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The importance of the Circular Economy is recognized in european and national guidelines and policies for its contribution to many of the current changes, such as the process of slowing down climate change, the potential for material recovery or the promotion of a more efficient use of resources.

Conscious of its responsibility to support the transition to a more Circular Economy, fostering a full understanding of the subject, leveraging leaderships and inspiring decisions towards the creation of virtuous circles, we publish the Guide for a Circular Economy.

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For you.

To support the transition towards a Circular Economy.

This Guide is the result of LIPOR work, with the aim of promoting a full understanding about circular economy and fostering the creation of virtuous circles.

We aspire...

Find leaderships, inspire decisions, overcome challenges, catalyze changes, identify opportunities, create networks, induce dynamics, value the economy, protect the planet and people.

Because our Purpose is “To build a better world, every day”.

LIPOR

1. FOREWORD

We are living an era of transformation. The 4th Industrial Revolution reshapes our societies and our economies. The pandemic demonstrated the vulnerability of our societies and accelerated their digitalization.

Till today, all the industrial revolutions skyrocketed the productivity of human labor, they provided the technologies and the systems to produce more products with less labor, less energy, and less raw materials. But together with the rapid increase of productivity, all the industrial revolutions created big waves of pollution. Industrial revolutions are directly linked with the emergence of new forms of pollution and the rise of new health and environmental problems.

Today we are in the middle of the 4th Industrial Revolution. At the same time, COVID19 highlighted the new, unexplored risks that emerge from the unprecedented triple environmental crisis involving global warming, loss of biodiversity and the rise of new forms of pollution. There are thousands of scientists and thousands of documents that provide a clear and straightforward message: human activities and the dominant economic growth model undermine the viability of the ecosystems that support human life. We simply can't continue the same way of economic growth without sacrificing serious environmental elements that support our societies.

For this reason, the 4th Industrial Revolution can't be unfolded like the previous ones. The particularity of this industrial revolution is that it should be disconnected from the rise of pollution, our ecosystems do not afford one more massive way of new forms of pollution. How can we enjoy the benefits of the 4th Industrial Revolution avoiding the worsening of environmental conditions?

Scroll to read more

Circular Economy is the answer to the previous question. Circular Economy is a new model of economic growth that aims to substitute traditional material management with closed loops and new business model that control, reduce and even eliminate, in some cases, pollution and the related health and environmental impacts.

The waste management sector is already in a serious transformation trying to adapt to the circular economy requirements. And in this transformation, the waste sector is using a lot of the advances of the 4th Industrial Revolution like optical and level sensors, RFID tags and readers, robotics and autonomous cars, mobile apps, and artificial intelligence systems. The waste sector is changing, and the emblematic sign of its change is the rise of cyber-physical systems that combine consumers, labor, vehicles, recycling infrastructure and software in new platforms in many cities. Besides using the advances of the 4th Industrial Revolution, the waste sector is providing us very important lessons from almost 100 years of delivering closed loops and manage, reduce, and eliminate pollution.

So, what can we learn from the waste management sector?

Lesson 1: Societies require availability of final sinks
Till today we already knew that societies require access to water, energy, and food to flourish. But today, we have two planetary challenges, global warming, and marine litter, that demonstrate another necessary element for resilient societies. Global warming is a problem of improper waste management: carbon dioxide, a major waste coming out of our economies, has saturated our atmosphere which was its final sink. Marine litter is a similar problem: plastic waste is rising and is getting close to saturate our oceans that served as the final sink. So, both

2. WHY IS OUR PATTERN OF CONSUMPTION A PROBLEM?

Presently, we live and use resources beyond the planet's regenerative capacity. This model is less and less viable for the future of humanity. Advertising, promotional offers, fashion, technological developments, permanent telecommunications and multimedia services encourage us to swiftly renew our goods. Generally, developed countries use more resources than developing countries. However, these resources aren't unlimited.

