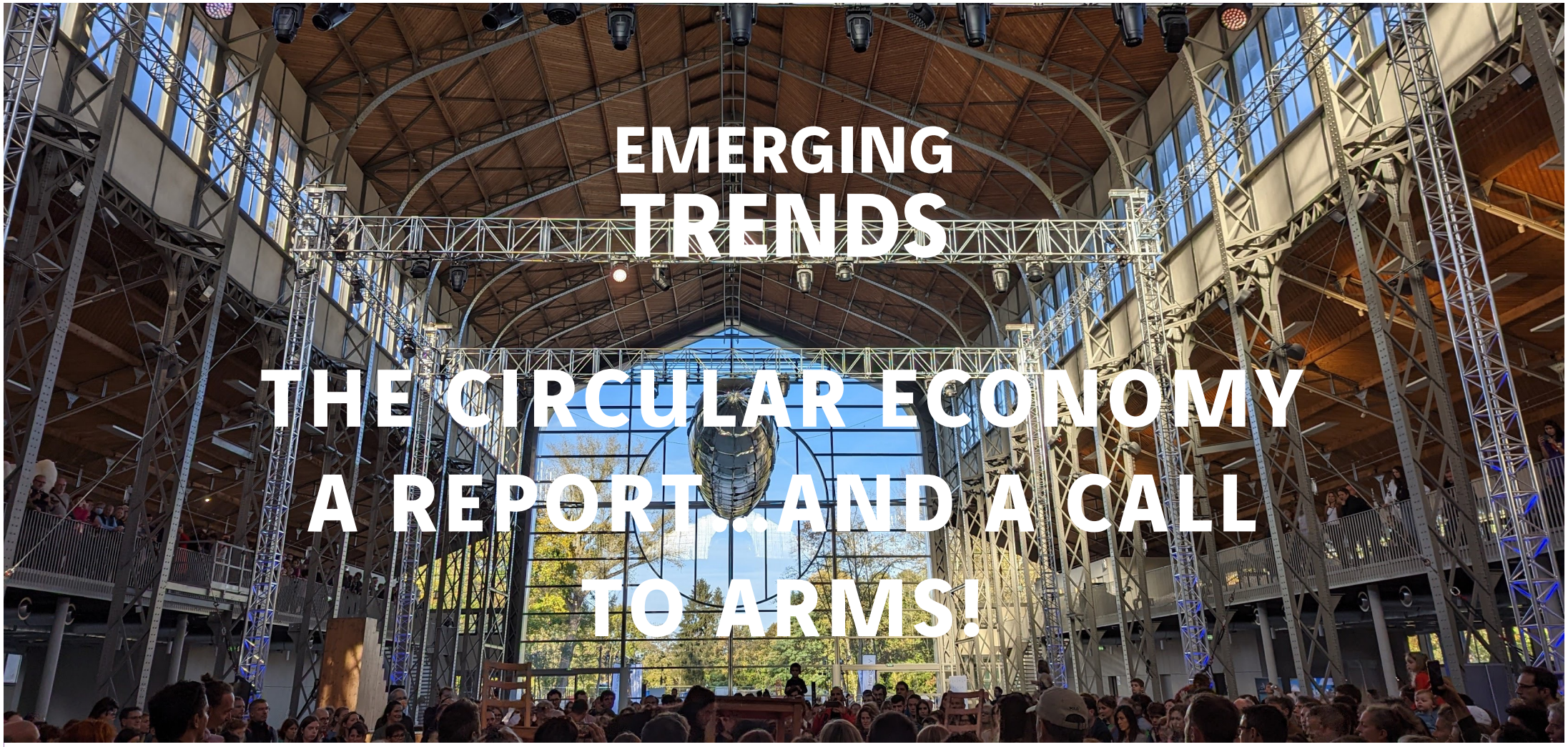


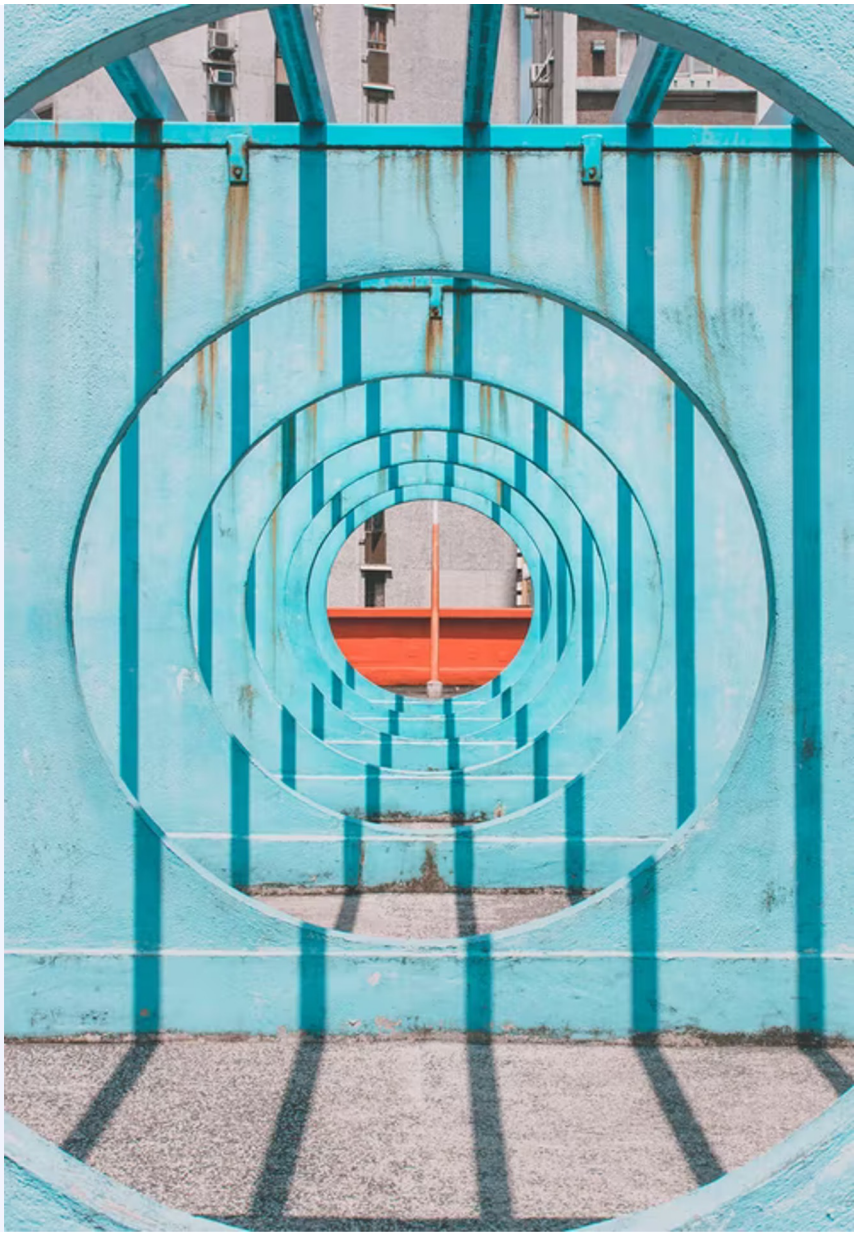
EMERGING TRENDS

THE CIRCULAR ECONOMY A REPORT...AND A CALL TO ARMS!

Circul'R

LEONARD together @ VINCI

TABLE OF CONTENTS



I. 2023:
A PIVOTAL YEAR

INCREASED AWARENESS

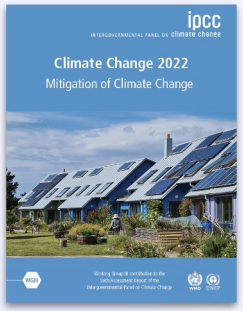
After a year 2023 marked by **waves of drought and fires**, particularly in Canada and Europe, as well as large-scale disasters such as floods almost everywhere in the world, **awareness of the climate emergency** seems to have finally spread beyond the scientific and activist sphere to the general public.

