement of leather stiffness**
Collagen from the tanning industry as a sensor to test flavonoids in food or natural products	**Flavonoid spectroscopic behaviour is influenced by collagen**
Collagen from the tanning industry to produce cosmetics	**Formulations tests of milk/cream, gel and shampoo products**
Fleshings as a source of fat and protein	**Proteins are employed for fertilizers formulations**

B. Valuation laboratory assays (3): some results

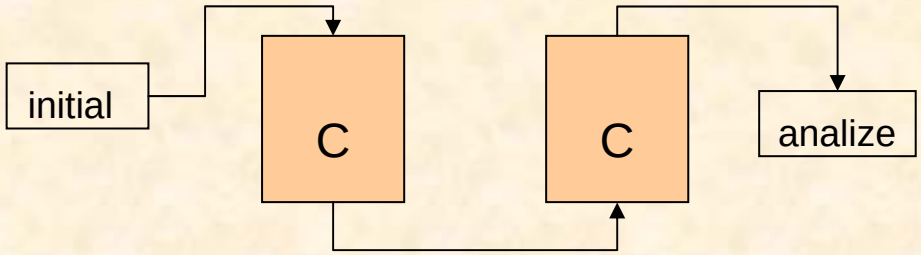
Valuation of Galvanic rinsing waters: **two separation methods**

1. Precipitation

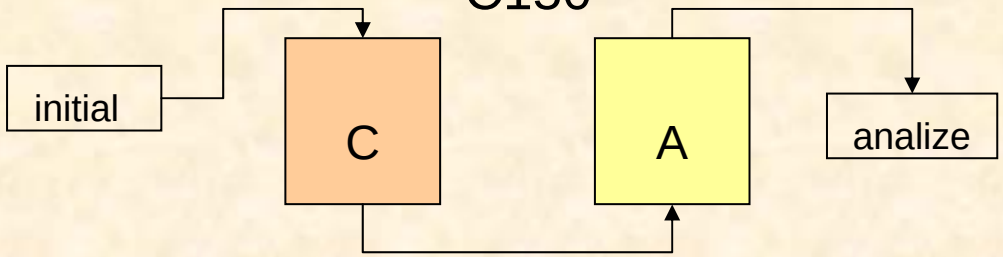
Agents used:

- Sodium carbonate
- Calcium carbonate
- Magnesium oxide

2. IONIC EXCHANGE (RESIN): Continuous process



C150



C150 + A100

B. Valuation laboratory assays (4): some results

Valuation of Galvanic rinsing waters: **results**

1. Precipitation:

- By means of MgO a better separation of Cr(VI) and the rest of divalent metals is obtained
- The final Cr(III) salt obtained by means of MgO has better properties

2. Ionic exchange:

- Cationic resin gives best separation results than the anionic one

B. Valuation laboratory assays (5): some results

Valuation of collagen to produce cosmetics

OBJECTIVE:

VALORIZATION OF COLLAGEN (TANNERY BY-PRODUCT) THROUGH THE PREPARATION OF COSMETIC PRODUCTS WITH 5% OF COLLAGEN HYDROLYSATE CONTENT.

COLLAGEN HYDROLYSATE:

DETERMINATION	RESULTS
pH	12.82
Dry matter (%)	26.4
Ashes 500ºC (%)	2.8
Ca (mg/L)	8617

COSMETIC APPLICATIONS REQUIRES THE CALCIUM CONCENTRATION REDUCTION.

After a purification process, calcium content was reduced to 427 mg/L

B. Valuation laboratory assays (6): some results

FORMULATIONS:

MILK
CREAM → **EMULSION** { **O/W (Aqueous external phase).** → **2 EMULSIFIERS**
W/O (Oil external phase).
W/S (Silicon external phase).