The Earth Overshoot Day marks the date when demand for ecological resources exceeds what Earth can regenerate in that year. In 2022, it took place on July 28, one day earlier than in 2021. [1]

In 1969, our planet was enough to meet human demands. By 2021, it would take 1.75 planets to meet all our needs without penalising the following generations. [2]

The prospects aren't encouraging as, by 2050, world population is expected to increase by 2.5 billion. At the same time, if nothing changes, global consumption of raw materials will increase from 85 billion tonnes to about 180 billion tonnes.

Bearing this in mind, governments around the world have decided to act so as to promote a sustainable future. Consequently, the Sustainable Development Goals (SDGs) were presented, a set of 17 interconnected global goals that provide a "blueprint to achieve a better and more sustainable future for all". The SDGs were approved by the United Nations General Assembly in 2015 and should be achieved by 2030.[3]

In the same context, the 2015 Paris Agreement was ratified, having the signatory countries jointly agreed to keep global warming "well below 2°C" through mitigation measures. However, even with the commitments made within the scope of the Agreement, global warming would still reach about 2.7°C by the end of the century. To limit warming to 1.5°C it would be necessary to halve emissions by 2030 and achieve net zero emissions by 2050. [4]

In addition, the European Commission presented the European Green Deal, consisting of a set of political proposals with the overall goal of achieving a climate-neutral European Union by 2050. The aim is to revise existing legislation on its climate impacts and to create new legislation on Circular Economy, building renovation, biodiversity, agriculture and innovation. [5]

3. WHY CHANGE?

The second industrial revolution, which began in the second half of the 19th century, was a time of great technological innovation, being characterised by mass production. Since then, the development of countries, societies and industries has been based on a linear model with a “take, make, waste” approach.

In short, in a linear model, natural resources are processed into products, which are ultimately destined to become waste, due to the way they were designed and manufactured.

Natural and energy resources are widely exploited for the provision of goods and services, even in the face of exhaustion at a global scale. In view of the growing scarcity of strategic resources and the increasing growth of world population, the issue of access and sharing arises. This scarcity leads to volatility, increased raw material prices, and the risk of instability, geopolitical tensions and conflicts.

Given the exposure to risks that arise from the numerous vulnerabilities we face today, such as pressure on resource use, air pollution, shortage of drinking water, soil contamination and erosion, extreme weather, loss of biodiversity, among others, the need for a paradigm shift has arisen. Societies, companies, countries, the whole world must transition into a new development model, which decouples environmental pressure from growth and prosperity.

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4. WHAT IS THE CIRCULAR ECONOMY?

To ensure the planet's sustainability, it is fundamental to rethink materials lifespan, so that they return to any of the industrial processes.

The model which advocates that systems must work as organisms, processing nutrients that can be fed back into the cycle – whether biological or technical – forming a closed or regenerative loop, is called a circular model.

A possible definition is: “Circular Economy is an economic system that targets zero waste and pollution throughout materials lifecycles, from environment extraction to industrial transformation, and to final consumers, applying to all involved ecosystems. Upon its lifetime end, materials return to either an industrial process or, in case of a treated organic residual, safely back to the environment as in a natural regenerating cycle.”

The Circular Economy generates value at the macro (either national, regional or urban), meso (symbiosis between organisations, including industrial networks and parks) and micro level (focused on companies, services or products), fully exploring the concept of sustainability through its environmental, social and economic dimensions. The aim is to keep products, materials, equipment and infrastructure in use for a longer time, thus improving the productivity of the respective resources.

Energy resources are green and renewable, and are used efficiently. Government agencies and responsible consumers play an active role ensuring correct long-term operation of the system.

The Circular Economy is founded upon three principles:[6]

- **A.** Eliminate waste and pollution, through the design of products, services and business models;
- **B.** Keep products and materials in use, preferably at their highest economic and utility value, for as long as possible;
- **C.** Regenerate natural systems, through the regeneration of materials used and of the underlying natural systems.