At the same time, **the sixth assessment report by the Intergovernmental Panel on Climate Change (IPCC),** the summary of which was published in March 2023, stresses the need for **immediate action in all sectors** to deal with the accelerating pace of climate change and its consequences. It points out that each fractional increase in global warming intensifies the multiple and simultaneous risks.

Without an urgent strengthening of current climate policies (drastic reduction in GHG emissions), we are heading for a temperature rise of 3.2°C by the end of the century, which would make the world unliveable in many regions and for many species..

Sources : AR6 Synthesis Report: Climate Change 2023 (March 2023

FINDINGS CONFIRMED BY THE IPCC



The latest IPCC report indicates that fast-paced, far reaching and in most cases, immediate reduction of greenhouse gas emissions (GHG) in all sectors is necessary, according to trajectories modelized on a worldwide scale limiting global warming to 1.5°C or 2°C.

This is why, in 2022, the IPCC called for usage sobriety combined with the deployment of low carbon technical **solutions which are already in practice, or about to be industrialised**.

CONSTRUCTION

61% of GHG emissions in construction can be prevented by 2050 via:

- Energy efficiency policies;
- Ambitious strategies aiming to reduce demand of energy and materials;
- The deployment of renewable energy

Different priorities according to different countries:

→ ***Developing countries***: construction of new, environmentally performing buildings

→ ***Developed countries***: renovating existing buildings

INDUSTRY

For industry, the reduction of emissions implies coordinated actions affecting every link in the value chain:

- Managing demand
- Material and energy efficiency
- Circular strategy
- Structural changes in the production processes

ENERGY

2 major transitions are necessary in order to reduce GHG emissions:

- Substantial reduction in the worldwide use of fossil fuels
- Deployment of low carbon energy sources

> ***We are now at a cross-roads. The decisions we make now can secure a livable future. We have the tools and know-how required to limit warming.***
>
> ***Hoesung Lee, IPCC President (2022)***

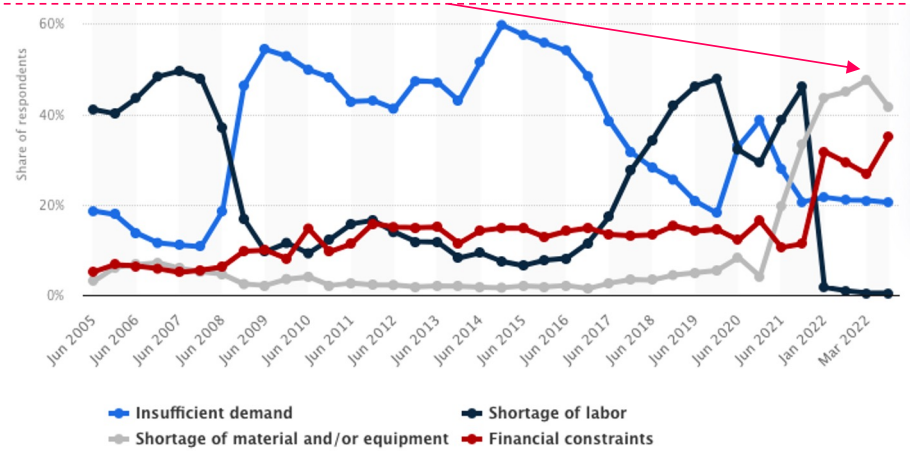
Sources: IPCC. (2022). Climate Change 2022, Summary for policymakers

TOWARDS A GLOBAL CONFLICT OF RESOURCES ?

Global 2023's 'overshoot' day : **2nd August**
(In 1970, global overshoot day was on December 29th…)

Demand for copper in Europe in 2050 vs 2020 : **+35%**

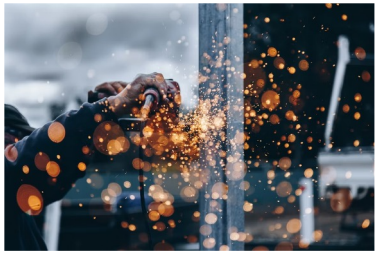
Factors limiting construction activity in France, between 2005 and 2022: shortages of material and/or equipment are increasingly burdensome



Sources: Statista (May 2022),
KU Leuven. (2022). Metals for Clean Energy: Pathways to solving Europe's raw materials challenge

Finite Resources

Resources in sand, essential for the construction sector, could be completely depleted by 2050



Material Shortages

According to a European survey, 29% of construction companies cited shortages of materials and/or equipment as the main factor limiting their construction activity in 2022.

Accumulation of Waste

Annual waste production could increase by 70% from 2016 to 2050 if the ***status quo is maintained***

Sources : National Footprint and Biocapacity Accounts, Mette Bendixen et al. (2019). Time is running out for sand, Nature . What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050 World Bank (2018)

TODAY, THE ENVIRONMENTAL IMPACT OF CONSTRUCTION IS COLOSSAL...

WORLD

~50%

Of resources extracted worldwide are used for construction

230

Billion m^2 of new buildings are scheduled to be built over the next 40 years

13%

Of materials delivered to a building site are directly sent to landfill without having been used

EU

30%

Of waste produced in the EU every year comes from the construction sector

75%

Of European real estate available is inefficient when it comes to energy consumption

36%

Of CO_2 emissions in the EU come from the construction sector

Still looking for a good reason to adopt a circular model?
Emerging Trends : Building a circular economy, here and now!
II.3. A source of environmental, economic and social value (p. 21)

Sources: World Bank. (2018). What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050 / WBGC. (2021). Beyond the business case
European Commission. (2021). European Green Deal: Commission proposes to boost renovation and decarbonisation of buildings

… AND WASTE FROM BUILDINGS REPRESENTS 19% OF TOTAL WASTE FOR THE BUILDING AND PUBLIC WORKS SECTOR

Or **46 millions of tons each year** (as an element of comparison, household waste represents about 30 million tons per year), and **49 %** comes from **demolition**, **38 %** from **rehabilitation** and **13 %** from new **construction**.

75%

of the total volume of waste produced is **inert**

For ex: bricks, concrete, tiles, glass, and so on

60 to 70% recovery rate

23%

of the total volume of waste produced is **neither dangerous nor inert**

For ex: wood, plastic, metal

30 to 50% recovery rate

2%

of the total volume of waste produced is **hazardous**

For ex: asbestos, solvents, polluted excavated soil

Source : French Ministry of environment. (2020).

HOW DID IT COME TO THIS?

The “Take, Make, Waste” linear model has led to the exhaustion of resources. Our planet can only provide a finite quantity of non-renewable resources, and already, at present, certain resources can no longer meet worldwide demand (sand, metals, water...).

Resources in sand, essential components of the building and public works sector, may be depleted by 2050. The capacity natural ecosystems have of absorbing pollutants, and waste stemming from human activity, is also limited, and the yearly production of waste could rise by 70% between 2016 and 2050 if nothing is done to address the issue.

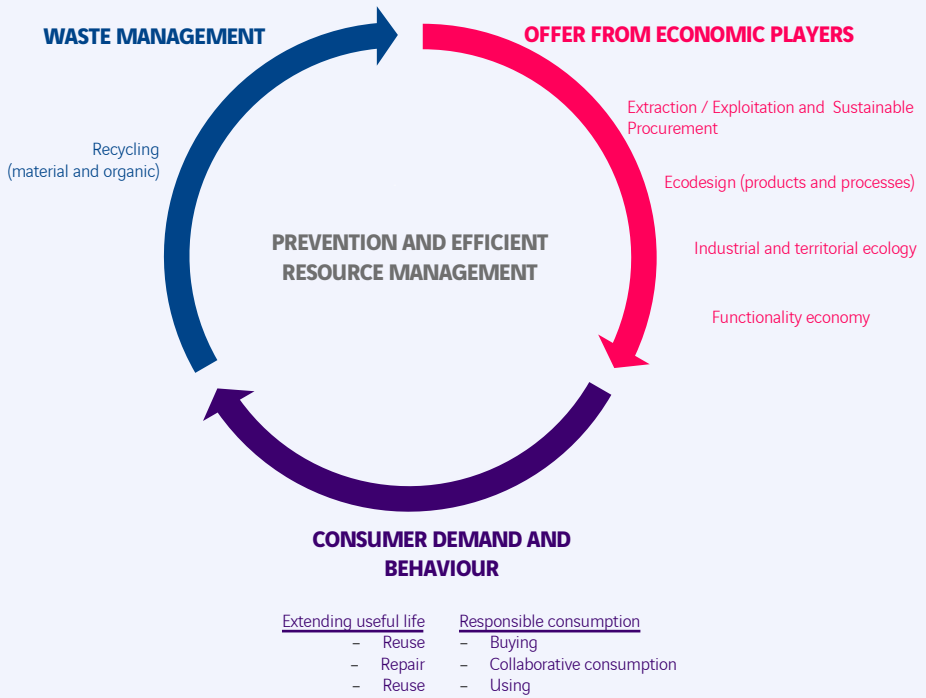
In 2023,
scientists estimate that
6 planetary boundaries
out of 9 have been exceeded.