SHAMPOO / SHOWER GEL
GEL → **2 GELIFICANTS**
CREAM GEL

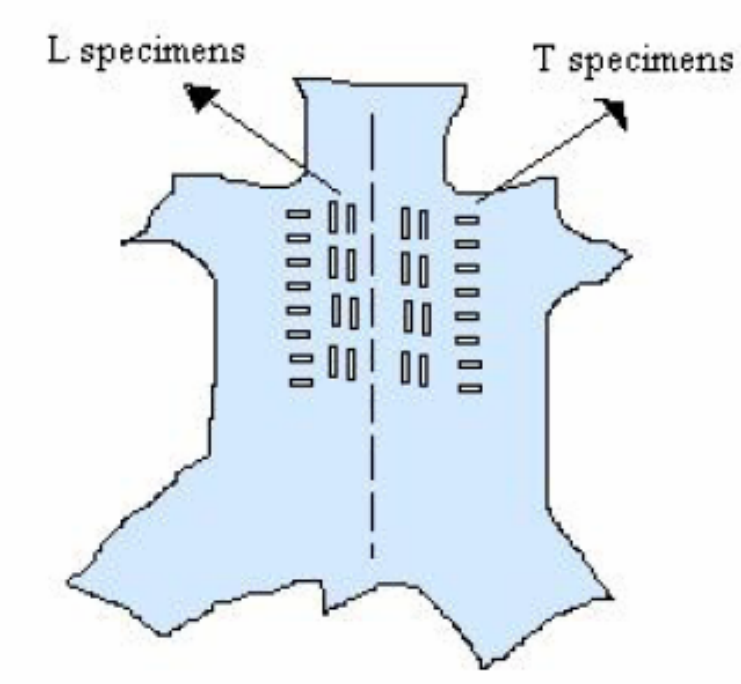
8 FORMULATIONS AND
5 COSMETIC APPLICATIONS.

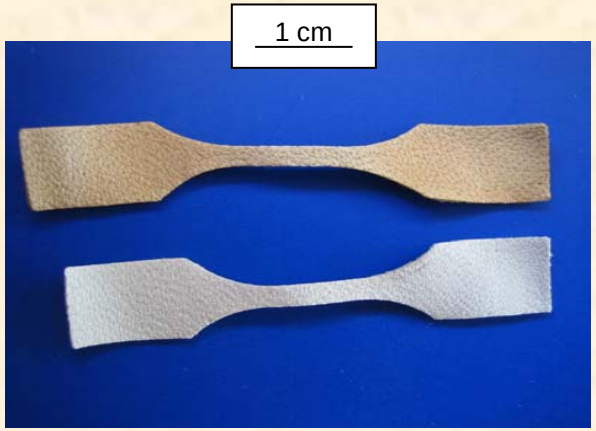
CODE	FORMULATION	COSMETIC ACTIVITY
01	GEL CREAM	Nutritive.
02	CREAMY BODY WASH	Hydrating
03	CREAM W/O	Hydrating & reaffirming adapted to sensitive skins.
04	CREAM O/W	Antiage moisturizing.
05	MILK W/S	Moisture.
06	CREAM O/W	Hydrating & reaffirming.
07	GEL	Stretch marks treatment.
08	GEL	Reaffirming.

B. Valuation laboratory assays (7): some results

Tannins and oils obtained from wastewater of olive oil production for leather retanning

Olive oil wastewater: filtration, preconcentration 1:10
Leather: cut, treatment, washing, drying and conditioning





B. Valuation laboratory assays (7): some results

Production of insulating panels

FINISHED TRIMMINGS

PRINTERY PASTE WASTES

INSULATING PANELS

B. Valuation laboratory assays (8): some results

Different chemical process to obtain test panels

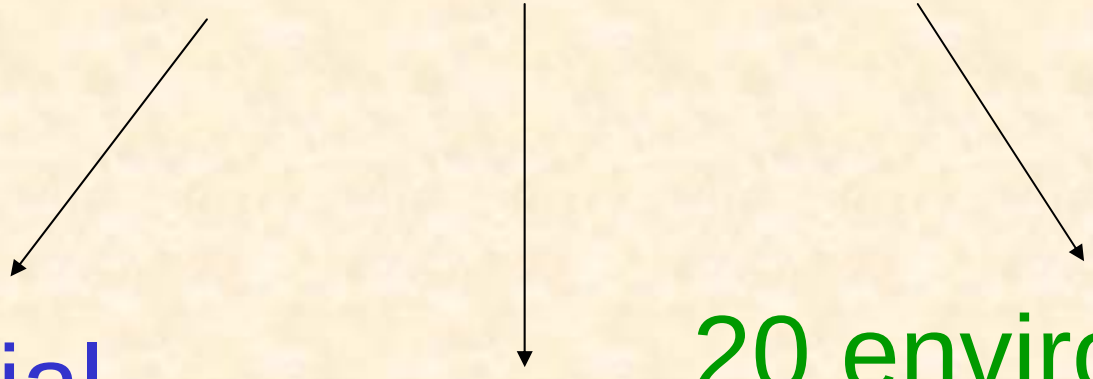
-Gelatine: hidrated gelatine + vegetable dust

