



# Challenges for sustainable development & circular economy

EIT Raw Materials  
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# VEOLIA

## Our Missions

# VEOLIA - *Our Mission* Resourcing the World

## Improving access to resources

Veolia offers operational solutions that consume fewer environmental resources and are more economically efficient, so as to expand both the potential and the accessibility of the resources available.

## Preserving resources

Veolia develops solutions to conserve resources and optimize their use, while protecting their quality and efficiency throughout the usage cycle.

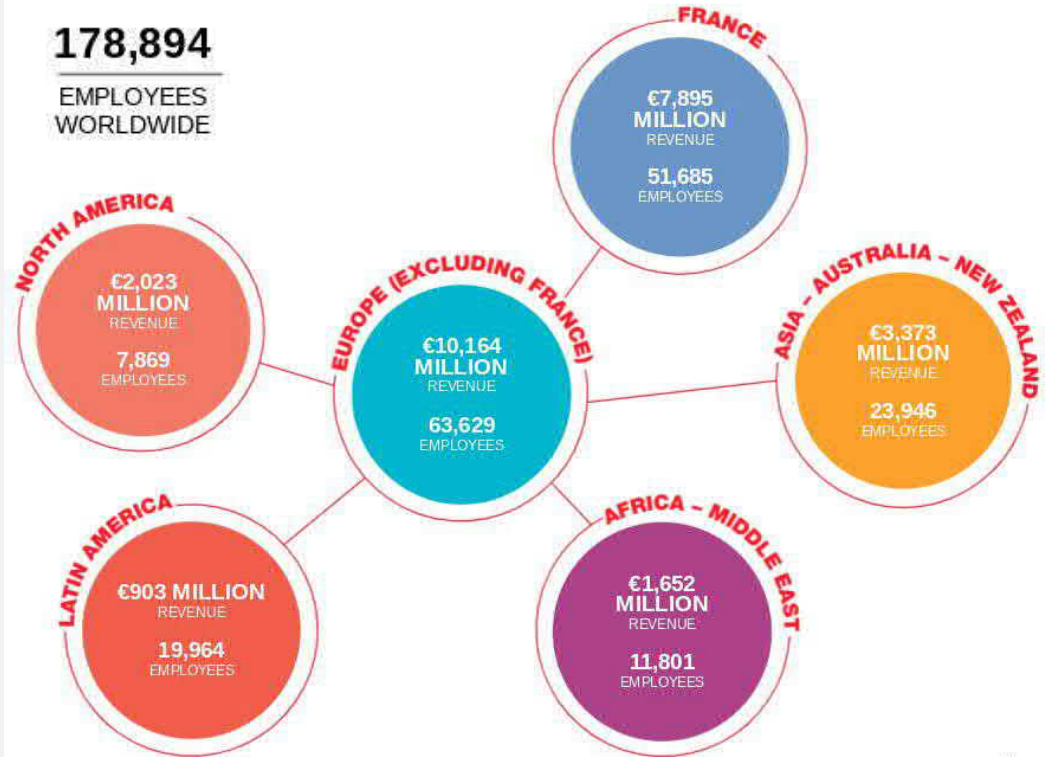
## Replenishing resources

Veolia provides solutions for creating new “secondary” resources that will gradually offset the increasing scarcity of natural “primary” resources, generating new opportunities for social and economic development that protect the environment.

**€26,010**  
MILLION REVENUE  
WORLDWIDE



**178,894**  
EMPLOYEES  
WORLDWIDE





## 1. The essentials of Veolia

# OUR 3 BUSINESSES

Veolia designs and deploys solutions for **water**, **waste** and **energy** management, participating in the sustainable development of cities and industries.



Management of the global water cycle, from production and distribution of drinking water to the collection, treatment and recycling of wastewater.

**95**

MILLION PEOPLE SUPPLIED WITH SAFE DRINKING WATER

**62**

MILLION PEOPLE CONNECTED TO WASTEWATER SYSTEMS

**3,362**

DRINKING WATER PRODUCTION PLANTS MANAGED

**2,737**

WASTEWATER TREATMENT PLANTS MANAGED



Liquid and solid non-hazardous and hazardous waste management. Our expertise covers the entire waste life cycle from collection to recycling, leading to the final recovery of waste as materials or energy.

**40**

MILLION PEOPLE PROVIDED WITH COLLECTION SERVICES ON BEHALF OF MUNICIPALITIES

**47**

MILLION METRIC TONS OF TREATED WASTE

**464,948**

BUSINESS CLIENTS

**685**

WASTE PROCESSING FACILITIES OPERATED



Energy efficiency, efficient management of heating and cooling networks, green energy production.