Find out more about planetary boundaries

THE TIME FOR ACTION HAS COME

We need to drastically reduce our demand for resources (energy, materials, water, soil, etc.) while **ensuring human well-being and social justice**. Sober production and consumption patterns are one of the solutions put forward by the IPCC (Intergovernmental Panel on Climate Change).

To meet this challenge of **reducing demand**, the circular economy proposes an **alternative economic system** that aims to **preserve natural resources** and **eliminate the notion of waste**. The circular economy thus enables the development of **responsible business models** and the creation of new local jobs that cannot be relocated. The most advanced form of the circular economy even helps to **regenerate** natural ecosystems and ensure a **balance** between economic challenges and respect for the planet's limits.

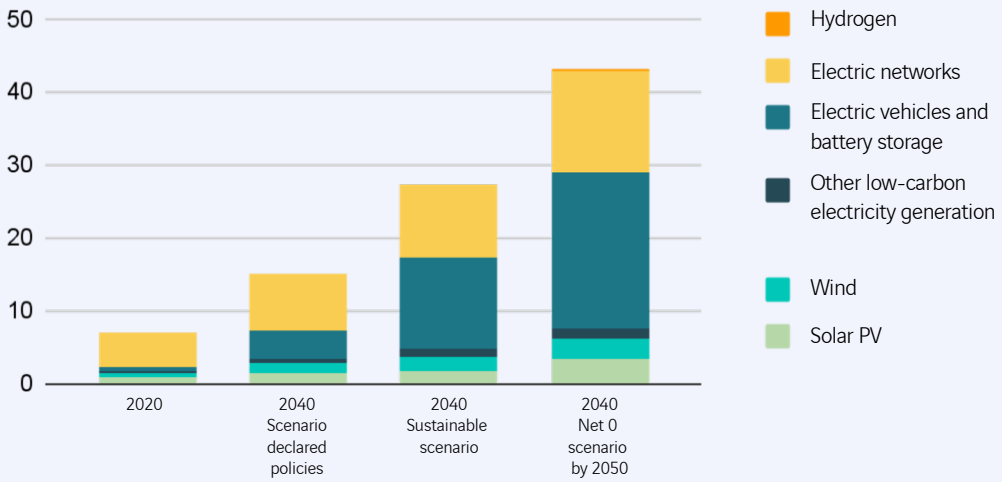


Source : Ademe

II. WHAT ARE THE LEVERS OF CIRCULAR TRANSFORMATION?

THE CIRCULAR ECONOMY IS ESSENTIAL FOR REDUCING GREENHOUSE GASES

Total mineral demand in millions of tonnes (Mt) for clean energy technologies by scenario (2020 vs. 2040)



Note : Does not include steel and aluminium.

Sources : EAI may 2021 The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions ; Circul'R

Compliance with the Paris Agreements and the IPCC recommendations will not be possible without the development of circularity

The objectives of the energy transition and a rapid and significant reduction in greenhouse gas emissions imply :

- **Upstream:** a very sharp increase in the need for minerals and strategic materials, which will have consequences for greenhouse gas emissions, land use and biodiversity.
- **Downstream:** exponential growth in end-of-life materials and equipment, leading to major pollution risks

... hence the need to develop circular loops in order to :

- **Reduce** waste and optimise the use of resources (e.g pooling)
- **Reuse** and recycle as many materials as possible, especially the most strategic ones (cement, steel, lithium, graphite, etc.)
- **Sequestering** carbon in products (by extending their useful life) and in soils (by regenerating them).

THE STRENGTH OF CIRCULARITY:
VIRTUOUS, SELF-SUFFICIENT AND REGENERATIVE

THE 3 GREAT PRINCIPLES OF THE CIRCULAR ECONOMY

1. Eliminates waste and pollution

Waste is an error of conception: in nature, there is no such thing as wastage.

2. Enables the circulation of products and materials

Use resources intelligently and anticipate the end of lifecycles to preserve materials without them losing value

3. Regenerates nature

The circular economy reproduces natural cycles and provides greater breathing space for nature

Sources: Rijkswaterstaat, Holland Circular Hotspot, TNO, Circulaire Bouweconomie. (2022). Circular Infrastructure: the road towards a sustainable future, Consolis. First circular viaduct in the Netherland

WHAT CAN WE DO - IN CONCRETE TERMS?

INTEGRATING THE 5 STAGES OF A CIRCULAR ECONOMY TO OUR ACTIVITIES

1. Better procurement

Preserve natural resources by favouring the use of secondary or renewable raw materials

2. Better Production

Create products that can integrate the different loops that make up the circular economy and **prevent them from going to waste**

3. Better Consumption

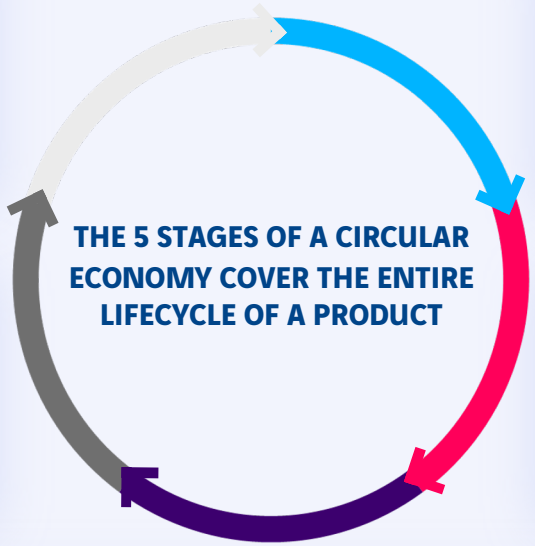
Extend usage periods to limit environmental impact thanks to repairs, leasing and second-hand initiatives.

4. Sorting and collecting

To facilitate revaluing and provide a secure source of secondary quality raw materials

5. Managing new lifespans

Ensure a durable end of lifecycle for products by favouring the shortest circular loops (re-employment, re-use, etc.)



Source: Circul'R, ADEME

CIRCULAR TRENDS THE KEYS TO THEIR APPLICATION

1

The fundamental role of eco-conception

2

Re-use and recycling: two essential elements

3

The innovative character of infrastructure as a service and the utility of urban metabolism

THE PARAMOUNT ROLE OF ECO-CONCEPTION

Eco-conception is becoming increasingly widespread

With **+40 million tons of waste generated per year in** France, including only **2% of hazardous waste**, the building sector is the ideal sector for leveraging the re-use of materials

80%

Of the impact of a product is determined at its point of conception

The conception phase is therefore fundamental in that it shall define the **potential a project has for circularity**, from its materials, and its usage, to the end of its lifespan.
Though eco-conception was still an emerging trend in 2022, it is becoming increasingly widespread in the building sector.

The Netherlands are in advance compared to others!
Eco-conception of the Triodos bank headquarters in 2019 (Annexes, p. 69)
First circular viaduct in 2016 (Annexes, p. 70)

Innovative methods of eco-conception
In 2014, a homeless shelter made up of modular building units, Los Angeles (Annexes, p. 71)

HOW DOES ECO-CONCEPTION WORK?

