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# Waste as a Resource

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# More waste, scarcer natural resources: in search of the right solution

*As today's consumer society has expanded, so has the consumption of resources and the waste it produces. Domestic waste, industrial waste... the population of the EU throws away 2.7 billion tonnes of it every year, of which 98 million tonnes are hazardous. The greatest waste stream comes from construction and demolition waste.*

On the other hand, competition for a diminishing supply of virgin raw materials is intensifying, as huge economies like China and India boost their manufacturing activities in response to domestic and foreign demand. Vital resources such as water and energy are becoming harder to secure. As the problem gets worse, it could endanger growth and impact prosperity worldwide, or irreversibly harm the environment.

But things are changing. Waste is ceasing to be regarded as merely a problem to dispose of, as people become aware of its potential as a reusable resource for a wide range of purposes.

## Research priorities

The EU's Seventh Framework Programme (FP7) is funding research which tries to find innovative ways of using waste as a resource. This entails looking at waste in a different way and convincing individuals, companies, local authorities and all stakeholders that a new approach will bring both economic and environmental benefits.

The top priority is finding ways to **reduce** waste where possible, **reuse** what can be salvaged, and **recycle** more and more with sophisticated as well as effective sorting and recovery technologies.

Further progress can be achieved by encouraging a more 'circular' economy across **sustainable industries** so that they can make use of waste generated in other sectors as a secondary raw material to increase their own resource efficiency. In this way, they can substitute virgin raw materials, thereby reducing production costs and lowering their environmental footprint.

Finally, **managing waste efficiently at local, national and global levels** will increase the supply of secondary raw materials in Europe, boosting growth and job creation in both large companies and small and medium-sized enterprises (SMEs), as well as supporting efforts in other parts of the world.

To make the right choices both now and for the longer term, policy-makers need accurate information on the whole life cycle of products and resources. Targeted research is vital, not only at national level, but also by pooling transnational expertise – and the lessons must be applied.



# Reduce, reuse, recycle

*The EU's Waste Framework Directive (2008) envisages a 'hierarchy' of actions, with landfill disposal as the last resort. Instead, reuse, recycling and recovery of waste should become profitable options for both the public and private sectors, through effective separate collection and well-functioning markets for secondary raw materials.*

The first challenge is to reduce waste production and to gain secondary raw materials through reuse and recycling/recovery. The next is to achieve

an efficient yet profitable use of waste materials through dedicated processes and technologies, with the ambitious aim of creating a circular economy generating minimal waste.



These changes are necessary because natural resources are becoming scarcer and harder to obtain. At the same time, humanity is producing a growing quantity of waste, especially in urban areas and as a by-product of industrial activity. And waste itself is getting more complex and harder to dispose of without damage to the environment, as new technologies allow for the manufacture of increasingly complicated products, such as cars or electronic devices. But the challenge is becoming more and more demanding: for instance, waste electrical and electronic equipment (WEEE), plastics or even recovered paper contain numerous parts which need identifying and sorting.

## A life-cycle approach

Life-Cycle Assessment (LCA) is one method used to measure the full environmental costs and impacts of products and processes, from sourcing to recycling, including raw materials, energy and water. FP7 promotes LCA and eco-design through the development of advanced recycling and recovery technologies. Although accurate, LCA still poses some difficulties in practical use.

The '**LCA to go**' project sets out to overcome barriers to this approach, especially in SMEs, where cost and complexity are disincentives. It is developing a web-based, open source toolbox and tailored instruments for use by different industrial sectors.

## Saving trees: SORT IT

*The worldwide demand for paper is putting severe strain on forests, where wood is in demand for a range of other uses as well. Virgin pulp is an increasingly costly raw material. The answer should be recycled paper, but unwanted materials in paper collection disrupt production and damage the quality of the product.*

*The **SORT IT** project used innovative technologies to improve sorting processes in industrial paper production. The project has developed a full scale sorting line using new sensors and machinery to improve the performance of recycled paper sorting.*

# Sustainable industries

*With the price of primary raw materials rising as supplies become scarcer and competition for them increases, European companies can become more competitive by cutting waste and its disposal costs, and using more recycled and recovered materials. Eco-innovation in industry saves money, opens up new growth opportunities and attracts customers. It is good not only for the environment but also for the economy and society.*

At present, waste recovery along value chains is often insufficient, as is industrial use of reusable and recoverable waste streams for higher-grade products.

Companies cannot only boost profits but also reduce the burden of administration by thinking creatively about waste as a resource, throughout the value chain, and across sectors.

## Waste from one sector is a resource for another

One solution is through setting up industrial networks for waste exchange between different sectors. The waste by-products of one company's processes may contain materials that are valuable to another. This is known as 'industrial symbiosis'.

For example, disposing of old tyres is a significant problem in Europe: 23% of them go to landfill. The **TyGRE** project uses gasification, coupled with a second thermal process, to obtain a useful material (silicium carbide) with a range of applications in engineering. SMEs are involved in testing the potential applications of the product.

Recycling end-of-life concrete into new material is one of the most promising ways of reducing construction and demolition waste. As the production of the cement used in concrete is responsible for at least 5% of global CO<sub>2</sub> emissions, the **C2CA project** aims to develop innovative technologies for recycling end-of-life concrete, obtaining fractions that could be used as secondary raw material in cement kilns replacing virgin materials.