-Plaster: plaster + chrome crushed leather

- Tests made: dried speed, consistence, lightness, easiness for working, and strength. Heat and water.
- Optimum proportion (gelatine vs dust, plaster vs leather) was determined
- Acoustic and consistence checking is necessary for the use of this new materials in construction.

C1. Sustainability indicators (1)

Set of indicators appliable to waste valuations and to the assessment of the industrial system change



6 social

6 economic

20 environmental

SPHERE	OBJECTIVE	THEMES
ENVIRONMENT	Closure of material cycle	Water recovery Reuse & recycling Waste production Material balance
	Reduction in material and natural resource use	Water consumption Consumption of fossil fuels
	Reduction in energy use and/or in the use of energy from non-renewable sources	Energy consumption Use of non-renewable energy sources Use of renewable energy sources
	Reduction in air emissions	Greenhouse gas emissions CO emissions NOx emissions VOC emissions
	Protection of water quality	Water emissions
	Reduction in the use of hazardous substances	Use of chemicals
ECONOMY	Reduction of environmental costs	Waste management Water use Pollutants abatement Energy use Raw material use
SOCIETY	Creation of new jobs or major quality jobs	Capacity to create new jobs Capacity to improve job quality
	Increase of social responsibility of the enterprise	Application of social measures
	Upgrading of decentralised technology	Promotion of adequate local/regional/country R&D activities
	Increased local social capital	Social cohesion Creation of jobs Enterprise relations

C1. Sustainability Indicators (2): Some examples

Table 1. *Environmental Indicators*

GENERAL OBJECTIVES	THEMES	INDICATORS
Closure of material cycles	Water recovery	Use of recovered water (m^3/unit)
	Reuse & Recycling	Reusable/recoverable components of final product at product's end of life (% of weight) Recycled or reused material components of product (% of weight)

Table 2. *Economic Indicators*

SPECIFIC OBJECTIVES	THEMES	INDICATORS
Reduction of environmental costs	Water use	Change in water fees after IEA (%)
Reduction of environmental costs	Raw material use	Change in raw material costs after IEA (%)

C1. Sustainability indicators (3): some examples

Table 3. *Social Indicators*

SPECIFIC OBJECTIVES	THEMES	INDICATORS
To create new jobs or major quality jobs	Capacity to create new jobs	Increase of new jobs after industrial ecology application (IEA) (%) Increase of workers wages after IEA (%)
To increase social responsibility of the enterprise	Application of social measures	New social measures applied in the enterprise after IEA (number)
To upgrade decentralised technology	Promotion of adequate local/regional/country R&D activities	New technology used in the enterprise's town/region/country (%)

C2. Chosing the best valuation (1)

Fleshing valuation to obtain fat for greasing products

↕

Fleshing valuation to obtein protein for fertilizers

Separation of Cr (VI) by means of MgO precipitation

↕

by means of Na_2CO_3 precipitation,

by means of ionic exchange

Vegetable buffer dust mixed with gelatine to obtain test panels

↕

Chrome shavings mixed with plaster to obtain test panels

C2. Chosing the best valuation (2): an example

2) *Comparison between different options for Residual galvanic baths, source for Cr (III) salt for the tanning process*:
A= Separation of Cr (VI) by means of MgO precipitation
B= Separation of Cr (VI) by means of Na_2CO_3 precipitation
C= Separation of Cr (VI) by means of ionic exchange

Table 10 *Assessment of environmental performance of Residual galvanic baths valuations*

Ind. Number	Name of indicator	Best performing option
8	Water consumption	A=B
10	Electricity consumption	Not applicable
15	NOx emissions	A=B=C
19	Water emissions	A
20	Use of chemicals	A

C2. Chosing the best valuation (3): an example

Table 11 ***Assessment of economic performance of Residual galvanic baths valuations***

Ind. Number	Name of indicator	Best performing option
23	Wastewater treatment costs	Not applicable
26	Raw material costs	A