Eco-conception stands for the whole series of design and production methods allowing us to reduce the environmental impact of a product and service over its entire lifespan.

The building sector faces a combination of **various associated obstacles:**

- Eco-conception can lead to a rise in purchasing and logistical costs (such as virgin materials which are cheaper than local eco-conceived and/or recycled materials)
- **Client needs may limit the** application of eco-conception, notably in terms of building modularity
- Habits as well as lack of commitment and training **when it comes to the teams** responsible for building design limit the application of circular principles
- The sector is **not yet fully digitized** (lack of appropriate tools, multiplicity of players, need for training, etc.)
- The complexity of some construction projects **makes long-term impact analyses difficult to undertake**

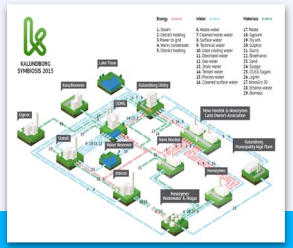
Environmental advantage:
Eco-conception allows us to limit waste and optimise resource flow

Economical advantage:
These construction projects can possess several leases of life, thus allowing the maximisation of building profitability in the long term

Minimise risk:
Eco-conception allows us to anticipate legislation, and adapt buildings as well as infrastructure to climate risk, and also to guarantee greater stability in the supply of raw materials in times of economic crisis and inflation

PLANNING FOR ECO-CONCEPTION MEANS...

ITE*



PLANNING FOR INTERDEPENDANCE

Considering the **integration** of a construction project to its **urban environment** (neighbourhood life, mobility infrastructure, etc.) and its **impact on biodiversity**.

Determining possible **synergies** with companies and other neighbouring infrastructures.

USAGE

PLANNING FOR INNOVATION AND SOBRIETY

Sourcing **durable, local materials** and creating buildings/infrastructures that may be **self-sufficient** in resources, and carbon neutral during their usage phase.

Taking inspiration from nature (biomimetics) so as to optimise resource usage.

BIM

PLANNING WITH FLEXIBILITY FOR INCREASED DURABILITY

Designing projects to resemble **a series of inter-dependent layers** for a greater ease in maintenance and repairs.

Creating buildings that can have **several lives or several uses.**

Basing oneself on tools such as **BIM or material passports, to obtain a global and long-term vision of the building**.

The economy of functionality can also be conducive to reversibility or to the evolutive potential of a construction project.

MULTIFUNCTION

TRAINING

PLANNING FOR COLLABORATION

Apply different loops and circular economic models to (de)construction projects implies **close collaboration,** not only with the **project contractor**, but also with the different stakeholders involved in the phases of conception and construction (consultants, architects, etc.).

*ITE = Industrial and Territorial Ecology

RE-USE AND RECYCLING: THE TWO POLES

Re-use and recycling allow us to save resources and reduce waste more efficiently

With **+40 million tons of waste per year in** France, including only **2% of hazardous waste**, the building sector is the ideal sector for leveraging the re-use of materials

90%

Of waste in the construction sector comes from demolition and rehabilitation sites

Re-use allows us to give an object a new lease of life with a view to extending its lifespan. The product keeps its status, as a product, and **at no moment is it turned into waste.**

Recycling designates operations of valuing whereby waste is processed to create substances, materials or products for the same usage or one that differs from its initial function.

RE-USE

Development for re-use is driven by:

- Tenders which increasingly call for the respect of **environmental factors** as a central criterion, and notably waste management.
- A **strong acceleration of behaviour and legal expectations** on the subject (Anti-wastage Law for a Circular Economy, Extended Responsibility for Products and Materials or ERP PMCB 01/23, RE2020)
- **Important price increases and lack of availability of certain raw materials** (steel, wood, polystyrene, PVC, ...)
- **The upheaval of worldwide supply chains** also implies sourcing local alternatives

Faced with the rarefication of certain natural resources, and to address the stakes of climate change and pollution, **re-use therefore presents itself as an** alternative to the extraction and import of virgin materials, and waste disposal.

Economic Advantage:

When re-used, materials can have a price which is inferior to that of new ones, especially when they come from a nearby site (because of the high cost of transporting materials to a building site). Re-employing materials also means saving money when it comes to handling waste.

Sustainable Advantage:

The future of materials is anticipated upstream, lifecycle is extended.

Climate Advantage:

38% of CO_2 emissions connected to construction materials could be reduced by 2050, on a worldwide level, if circular economy strategies are deployed regarding steel, aluminium, cement and plastic.

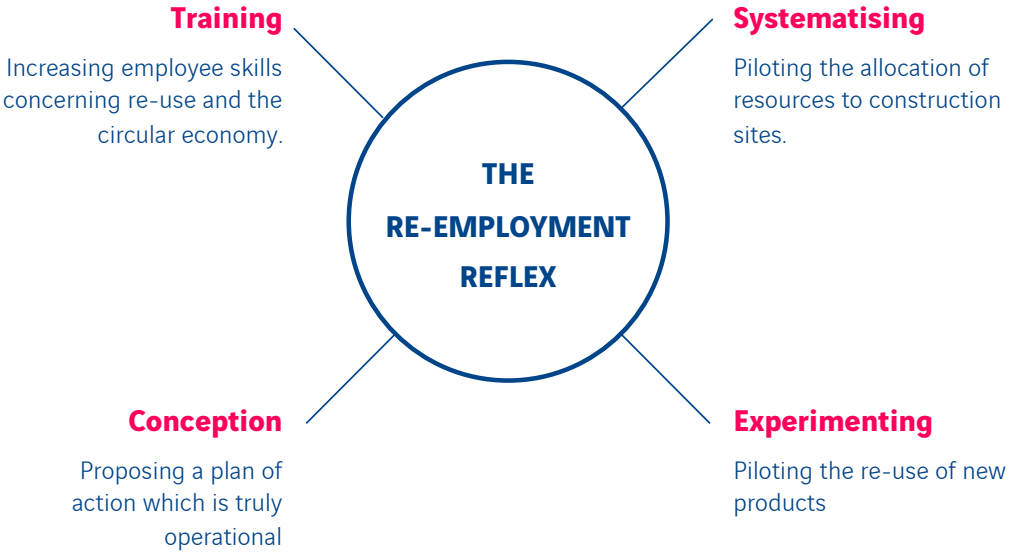
Discover three concrete examples of successful re-use
Building site gates used in the construction of a creche, a municipal building that can be dismantled and be selectively rebuilt (Annexes, p. 72)

*Hazardous waste needs special treatment upon collection, it must be packaged and labelled correctly, and is not easily re-employable.

CASE STUDY: LA RESSOURCERIE DU BTP (VINCI CONSTRUCTION)

Supported by the Leonard Intrapreneurial program, "la Ressourcerie" is **an entity providing expertise for re-use** integrated to the Technical and Operational Resources Direction of the France Building Division at VINCI Construction.

It places knowledge at the service of internal teams and clients, but also develops partnerships with, for example, dredging specialists or reconditioners.



CASE STUDY: R.USED (VINCI CONSTRUCTION)

Inspired by "***Le bon coin", a second-hand retail website,*** R.Used is one of the group's internal applications developed with an aim to becoming **the marketplace for re-use on construction sites.**

Intuitive and user-friendly, it allows a user (such as a site contractor or construction manager) to place an ad online, in order to **sell** new surplus materials, or materials derived from dredging, as well as equipment and site tools which have not been employed; and another user may **purchase** them. It therefore facilitates re-use **between sites and agencies situated close to one another.**

R.USED presents many economic and environmental benefits since, for example, it allows users to:

- Purchase for less
- Prolong the lifespan of materials that are still viable
- Reduce wastage, and generate less new waste
- Help collaborators become aware of what is at stake through this valuing process

This solution, which is part of a strong circular economy drive, is one of the 50 initiatives selected as finalists for the Prix de l'Environnement VINCI and has been developed as part of the Leonard Intrapreneurial program.