**43**

MILLION MWH PRODUCED

**45,806**

THERMAL INSTALLATIONS MANAGED

**2,137**

INDUSTRIAL SITES MANAGED

**611**

HEATING AND COOLING NETWORKS MANAGED



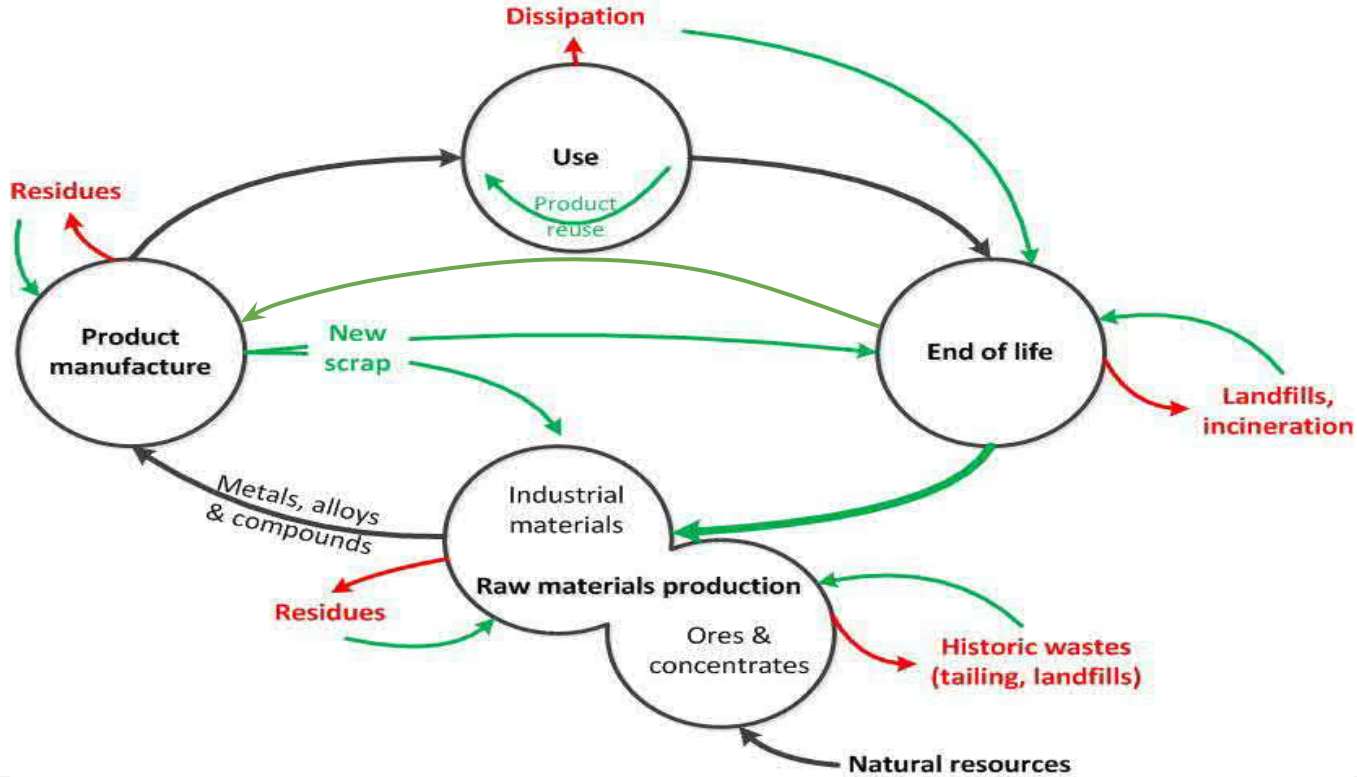


# Materials Cycle



# Materials cycle

## Common representation

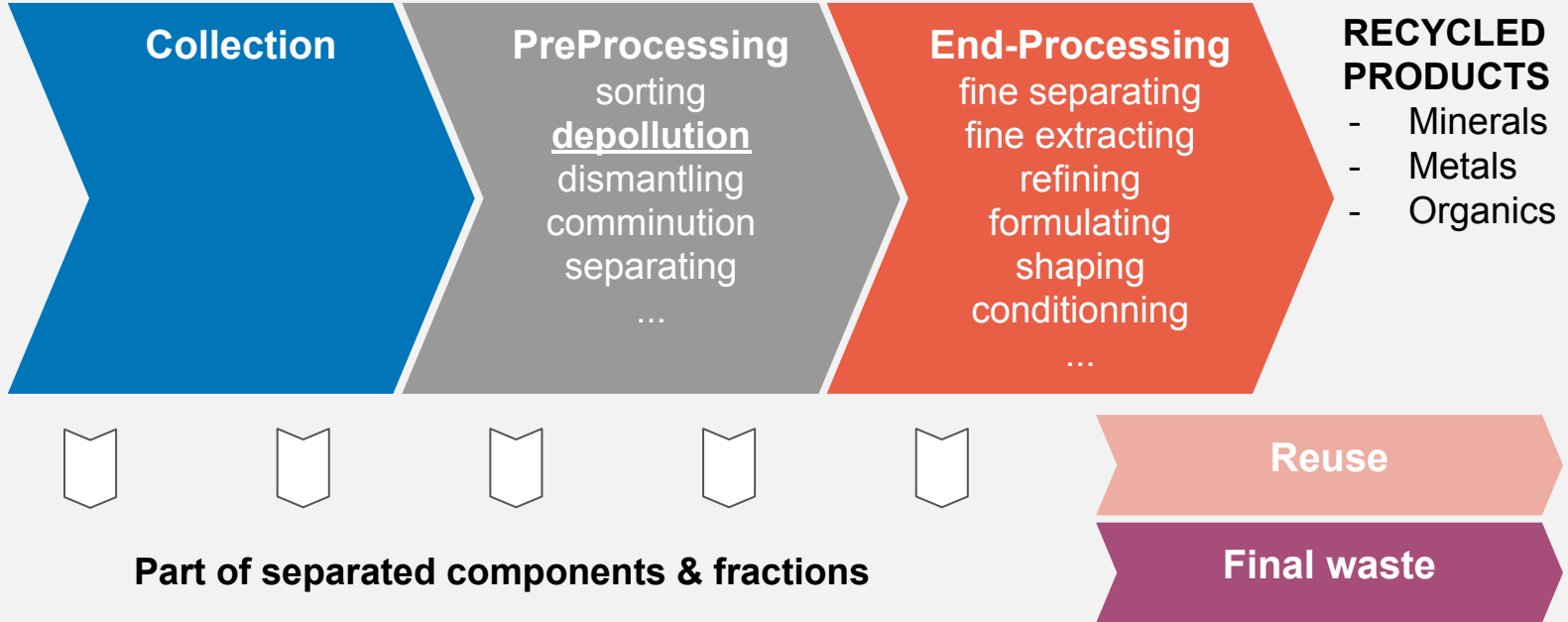


# Materials cycle

## General chain of the recycling industry

### WASTES

- Minerals
- Metals