Table 12 ***Assessment of social performance of Residual galvanic baths valuations***

Ind. Number	Name of indicator	Best performing option
27	New jobs that could be created (number)	A=B=C
30	Number of new activities/projects that could be started	A=B

Environmental……A and B
Economic ……A
Social ……A, B, C
Sustainability……A

C2. Chosing the best valuation (1)

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by means of Na_2CO_3 precipitation,

by means of ionic exchange

Vegetable buffer dust mixed with gelatine to obtain test panels

↕

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D. Pilot plant of chosen valuation

Contacts with some firms for future development of a pilot plant:

- **TEXTILE ASSOCIATIONS (3):**

ASEGEMA, FNAETT, AEGP

- **TEXTILE COMPANIES (4):**

Estampados Continentales, Texknit, Estampados Family, Sisa

- **CONSTRUCTION ASSOCIATIONS (2)**:

ITEC, Union of Building Constructors of Mataró and County

- **CONSTRUCTION COMPANIES (2):**

HORMIPRESA, CIRCA

E. Web site

www.mesval.net

MEMBERS AREA:

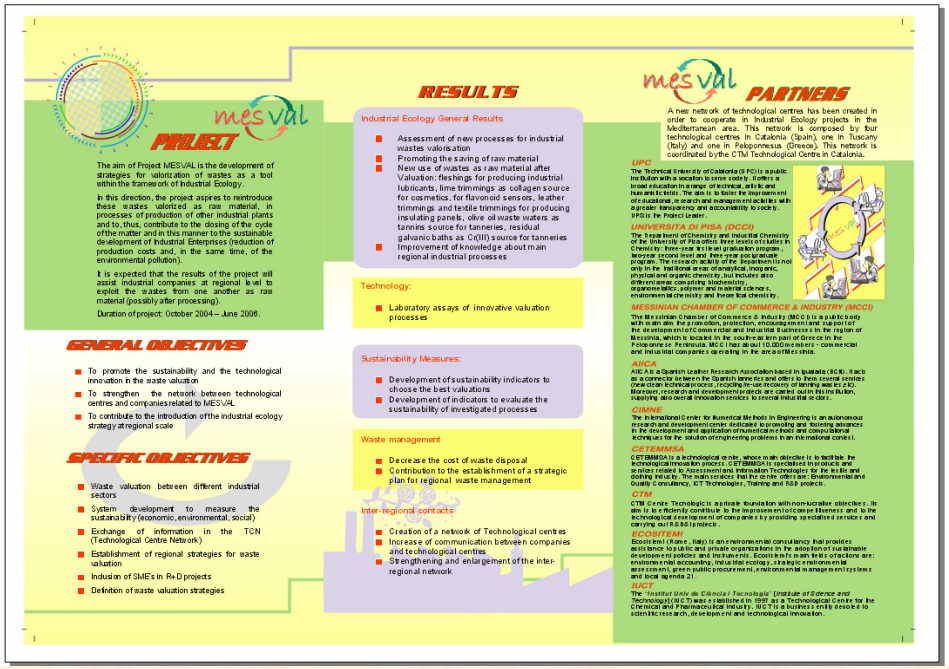
- **send e-mails to the partners**
- **browse and download files which require collaborations and revisions**
- **source of the main documents produced during the project**
- **organize a forum between the partners or opened towards interested people**

F. Networking

- Inter and intra regional coordination
- Task coordinators
- Get to know each partner's research and projects
- Close human contact (meetings, ...)
- Coordination among partners for future collaborations