It is based on renewable energy and materials, and boosted by digital transformation. It is a resilient, regenerative, collaborative, diverse and inclusive economic model. This economic concept is frequently associated with the Sustainable Development Goals, Green Economy and Sustainable Bioeconomy. In short, the aim is to make economy as circular as possible, devising new processes and solutions for resource optimisation, and eliminating the dependency on finite resources.

INNOVATION

New technologies and innovative business models allow for a better environmental and social performance of products and contibute to the circularity.

IN A CIRCULAR ECONOMY...

Click to learn more

- ENERGY
- WATER
- MATERIALS
- PRODUCTION AND TRANSPORT
- SERVICES
- CONSUMPTION
- CIRCULAR PROCUREMENT
- TRAINING & EMPOWERMENT
- COMMUNICATION
- DESIGN
- DIGITAL TRANSFORMATION
- INNOVATION
- INDUSTRIAL SYMBIOSES
- SUSTAINABLE FINANCING
- MONITORING

6. BOOSTING THE CIRCULAR ECONOMY

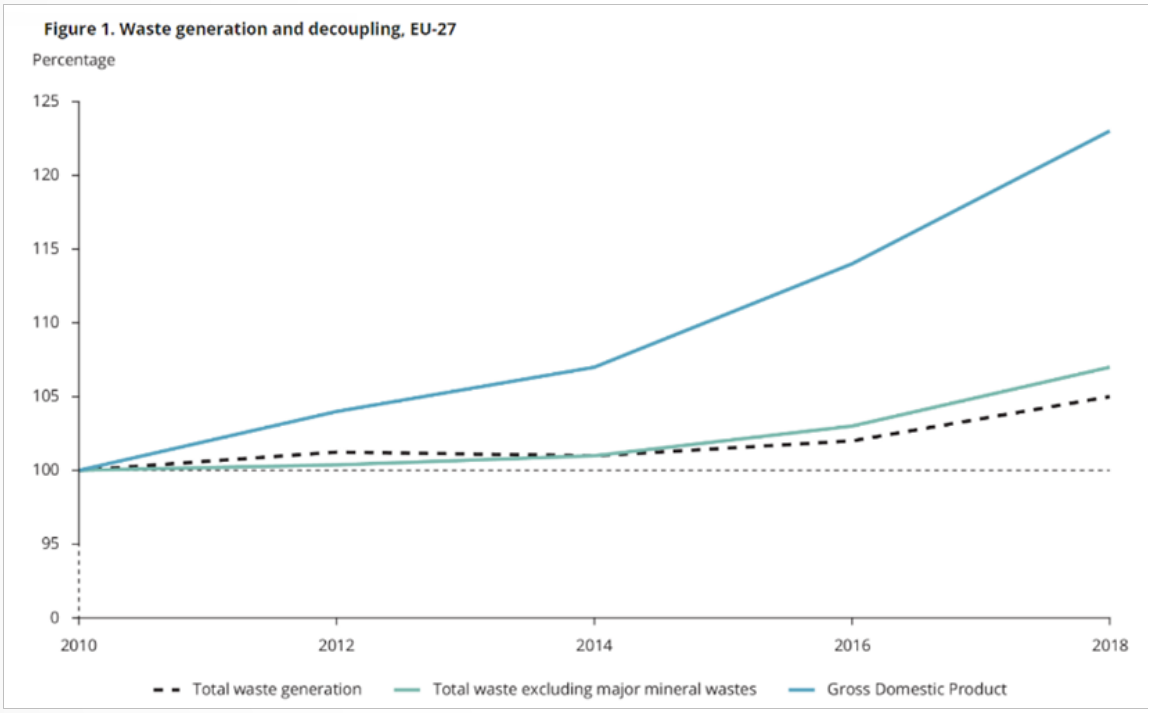
Touch the colored areas

1. **Conception/design** – Design of economically viable and ecologically efficient products and services, destined for multiple lifecycles. Design or redesign of more durable products, using less resources.