R.used

Rien ne se perd

RECYCLING

Certain recycling channels are now regularly used in France (such as those for bituminous coating and aggregates). For other channels (such as plaster and PVC windows) more time is needed to close the gap, notably due to:

A lack of human and technical means to sort through the different types of waste produced and systemise waste diagnostics

A lack of knowledge and awareness when it comes to sorting, to prevent mixing different materials, thereby rendering their retrieval impossible

Collection platforms unequally distributed geographically which can lead to important logistical costs for project managers

Zooming in on... Extended Producer Responsibility (EPR) for Building Sector Products and Construction Materials (BSPC)

France's Anti-Waste and Circular economy Law (AGEC) dated 10th February 2020 includes the establishment of an EPR channel for waste from the building sector, active from January 1st 2023, onwards.

Its objectives?

- Setting up actions to prevent **illegal dumping**: densification of the network of collection points and the setting up of a collection service **without extra fees**
- Developing **channels for recycling and re-using** with substantial profit margins
- Taking on board the management of **magnetized waste**
- Developing better **traceability** to know exactly where this waste ends up

Fiberglass, raw earth, wood

In Belgium, France and Norway, 3 methods for recycling have been adopted by the building industry (Annexes, p. 73)

CASE STUDY: WASTE MARKETPLACE (VINCI CONSTRUCTION)

Founded in 2018, Waste Marketplace is a startup stemming from the Leonard Intrapreneurs program. It offers a digital **solution to simplify the management of waste from construction and industrial sites.**

- **The principle**: allowing construction contractors or site managers to pilot the removal of skips in a quicker and more efficient manner.

- **How?** Via an application which is easy to use:

  1. **Get organised.** Waste Marketplace is then in charge of finding the adequate provider(s) to handle the waste.
  2. **Follow** the handling process of your waste in real-time.
  3. **Master** valuation metrics thanks to well rounded and consolidated reporting.

Waste Marketplace

Waste Marketplace also accompanies its employees in the deployment of made to measure solutions to manage atypical waste and improve waste valuation levels.

It is based upon a network of waste processing entities and the solutions offered aim to encourage re-use, as well as optimization of materials and energy efficiency.

CASE STUDY: GRANULAT + (VINCI CONSTRUCTION)

Granulat+ is a brand of VINCI Construction Route Division France dedicated to the circular economy of materials.

Every Granulat+ site welcomes mineral waste from construction and industry which is procured through various channels (inert deconstruction waste, soils, railway waste, etc.) and commits to giving them the most appropriate second life.

Its objective: **substituting as many natural granulates as possible with granulates made from a recycled base**. In fact, after water, granulates make up largest resource consumed by mankind.

GRANULAT+
LA QUALITÉ ENGAGÉE

Through this brand, VINCI Construction offer:

- The greatest number of sites for the collection of mineral waste from the construction and public works sector as well as industry (144 sites in France)
- The largest commercial offer of quality granulates with a recycled base (8 million tonnes of granulates with a recycled base per year)
- Solutions to add value to its property thanks to the remodelling of quarries.

CASE STUDY: PERPETUAL QUARRY (VINCI CONSTRUCTION)

This project has the support of ADEME (French Environment and Energy Management Agency), notably in the conception phase of the tool, designed to be as environmentally virtuous as possible:

- Environmental Integration at the heart of its conception
- Transparent-anti noise barriers
- Electrical Conception
- Retrieval of rainwater in a closed circuit as part of the process

Since 2020, over 350 000 tonnes of refuse have been recycled into granulates which can be used for the construction of new projects. The jury of the Prix de l'Environnement VINCI awards singled this initiative out for a special award - the "Grand Prix".

Photo of the Tourville-la-Rivière site (27)

Situated in Tourville-la-Rivière (Eure, North-western France), this former quarry has been turned into a recycling platform for inert debris. A tool has specially been conceived to wash and sieve these products.

THE INNOVATIVE CHARACTER OF INFRASTRUCTURE AS A SERVICE

The Infrastructure as a Service (IaaS) model contributes to changing the outcome of certain projects

5%

Of **infrastructure needs** (energy, transport, water, telecommunications and social needs) contributed to around **5%** of **EU GDP in 2016.**

IaaS or "infrastructure as a service"

IaaS is an **economy of functionality** model which encourages the application of different circular strategies all through the lifecycle of an infrastructure.

The construction manager is notably encouraged to use **high quality, easily replaceable and low maintenance**, sustainable materials **as well as** building the infrastructure in a manner that facilitates and values its **deconstruction.**

Sources: Rijkswaterstaat, Holland Circular Hotspot, TNO, Circulaire Bouweconomie. (2022). Circular Infrastructure: the road towards a sustainable future, De Circular Weg,

INFRASTRUCTURE AS A SERVICE – A CIRCULAR INFRASTRUCTURE

There are many challenges linked to the construction of infrastructures:

- **Ecological impact**, land use, **acceptation and integration** to a rural or urban setting
- Mobilisation of public funds to **modernise and renovate existing infrastructures**
- Acceleration of energy **transition and development of new** infrastructures adapted to **new practices in mobility**
- **Difficulties in concluding contractual deals** because of the duration and complexity of construction projects

In an IaaS (Infrastructure as a Service) contract, **the project manager is the owner/exploiter of the infrastructure** for an arranged period, whereas the **client purchases usage of the infrastructure** by paying fixed periodical fees.

IaaS or "infrastructure as a service" is an economic model of **functionality which** encourages the application of different circular strategies at every stage in the infrastructure's lifespan.

The project manager is notably **encouraged to use sustainable, high quality and easily replaceable materials** that do not require heavy maintenance **as well as** build this infrastructure in a manner that **facilitates and values its deconstruction.**

Economic Advantage

This model maximises the short-term profitability of infrastructure projects thanks to the use of sustainable materials which minimise maintenance costs, and which can then be resold at their maximal price or re-used at the end of their initial usage period

Circularity Advantage

Mainly adapted to relatively short-term projects, IaaS is conducive to the application of the shorter cycles of the circular economy as well as the conception of reversible projects

Environmental Advantage

Retaining the properties of materials used by the project manager triggers a maximisation of the infrastructure usage value in the long term, whilst also minimizing consumption of energy resources

In the Netherlands (again!), 7 pilot projects tested Iaas

In 2022, the entities mobilized delivered their conclusions, which can be accessed here !

Sources: Rijkswaterstaat, Holland Circular Hotspot, TNO, Circulaire Bouweconomie. (2022). Circular Infrastructure: the road towards a sustainable future, De Circular Weg, Inès Belhajjam et Juliette Cohen. (2021). Le Plan d'infrastructure Européen

CIRCULAR ROUTES: DE CIRCULAIRE WEG

A MULTI-PARTNER APPROACH

The first De Circulaire Weg programme, which lasted 2 years, is a collaborative programme between Dura Vermeer (builder), public players (3 provinces and 3 municipalities) as well as the Delf University of Technology, ABN AMRO, Nederlandse Waterschapsbank and Sweco. These stakeholders came together to test IaaS by **launching 7 pilot projects in the Netherlands.** Building on the successes achieved, the stakeholders have announced the launch of new pilot projects with the aim of refining the De Circulaire Weg approach and preparing it for scale-up. The results will be shared with the construction industry at the end of 2024.

CONCRETE OBJECTIVES

This programme aims to encourage the application of circular models to infrastructures. Unveiled in June 2022, the results of the programme have identified a number of **advantages to IaaS**, including

- A reduction in environmental costs of between 30% and 80% (according to the Environmental Cost Indicator)
- An opportunity to test new materials
- A contribution to improved cooperation
- A development of thinking about the entire lifecycle of the infrastructure sharing knowledge across the entire value chain.

The **following obstacles** have also been identified:

- complex definition of the terms of the long-term service contract
- the need to determine the residual life and residual value of the infrastructure
- legal issues relating to the transfer of control.

IaaS vs Concessions

- IaaS is more adapted to short-term contracts as well as reversible infrastructure projects
- Running and construction fees are paid by the construction manager instead of by the infrastructure users (for ex: motorway toll gates)
- Ownership of the infrastructure and its materials is retained by the project management

> ***Besides stimulating the circular economy, an "As a Service" contract also introduces a new way of working together. You spend more energy focusing on the achievement of a common goal than on technical details. As a client, you offer the market more freedom to find the right solutions. As a result, the client uses market knowledge and the capacity for innovation provided by market players in an optimal manner.***
>
> **Twan Cortenraede, Sweco**

THE UTILITY OF URBAN METABOLISM

“Urban metabolism" encourages the application of circular economy strategies on an area-wide scale, for example through better management of resources, the identification and mapping of material deposits, the study of flows, etc.