- Organics
- *mixed*



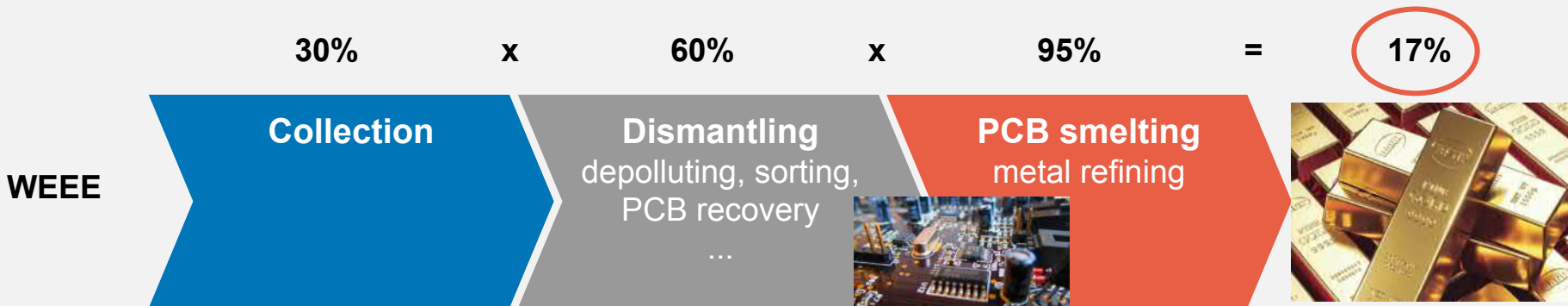
### RECYCLED PRODUCTS

- Minerals
- Metals
- Organics



# Materials cycle

## Example of effective total recovery rate of gold in WEEE



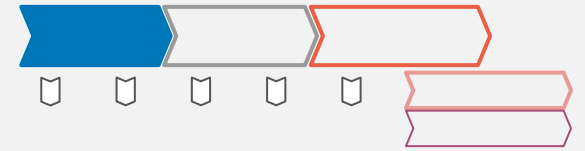
Recycling process chain for consumer product : actual recovery rate mainly determined by the weakest link (*semi fictitious values*)  
*adapted from UNEP, 2013*