- Ecodesign applied to mobile phones, tablets and laptops (so that device planning and production encompass energy efficiency, durability, and potential for updating, maintenance, repair, reuse and recycling)
- Launching of a common charger for mobile phones and similar devices
- Sustainability and transparency requirements for batteries (namely taking into account the carbon footprint of battery

7. RESOURCE MANAGEMENT – LESS WASTE, MORE VALUE

Despite the efforts made at the European and national level, the amount of waste generated isn't decreasing. The annual waste generation comprising all of EU's economic activities amounts to 2.5 billion tonnes, i.e., 5 tonnes per capita per year, with each citizen generating almost half a tonne of municipal waste, on average.



European Environment Agency. 2021.
https://www.eea.europa.eu/ims/waste-generation-and-decoupling-in-europe

HIGH-QUALITY RECYCLING DEPENDS ON AN EFFECTIVE SELECTIVE WASTE COLLECTION.

An important pillar of the waste management approach consists of treating it as a valuable resource. An effective waste management is paramount to the conservation of limited natural resources, and fundamental in ensuring a sustainable future. As waste generation increases globally and in Europe, it is increasingly urgent to focus on reduction, reuse, recycling and recovery.

High-quality recycling depends on an effective selective waste collection. To help citizens, companies and public entities better sort waste, selective collection systems have to be standardised. It is necessary to combine the most effective selective collection models, the density and accessibility of different selective collection points, including in public spaces, bearing in mind local and regional conditions, which include urban to outermost regions. Once we have high-quality secondary raw materials derived from recycling, the next step is to incorporate them into new products, thus decreasing the use of primary raw materials.

A responsible management of hazardous waste is also paramount to the development of a sustainable economy. An efficient use of resources protects the environment and human health from the impacts of waste.

The sustainability of the waste sector can be fostered through multistakeholder engagement (involvement of several players and stakeholders) and R&D, creating assorted opportunities, from collaborative partnerships to supporting loop closure.

The economic opportunity generated by an effective waste management by the waste industry is growing. These changes reflect the initial success of an annual additional opportunity worth 900 billion euros for global economy, as estimated by the World Economic Forum, brought about by the adoption of a Circular Economy. The Ellen MacArthur Foundation estimates a figure of 475 to 574 billion euros per year for Europe, in the most advanced transition scenario.

Therefore, sustainable waste management definitely plays a paramount role in the Circular Economy, potentially contributing to: [9]

- Protection of human health and improvement of habitability;
- Protection of nature and ecosystems;
- Provision of secondary raw materials, nutrients and soil quality improving materials;
- Production of green and renewable energy and fuels;
- Mitigation of climate change;
- Economic development by generating jobs and wealth to cities and regions.

8. LIPOR'S CONTRIBUTION

LIPOR – Intermunicipal Waste Management of Greater Porto is responsible for the management, recovery and treatment of the municipal waste generated in its eight associated municipalities: Espinho, Gondomar, Maia, Matosinhos, Porto, Póvoa de Varzim, Valongo and Vila do Conde. Every year, we treat about 500,000 tonnes of municipal waste, generated by about 1 million inhabitants.

LIPOR clearly takes on a waste management approach based on a resource perspective, consolidating its commitment to the creation of value throughout the entire production cycle. This approach of incorporating waste as a resource, based on our Circular Business Model, allows us to re-enter materials into the production cycle, thus supplying the market with high-quality secondary materials, obtained through multimaterial and organic recycling, and boosting continuous material cycles. In this way, we close resource loops!