It gradually transforms the way the city functions as a whole.

70%

Of **greenhouse gas emissions** are produced by towns and cities, which also consume 75% of resources though they only occupy 2% of the planet.

Urban Metabolism

Urban metabolism consists in studying **the incoming and outgoing flow of energy and materials** and the key players necessary for the functioning of a given geographical territory, as well as determining the **stocks of materials that it contains**.

It reveals the degree of **linearity of cities that chiefly depend on non-circularised flow** and that most products and materials in a non-local fashion.

URBAN METABOLISM: AN ECO-SYSTEMIC VISION OF A GIVEN TERRITORY

Urban metabolism allows us to facilitate the **adoption of circular economy strategies** when applied to a given territory:

- Knowledge of how a city environment functions allows us to better manage our resources, to source more locally, to predict future waste as well as **create a circular loop for incoming and outcoming flows**
- The identification and mapping of the sources of **materials used in buildings and** infrastructure networks is conducive to these materials being **re-used**
- Studying incoming and outcoming flow contributes to setting up **programmes of Industrial and Territorial Ecology (ITE)** involving those managing the construction, the buildings themselves and infrastructure

Sources: Circular Urban Metabolism Framework, Yuliya Kalmykova et Leonardo Rosado. (2015), Urban Metabolism as Framework for Circular Economy Design for Cities

Economic Advantage

Perspectives for the re-use of materials stored in buildings and networks allows us to maximise their long-term value as well as to minimise the cost of renovation and demolition.

Risk Reduction

Mapping the interactions of the urban landscape sheds light on existing interdependence, and therefore encourages cooperation between different players. They can also work together to increase the resilience capacity of a city faced with climate change.

Environmental Advantage

Considering a city as an ecosystem allows us to integrate buildings in such a way that they address urban needs as best they can. This may therefore have a positive impact on the city and its inhabitants but also on biodiversity, whilst also minimising carbon footprint.

A metabolic analysis to circularise a given territory

This project was undertaken in Seine-Saint-Denis from 2017 to 2020 (Annexes, p. 74)

WHAT ARE THE 3 MAIN CHALLENGES WE FACE ON THE ROAD TO SUCCESS?

Challenge n°1

CONQUERING THE SYSTEMIC INERTIA OF THE INDUSTRIAL SECTOR

The sector is like an ocean liner which must be manoeuvred: changes in processes and industrial techniques are tricky to put into place and there is a strong adherence to entrenched ways of thinking and acting, especially in construction, energy and also in transport.

Challenge n°2

MANAGING TO ADAPT TO DIFFERENCES ON AN INTERNATIONAL LEVEL

There are different speeds of integration for the principles of circular concepts according to countries and regions, whether this is because of regulations in application, or down to cultural behaviour. It is therefore necessary to work with local counterparts who can carry and adapt the strategic axes of circular transition.

Challenge n°3

GETTING PAST A SHORT-TERM VISION

Challenges connected to price may slow down circular innovation. To put this innovation into application and reap its benefits, we must shift to a long-term vision.

III. REGULATORY TRENDS

A FAVOURABLE LEGISLATIVE AND REGULATORY FRAMEWORK

> ***Those who move a mountain begin by carrying away small stones.***
>
> ***Confucius***

We need laws, guidelines and obligations to foster a dynamic. The circular economy in the construction sector possesses the potential for unprecedented acceleration thanks to ambitious objectives determined by the EU, objectives France is in the process of incorporating.

A MULTIPLICATION OF CIRCULAR ECONOMY REGULATIONS IN THE EU

Circular Economy Action Plan - March 2020

The Circular Economy Action Plan (CEAP) is a key element of the European Green Deal. Structured around **35 actions** addressing the different challenges of the circular economy, the CEAP **paves the way for the circular transition of the EU.**

Construction Product Management - March 2022

Two years after the CEAP, the revision of the Construction Product Management (CPM) law imposes criteria of **circularity for products concerned by the** legislation, thereby accelerating the transition of the construction sector towards a circular economy.

REPower EU - March 2022

The objective of this strategy is to put an end to the **import of Russian fossil fuels by** 2030. This implies a substantial effort in terms of **transition and energy sobriety** and calls for the **application of circular concepts.**

Fit For 55 - July 2021

For this series of measures, the EU fixed a new objective in the **reduction of GHG emissions : 55% by 2030,** compared to 1990. As construction is responsible for 36% of CO_2 emissions in the EU, this sector is therefore largely concerned by these proposals.

Eco-design for Sustainable Products Regulation - March 2022

The Eco-design for Sustainable Products regulation is part of the CEAP action plan and calls for **changes in eco-conception, notably for materials with a strong environmental impact** (iron, steel and aluminium).

A FRENCH CIRCULAR STRATEGY THAT IS TAKING SHAPE

RE2020 / Loi ELAN - November 2018

The 2020 Environmental Regulations set ambitious climate targets for the construction of new buildings, particularly in terms of :

1) energy performance
2) reduction of the carbon footprint of buildings
3) 3) well-being and health of occupants

More info on associated circular opportunities slides 77-78

Loi Climat et Résilience - August 2021

This law revisits part of the proposals for the **Citizen's Convention for Climate** so as to accelerate the ecological transition of the French economy. Each of its **4 main axes** concerns the construction and public works sector which is in charge of planning its decarbonation strategy.

Discover the measures of the Climate and Resilience law that concern construction slide 80

Loi AGEC - February 2020

The Anti-Waste and Circular Economy Law (AGEC) is entirely dedicated to the circular economy. Among its 5 axes for action, "producing better" as well as "fighting waste and encouraging coordinated re-use" **form bases to accelerate the adoption of circular practices in the construction and demolition** of buildings and infrastructures.

The consequences of the AGEC law on construction can be consulted slide 79

Project of law for a green industry - March 2023

The aim of this bill is to

1) position France at the forefront of green industry and decarbonisation technologies
2) 2) help industry reduce its greenhouse gas emissions. To achieve this, the circular economy has been identified as a key lever for accelerating industry's transition to a low-carbon economy.

AND IN OTHER PARTS OF THE WORLD…

> ***“it is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able best to adapt and adjust to the changing environment in which it finds itself..***
>
> ***Darwin***

The human race as a whole must adapt to climate change. However, even though the COP27 has shed light on how hard it is to get all 200 countries to move forward in unison, certain geographic zones such as Africa and Latin America already benefit from well anchored behaviour patterns which are expressions of a circular economy. Though these have often been adopted to make up for a lack of resources, today, they constitute definite advantages upon which these countries are seeking to capitalize.

CIRCULAR TRENDS IN AFRICA...

A recognition of the importance of the circular economy on a continental scale...