<b>30%</b>	<b>x</b>	<b>60%</b>	<b>x</b>	<b>100%</b>	<b>=</b>	<b>18%</b>
<b>50%</b>	<b>x</b>	<b>70%</b>	<b>x</b>	<b>95%</b>	<b>=</b>	<b>33%</b>

**Among the major challenges for VEOLIA and for the development of a sustainable circular economy, increasing recovery rates for the blocks with the lowest recovery rates is essential.**

## Some Challenges

The governance of the circular economy is not only plays within the organization, but with all actors in the value chain. Usually, a company can't do it alone. Collective approaches, where each stakeholder brings their expertise, are necessary and more effective.



# Challenges Collection

**Crucial stage** which determine the amount of material available for effective recovery.

**Depending more on social and societal factors** than collection methods.

**Opportunity to facilitate the efficiency of the preprocessing step** by proposing an incentive policy and/or waste presorting means.

**Reduce the risk of theft and pecking of the most interesting/lucrative materials** (high-tech WEEE, copper...).



*Selective material recovery skips on a demolition site*

*from ADEME*



# Challenges

## Preprocessing

**Identify, remove, store or treated safely Hazardous substances**  
 (batteries, capacitors, toner print, paint bucket, flammable liquid, gas cylinder, weapons and ammunition, distress rocket... degassing and oil remove for refrigerators and air-conditionners...).

**Presorting** : manual or automatic ?

**Dismantling** : manual or automatic ?  
 (depending on the size of the objects, their complexity, their dangerousness, the values contained, the recoverable products...)





# Challenges

## Preprocessing

**Comminution** to liberate the material and direct them to adequate subsequent final treatment processes.

**Shredding, grinding** with less loss

**Automatic detection/separation** (metal rods in concrete, plaster and bricks, aluminum / plastic in glass, iron/aluminum/plastics in WEEE...)

**Identify, sort and extract high value components** (PCB in WEEE)

**Have robust processes to variations of flow**

**Specificities of a waste stream** : mixture of waste, mixture of material, dirty, damaged, in pieces, presence of unwanted pollutants, dangerous or not, composition and volumes fluctuating over time ...

*WEEE idealistic vision*



*WEEE reality*







# Challenges

## End-processing

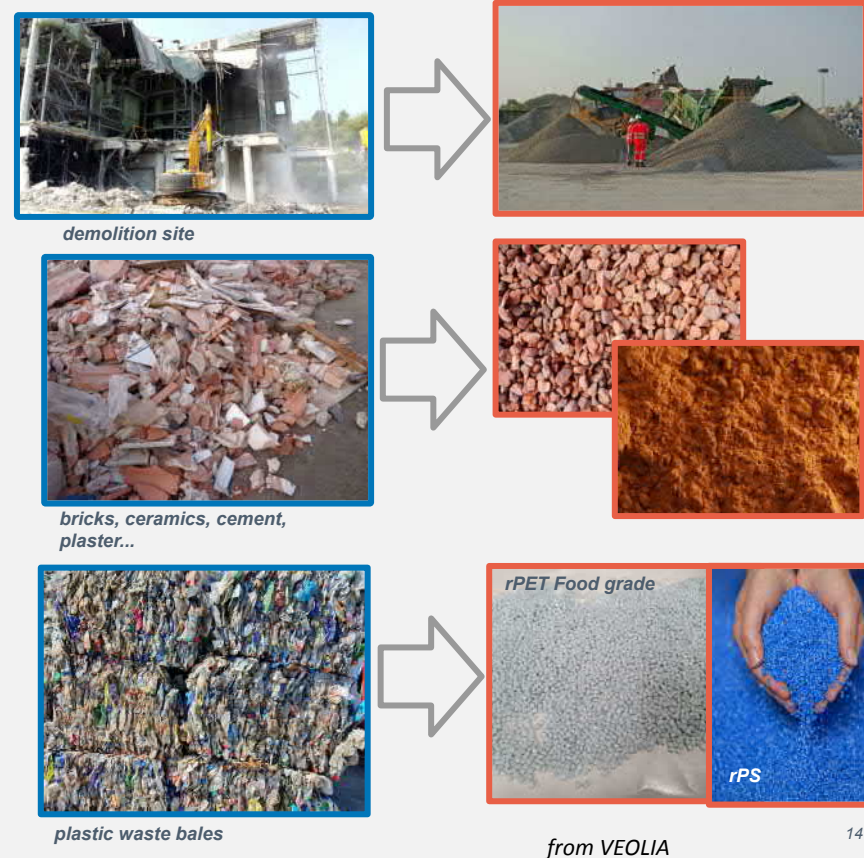
Set up processes according to secondary raw material requirements of End-Users (formulation, purity, shape, ...)