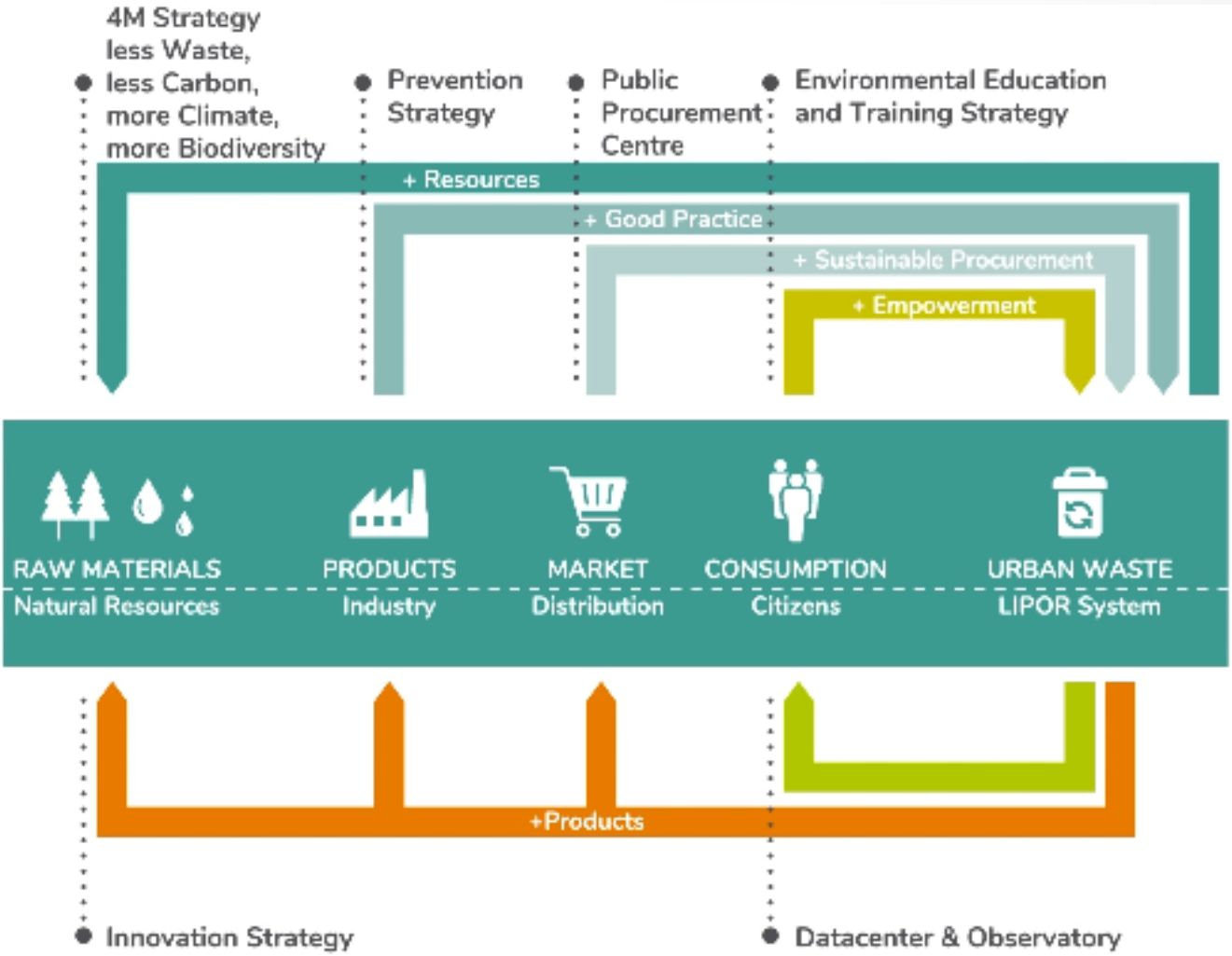
Our **Nutrimais®** is a perfect example of loop closure. It is a 100% natural product, obtained from the composting of food and green waste sorted at the source, which is used in soils to preserve or improve their natural fertility. Our careful sorting of raw materials is acknowledged by SATIVA by means of its certification for use in Organic Farming.

LIPOR is committed to developing several solutions for the agricultural sector, always keeping in mind its commitment to environmental sustainability and the soil maintenance and preservation strategy that underlies **Nutrimais®**. In this context, we've launched four new products in the agricultural market: three organic substrates and a vermicompost.