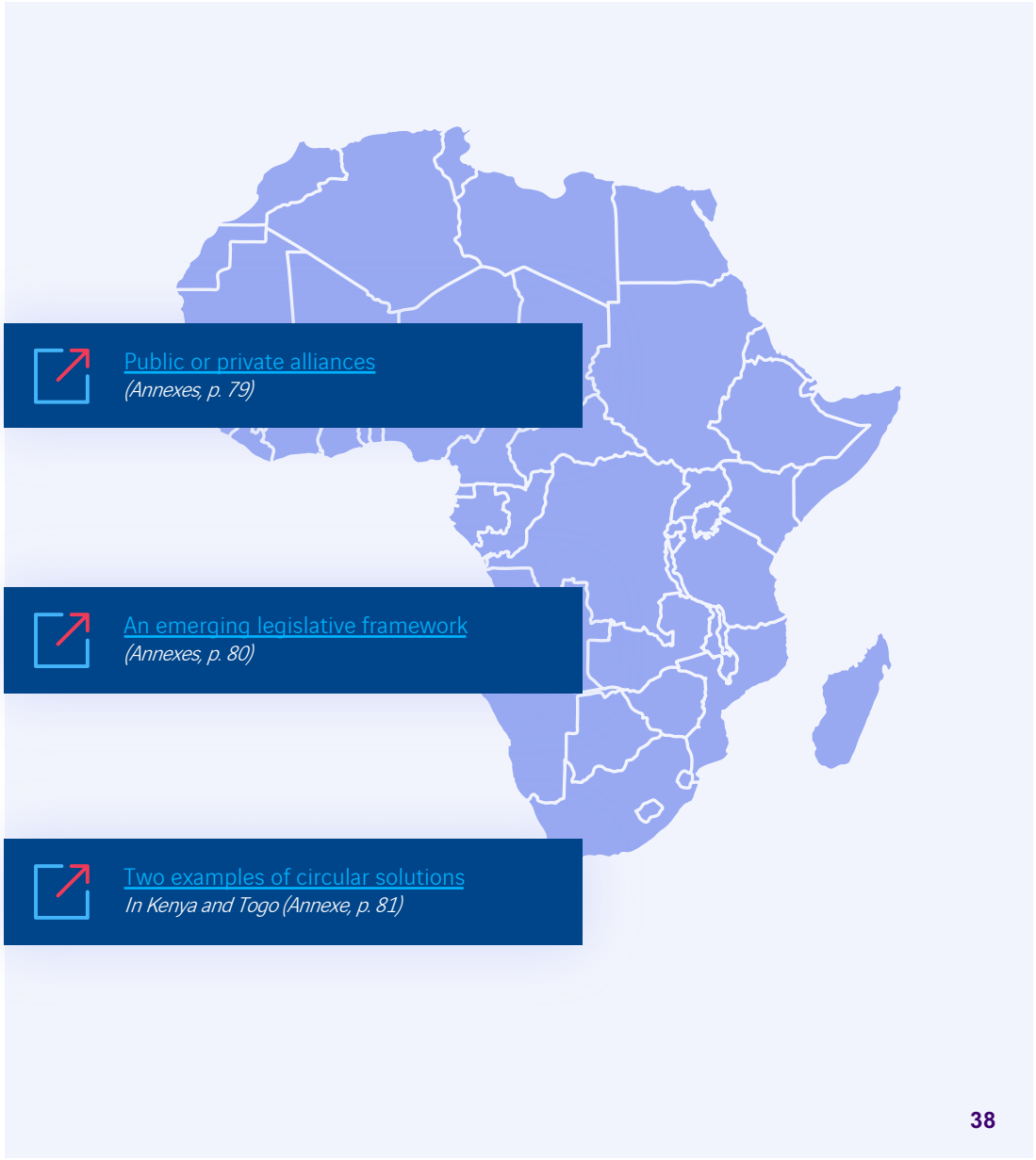
Alliances and **projects** take shape on a continental scale to stimulate the transition of Africa towards a circular economy.

...facilitated by the emergence of legislation...

Faced with repeated ecological and climate crises, governments on the African continent see the circular economy as a solution to bring together economic and demographic development, as well as the preservation of nature.

...and backed by local constraints of development

Often borne from necessity, habits and models of re-use, repair and collaboration are widespread within African communities.



Public or private alliances
(Annexes, p. 79)

An emerging legislative framework
(Annexes, p. 80)

Two examples of circular solutions
In Kenya and Togo (Annexe, p. 81)

TWO EXAMPLES OF CIRCULAR ECONOMY INITIATIVES IN AFRICA WHICH HAVE BEEN AWARDED THE VINCI ENVIRONMENT PRIZE (1/2)

CONTEXT –LATERITE LIVING FACILITIES PROJECT

Most construction projects involving SOGEA SATOM, a subsidiary of VINCI Construction, call for the prior organisation, preparation and installation of building sites, which includes living facilities. Living facilities represent about **5% of** SOGEA SATOM **CO_2 emissions** which are mainly:

- **Short-term installations** not designed to extend construction site lifespan
- Electrically powered via **diesel generators**
- Fuelled by water coming from **underground reserves** accessed by boring wells
- A source of **non valued waste**

SOLUTION - LATERITE LIVING FACILITIES

To minimize the impact of these facilities, SOGEA SATOM tested a new construction technique on the Lena-Tibati Road construction site in the Cameroon, a construction technique using Compressed Earth Bricks (CEB). A simple technique, using natural, locally available materials, and one which is accessible at a reduced cost:

- **Origin of the project**: the idea emerged due to the degraded state of the road leading to the living facilities of the construction site, which led to difficulties in providing traditionally used construction materials
- **Process** : mix of laterite soil and water to which about 4% of cement is added so as to increase the mechanic resistance of the bricks (compared to about 50% of cement for standard breeze blocks)
- **Stakeholders**: cooperation with the HYDRAFORM company, distributor of Hydraform machines used in the manufacture of compressed earth bricks, which had closed two years previously - SOGEA SATOM collaborators used HYDRAFORM machines.

Source : Vinci

TWO EXAMPLES OF INITIATIVES CONCERNING A CIRCULAR ECONOMY IN AFRICA WHICH HAVE BEEN AWARDED THE VINCI ENVIRONMENT PRIZE (2/2)

CONTEXT - "GREEN" COAL PROJECT

The government of Tchad **banned the production, distribution and use of charcoal** in December 2008, but this measure remained without effect because of the **absence of an easily accessible alternative source of fuel** for the population. This project, set up by SOGEA SATOM, consisted in **replacing charcoal** with a combustible manufactured locally, **from resources which are often not valued and yet easily available.**

SOLUTION : ENERGETIC BRIQUETTES CREATED FROM BIOMASS

The objective is to contribute to the fight against climate change by offering the population a solution at an affordable price, therefore allowing them to **limit the illegal exploitation of firewood,** and also value plant waste:

- **Process** : production of "green coal" or "energy briquettes" - a combustible made from green waste or renewable biomass produced by living facilities, construction projects and other sites, thanks to a carbonation process
- **Stakeholders**: cooperation with ADID (Sustainable and Integrated Development Action), an organisation taking part in the drive to meet sustainable growth objectives, and subcontractor of SOGEA SATOM for waste management

... BUT ALSO IN SOUTH AMERICA

A common vision of the circular economy...

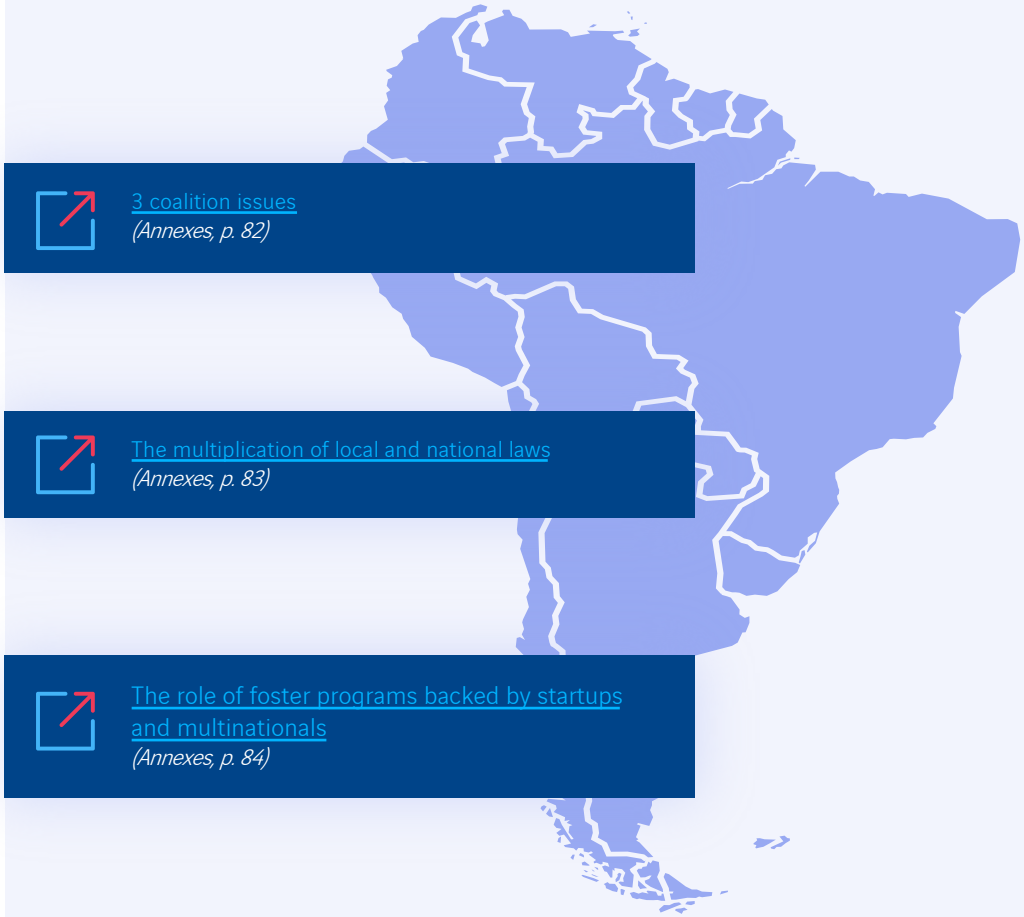
In February 2022, the **Circular Economy Coalition of Latin America and the Caribbean** published its shared vision of the circular economy, so as to guide and facilitate cooperation between countries on the subject.