G. Dissemination (1)

Brochure

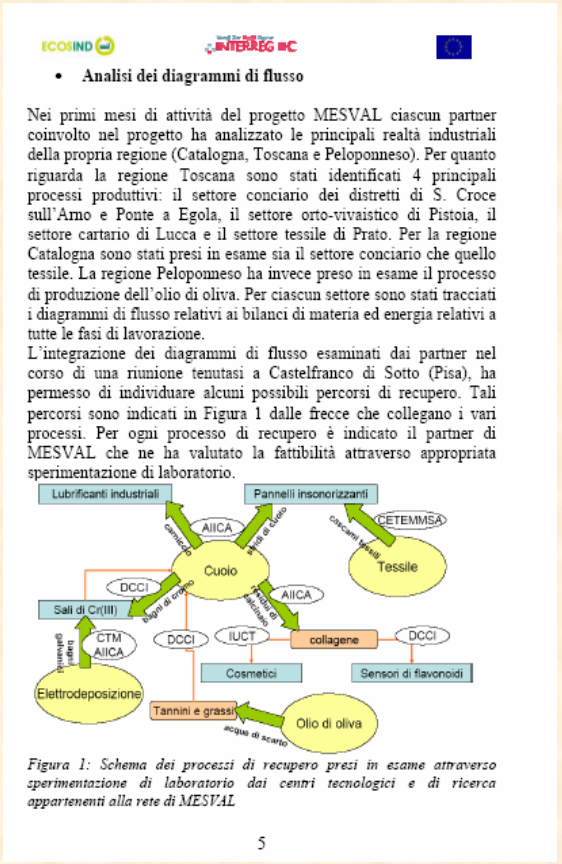


G. Dissemination (2)

- Italian small book

Basi tecnico-scientifiche e strategie per la ricerca di nuovi processi di valorizzazione regionale dei residui industriali

sito web: www.mesval.net



- **Analisi dei diagrammi di flusso**

Nei primi mesi di attività del progetto MESVAL ciascun partner coinvolto nel progetto ha analizzato le principali realtà industriali della propria regione (Catalogna, Toscana e Peloponneso). Per quanto riguarda la regione Toscana sono stati identificati 4 principali processi produttivi: il settore conciario dei distretti di S. Croce sull'Arno e Ponte a Egola, il settore orto-vivaistico di Pistoia, il settore cartario di Lucca e il settore tessile di Prato. Per la regione Catalogna sono stati presi in esame sia il settore conciario che quello tessile. La regione Peloponneso ha invece preso in esame il processo di produzione dell'olio di oliva. Per ciascun settore sono stati tracciati i diagrammi di flusso relativi ai bilanci di materia ed energia relativi a tutte le fasi di lavorazione.
L'integrazione dei diagrammi di flusso esaminati dai partner nel corso di una riunione tenutasi a Castelfranco di Sotto (Pisa), ha permesso di individuare alcuni possibili percorsi di recupero. Tali percorsi sono indicati in Figura 1 dalle frecce che collegano i vari processi. Per ogni processo di recupero è indicato il partner di MESVAL che ne ha valutato la fattibilità attraverso appropriata sperimentazione di laboratorio.

Figura 1: Schema dei processi di recupero presi in esame attraverso sperimentazione di laboratorio dai centri tecnologici e di ricerca appartenenti alla rete di MESVAL

5

Castelfranco di Sotto (Pisa) - 18 Luglio 2005

Igualada (Barcellona) -13 Gennaio 2006

12

G. Dissemination (3): actions

Partner	*Event*	*Where, when*	*Kind of action*
MCCI (Nick)	ECOSIND meeting in the Peloponneso	Tripoli, March 2005	conference
MESVAL Coordination (Gemma)	Radio program about Industrial Ecology	Terrassa, April 2005	interview
MESVAL Coordination (Gemma)	International Conference on Industrial Ecology	Stockholm, June 2005	poster
IUCT (Carles)	Green Chemistry &Eng Conference	Washington DC, June 2005	poster
AIICA (Silvia)	Leather Network Meeting	Igualada, September 2005	conference
MESVAL Cordination (Juanjo, Gemma)	Expoquimia	Barcelona, November 2005	Poster conference
MESVAL Coordination (Gemma)	ECOSIND meeting in Catalonia	Barcelona, November 2005	conference
DCCI (Beatrice)	ECOSIND meeting in Italy	Florence, February 2006	conference

H. Strategies and contribution to ECOSIND guide

- **"Industrial Ecology" as a methodological tool**

- **Multidisciplinary approach.**

  Different **industrial sectors**: textile, leather tanning, metals, green chemistry, olive oil production, organic chemistry

  Different kinds of **organisations**: consultancies, research and technology centres, universities, Chambers of Commerce

  Different **dimensions**: social, environmental and economic dimension (sustainability indicators)

  Regions from different **countries**

  Multidisciplinary team

- **"matching" the flow diagrams**

- **Sustainability indicators as evaluation tool**

- **Research and Technology Development centres (RTD) – Industry cooperation**