For this project, two Dutch towers containing 70 000 tonnes of concrete have been selectively demolished.



## Copying natural cycles: ZeroWIN

*There is no simple recipe for making Europe's industries sustainable. The ambitious **ZeroWIN** project is working towards zero waste and emissions, through industrial symbiosis and integrated systems that emulate the cycles found in nature, and make more efficient use of the Earth's resources.*

*The project addresses nearly 3 million companies – 80% of them SMEs – with a turnover of over €800 billion and more than 20 million employees. They produce some 400 million tonnes of industrial waste every year, consuming 50% of all the materials extracted from the Earth's crust, and generating 35% of all greenhouse gas emissions.*

*Working with sectors such as electronics and construction, ZeroWIN wants to help them reach targets such as a 75% cut in fresh water consumption, or reusing and recycling 70% of waste.*

# Managing waste efficiently at global and local level

*Poor waste management is expensive and unsustainable. The problem of inefficient systems which deliver too much waste to landfill - waste that could, instead, be recycled - does not affect Europe alone. It is a pressing issue for emerging economies expanding their industrial activities, and growing cities in developing countries.*

Europe urgently needs to find ways to increase the supply of secondary raw materials available



## *Intelligent waste collection: BURBA*

*Waste management is a pressing problem in towns and cities. Weekly collection schedules do not respond to variations in demand, and sorting depends on the good will of individuals, who receive little information about the impact of their efforts.*

*The **BURBA** project aims to improve waste collection in urban areas by developing automatic systems to identify waste types, and 'intelligent' waste containers in convenient locations.*

*This will allow local authorities to set up incentive-based recycling programmes that reward residents for taking action.*

to its industries. The challenge is to develop better waste-management practices and technologies that can meet this need through recycling and reuse, and to transfer this technological and organisational know-how to other countries.

Internally, Europe is setting itself increasingly high recycling targets, based on the Waste Framework Directive. But at the same time, waste shipments to non-EU countries are increasing. Even well-meaning gifts of used electronic equipment generate more waste in receiving countries. Waste management is a global issue.

## Transferring knowledge

The EU supports capacity building of local waste management sectors dealing with waste collection and recycling in countries outside Europe. This will help these countries improve their environmental governance. One of the objectives of these actions is also to improve communication and transfer of knowledge to policy-makers, business and the general public.

Most African countries are struggling hard to achieve better and sustainable living conditions. The **IWWA** project has been helping to set up integrated solid-waste-management systems in four Western African countries, involving stakeholders and raising public awareness.

Some Asian countries are more advanced, with their own research programmes, but others have a long way to go. **ISSOWAMA** harnessed international co-operation to set up solid-waste-management systems, reducing pollution and protecting natural resources.

# Project List

**BURBA** – Bottom-up selection, collection and management of urban waste  
<http://www.burbaproject.net/>

**C2CA** – Advanced technologies for the production of cement and clean aggregates from construction and demolition waste

**cyclLED** – Cycling resources embedded in systems containing Light Emitting Diodes  
[www.cyc-led.eu](http://www.cyc-led.eu)

**Dragon** – Development of resource-efficient and advanced underground technologies

**END-O-SLUDG** – Marketable sludge derivatives from sustainable processing of wastewater in a highly integrated treatment plant  
[www.end-o-sludg.eu](http://www.end-o-sludg.eu)

**FFW** – Liquid and gas Fischer-Tropsch fuel production from olive industry waste: fuel from waste

**HydroWEEE Demo** – Innovative hydrometallurgical processes to recover metals from WEEE including lamps and batteries - Demonstration  
[www.sat-research.at/hydroWEEE](http://www.sat-research.at/hydroWEEE)

**INNOBITE** – Transforming urban and agricultural residues into high performance biomaterials for green construction

**I-PAN** – Innovative Poplar Low Density Structural Panel

**IRCOW** – Innovative strategies for high-grade material recovery from construction and demolition waste  
[www.ircow.eu/](http://www.ircow.eu/)

**ISSOWAMA** – Integrated sustainable solid waste management in Asia  
[www.issowama.net](http://www.issowama.net)

**IWWA** – Integrated waste management in Western Africa  
[www.iwwa.eu](http://www.iwwa.eu)

**RecoPhos** – Recovery of Phosphorus from sewage sludge and sewage sludge ashes with the thermoreductive recophos-process  
[www.recophos.org](http://www.recophos.org)

**SORT IT** – Recovered paper sorting with innovative technologies  
<http://www.sortit.eu/>

**TyGRe** – High added value materials from waste tyre gasification residues  
[www.tygre.eu](http://www.tygre.eu)

**W2Plastics** – Magnetic sorting and ultrasound sensor technologies for production of high purity secondary polyolefins from waste  
[www.w2plastics.eu](http://www.w2plastics.eu)

**WASTE2GO** – Development and verification of an innovative full life sustainable approach to the valorisation of municipal solid waste into industrial feedstocks

**ZeroWin** – Towards zero waste in industrial networks  
[www.zerowin.eu](http://www.zerowin.eu)

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*Research and Innovation policy*



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