LIPOR HAS IMPLEMENTED THE FOLLOWING CIRCULARITY PRACTICES:

Click to learn more

- 4M STRATEGY
- ENVIRONMENTAL EDUCATION AND TRAINING STRATEGY
- PREVENTION STRATEGY
- INNOVATION STRATEGY
- PUBLIC PROCUREMENT CENTRE
- DATACENTER & OBSERVATORY


4M Strategy
less Waste,
less Carbon,
more Climate,
more Biodiversity
Prevention
Strategy
Public
Procurement
Centre
Environmental Education
and Training Strategy
+ Resources
+ Good Practice
+ Sustainable Procurement
+ Empowerment
RAW MATERIALS
Natural Resources
PRODUCTS
Industry
MARKET
Distribution
CONSUMPTION
Citizens
URBAN WASTE
LIPOR System
+Products
Innovation Strategy
Datacenter & Observatory

9. SPREAD THE WORD!

If you are already working on a plan to reduce the environmental, social and governance impact (ESG), the world needs more organisations and people like you. Explain to the Community how it can act, it is necessary.

ONE PERSON CAN MAKE THE DIFFERENCE!

Promoting sustainability doesn't mean more unemployment. In fact, the transition towards a Circular Economy necessarily involves creating green jobs.

IT IS PART OF THE TRANSITION!

The effects of climate change are already evident today – it isn't a problem for future generations only, but actually a current problem. All generations have a voice

DO NOT CHOOSE SILENCE, CHOOSE INTERGENERATIONAL SOLIDARITY

Even if you don't live in an area threatened by sea level rise, your lifestyle will be affected, from the air you breath to the food on your plate. The Circular Economy doesn't involve losing certain comforts, but actually dealing with them.

BE SUSTAINABLE!

If you think you have little spare time to make this change, you should bear in mind that the sooner you start, the easier it will be.

DON'T FALL BEHIND!

It takes some time to process so much information. That's one of the reasons why we devised this guide! It isn't too late to change our behaviours.

THE SOLUTIONS ARE BEFORE YOU, NOW IT'S TIME TO IMPLEMENT THEM!

10. QUIZ
CIRCULAR ECONOMY

1. CIRCULAR ECONOMY
IS THE SAME AS RECYCLING

TRUE | FALSE

2. IN A CIRCULAR ECONOMY WE CAN RENT
SERVICES INSTEAD OF PURCHASING THEM

TRUE | FALSE

QUIZ
CIRCULAR ECONOMY

3. IF LESS PRODUCTS ARE MANUFACTURED, UNEMPLOYMENT WILL RISE

TRUE | FALSE

4. PRODUCTS DEVELOPED WITHIN A CIRCULAR ECONOMY HAVE TO BE EASILY DISASSEMBLED, REPAIRED AND RECYCLED

TRUE | FALSE

QUIZ
CIRCULAR ECONOMY

5. THE CIRCULAR ECONOMY IS DETRIMENTAL TO COMPANIES

TRUE | FALSE

6. NATURE IS THE ORIGINAL CIRCULAR ECONOMY

TRUE | FALSE

QUIZ
CIRCULAR ECONOMY

7. THE CIRCULAR ECONOMY DOESN'T CONTRIBUTE TO REACHING THE TARGET OF CLIMATE NEUTRALITY

TRUE | FALSE

8. THE CIRCULAR ECONOMY IS ALREADY UNDERWAY

TRUE | FALSE

QUIZ

CIRCULAR ECONOMY

9. IF WE IMPLEMENT A CIRCULAR ECONOMY, WE CAN PRODUCE MORE WASTE

TRUE | FALSE

10. THE CONCEPT OF CIRCULAR ECONOMY CAN'T BE LINKED TO ONE SINGLE AUTHOR

TRUE | FALSE

Circular Economy Guide

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