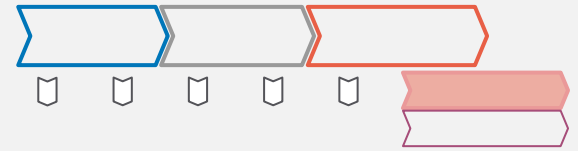
Case of high volumes / low value products (glass, gravel, bricks, foam...)

- Challenge of finding motivated buyers on long term recovery with acceptable specifications

Case of emerging recycling solutions

- Challenge of developing sustainable chains and profitable for all players





# Challenges

## Reuse

**New virtuous trends and new markets in development**

**Limit the increase in illegal exports outside Europe of so-called second-life products :**

- **hurdle on the current establishment of virtuous reuse sectors in Europe**
  - grow-up of deplorable recycling channels in Africa, Asia / India and South America
- **hurdle on the reduction of imports into Europe of primary materials**

**More easily trackable for large products (second life for PV, electric vehicle battery ...) than small products high value (telephony, TV, computer ...)**



from UNEP, 2015





# Challenges

## Technologies development

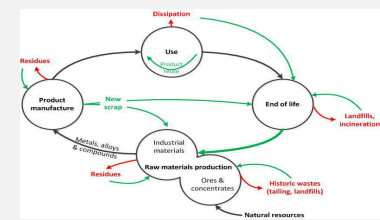
Not (or very rare) turnkey sustainable project / sector - Requirements :

- **collaborative approach and efforts of several years by all partners** (industrialists / startups / academics / institutions and politicians)
- **win-win commitments** : esteem, listening, sharing of interest of each partner
- **sustainable business model**
- **design of solution in practice and at scale on real waste stream**

### Example of collaborative approach/project

- recycling of automotive lithium batteries *[Renault/Veolia/Solvay]*
- production of gypsum from acid waste *[Cristal (ex-Millenium)/Veolia/Lafarge]*
- robotic dismantling of flat screens *[Veolia/Sileane]*
- recycling of PS plastic from refrigerators for eco SIM card production *[Veolia/Thales]*
- recycling of silicon PV *[Veolia/Flaxres/Rosij]*
- recycling of aggregates for rapid concrete production *[Veolia/Agilis]*
- recycling of WEEE plastics *[Veolia/SEB]*
- recycling of glass wool from thermal power plants *[Veolia/EDF]*
- ...

# Challenges others



Co-creativity / co-creation activities with manufacturers to develop business cases with recycled products.

Regulatory challenges : not enough incentive to use recycled materials...

- a lot of “recyclable” logos, but not enough “recycled” logos !



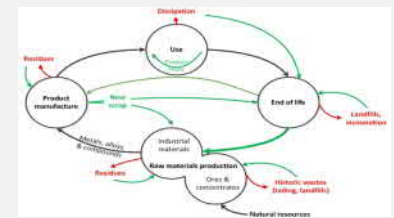
- in most cases, the establishment of a circular economy loop for a specific product/material FAILS due to the LACK of REGULATORY OBLIGATION

Consumer challenges : how to change belief/*a priori* ? "A good produced with virgin raw materials would offer higher quality than the same good made from recycled materials"



# **VEOLIA & EIT raw Materials**

# VEOLIA & EIT Raw Materials



**Veolia "associated partner" since 2016 & active participation in the U-START "Cleantech startup accelerator" program - 6 startup funding**

### 3 upscaling projects:

**PhosForce** (2018-2021) - recovery of phosphorus in municipal wastewater - construction under study of a demonstration unit (100,000 p.e)

**Relicario** (2019-2022) - development of a solvolysis process to recycle carbon fibers in composites. Industrial partner and technology carrier: **Extracthiv** (France). Planning of a demonstrator

**ReProSolar** (2021-2025) - development of a recycling process for PV (Si) panels with the objective of recovering silver and silicon. Industrial partners and technology carriers: **Flaxres** (Germany) and **Rosi** (France). Start-up of a demonstrator (5,000 t / y) scheduled for 2023.

**Participation in an "education" project of the EIT : AMIR project** (Master program on the circular economy, 2017-2021), coordinated by the University of Bordeaux.

**VEOLIA helps and participates in implementing sustainable solutions**



*Thank you for your attention*