...carried by the multiplication of national legislation bolstering the circular economy...

Setting up of regulations in favour of the circular economy, notably to **fight plastic pollution and the proliferation of waste.**

...and accelerated by the growth of sustainable ecosystems

Faced with the challenges of pollution, of insufficient public infrastructure and of a lack of information amongst local populations, we have witnessed **an emergence of dynamic ecosystems and innovative solutions** where the circular economy is concerned.



3 coalition issues
(Annexes, p. 82)

The multiplication of local and national laws
(Annexes, p. 83)

The role of foster programs backed by startups and multinationals
(Annexes, p. 84)

https://buildingcircularity.org/regional-trends-latin-america-and-the-caribbean/
https://petarostojic.medium.com/latin-america-goes-circular-5d1b73a96c27
https://www.unido.org/sites/default/files/files/2020-09/circular_economy_lac.pdf
https://www.unido.org/sites/default/files/files/2020-09/circular_economy_lac.pdf

LEONARD

IV. CASE STUDIES FOR INSPIRATION

THEY TOOK THE PLUNGE!

From Interface, which is a **pioneer and leader in the circular industry**, to FNAC Darty, which is **anticipating legislation on sustainability**, to Schneider Electric, which has created a **label for products** from the circular economy,

From Michelin, which has made **lifespan** its strategic differentiation angle, to Icade, which is converting **old buildings**...

Here are a few inspiring case studies.

Interface®

FNAC DARTY

Schneider Electric

MICHELIN

ICADE

INTERFACE CASE

> *If all manufacturers had done what we did in the 90s, we wouldn't need to reverse the curve as much or at least adapt to the climate emergency.*
>
> *Laetitia BOUCHER,*
> *Directrice Développement durable – Europe du Sud*

Interface®

INTERFACE
PIONEERING THE CIRCULAR ECONOMY

1994

Launch of **Mission Zero®** to eliminate all negative impact on the environment by **2020**

1995-97

Setting up of the **ReEntry® recycling program**, a framework to **measure environmental impact** (EcoMetrics), a partnership to create **recycled nylon** & the publication of the **1st environmental company report in the world**

2000-10

R&D and innovation products: biomimetic carpeting, underlays which are up to 80% recycled, installation of floor covering without glue, 100% recycled nylon

2012-17

Launch of the **Net-Works™ program** (fishing nets), and of a new mission, **Climate Take Back™ , *who have created*** the prototype for a slab with a negative carbon **footprint**

2017-19

Adhesion to **NextWave Plastics** and **materialsCAN,**

Creation of **CircuitBac™ Green** (an underlay with a negative carbon footprint) and the **Carbon Neutral Floors™** program

Worldwide meeting of sales forces on the theme of climate change

2019-21

The objectives set by **Mission Zero®** were met in 2019

Innovation, with the launch of CQuest Bio in 2020 and the 1st ever collection of negative CO_2 impact paving slabs, "***cradle to gate".***

Large scale launch of **Climate Take Back™**

Source: Interface website

CASE STUDY: INTERFACE, A FORERUNNER OF THE CIRCULAR ECONOMY

Pioneers in the field of sustainable growth in the industrial sector, Interface initially aimed to **address** challenges related to climate change (Mission Zero®). Today, they are attempting to **reverse** the curve of global warming or at the very least, find solutions to help us **adapt** to this issue (Climate Take Back™).

The actions of the company to promote the circular economy (reduction, eco-conception, recycling) are also part of a **more global strategy** to reduce environmental impact **as much as possible**.

85%

Reduction in waste sent to landfill since 1996

76%

Reduction in the carbon footprint related to carpeting manufacture since 1996

Factories as a Forest (FaaF) Methodology

In collaboration with Biomimicry 3.8, Interface has developed a methodology allowing companies to create infrastructures providing the same benefits as high performing natural ecosystems.

This therefore allows us to go one step further than traditional “zero impact” policies.

If all of industry had taken the same steps as we did, in the 90s, we would not need to work so hard to reverse the curve, or at the very least, to adapt to climate emergency.

Laëtitia BOUCHER,

Regional Sustainability Manager for Southern Europe

INTERFACE CIRCULAR STRATEGY

Catalysers

Strong ambition and vision

Ray Anderson has laid the foundations for a strong, **clear vision for the next 20 years.** Interface is not afraid to set the **bar very high** and to put in place the resources needed to achieve its objectives via a **transparent action plan.**

Internal commitment and awareness-raising

Employees have always been **keenly aware** of climate issues and invested in Interface's major missions. Now **they're asking** to do even better!

Regulations

Interface is heavily involved in **work on new regulations** to ensure that they **move in the right direction** (e.g. pushing for reuse in the PMCB EPR, work with AFNOR, etc.).

Frameworks and indicators

Since the launch of its Mission Zero, Interface has developed its **own frameworks** for monitoring its progress and areas for improvement. The indicators **serve the missions** that the company has set itself.

Challenges

Differences in speed

Depending on the geographical area, it is more or less easy for Interface to get its key messages across about its climate action. Customers are moving at a slower pace than the missions Interface has set itself, particularly when it comes to the regenerative economy.

Investment requirements

Recent developments at Interface (FaaF, new ranges with very high environmental performance) require heavy investment that is difficult to raise, particularly during particularly during a pandemic.

Local relays

It is essential to succeed in raising awareness and training sales representatives in the various countries so that the messages are harmonised. Commercial issues tend to take precedence, particularly in times of cost pressure.

CASE STUDY: FNAC DARTY

> *De-consumption is not a threat to us.*
>
> *Enrique MARTINEZ,*
> *General Manager of the Group*

FNAC-DARTY:
PIONEERS OF SUSTAINABLE RETAIL FOR A CIRCULAR ECONOMY

1960-79

1968 : Darty creates its very **1st After sales service**

1972 : the FNAC creates its **1st independent trial lab** for products

1980-99

1984 : Darty becomes a partner of **Envie**

1988 : Darty creates **DACEM,** a company enabling it to source spare parts for repairs more easily.

1996 : Darty launches the **Contrat de Confiance** consisting in extending product warranties by 5 years.

2000-2017

2014: Darty launches the **Bouton Darty**, an after-sales service available at the touch of a button, 24/7

2016: officialization the news that Fnac and Darty have **joined forces**. Purchase of **WeFix** (repairs and reconditioning of Smart Phones)

2018-19

Launch of the **Darty Max** offer

Launch of the **After-sales service Barometer**: which analyses product **repairability** and **sustainability** using repair logs

Creation of the **Seconde Vie** : **Fnac 2nde Vie** and **Darty Occasion** second-hand goods divisions

2020

Darty Max numbers **200 000 subscribers** by the end of 2020

63 categories of products are analysed within the frame of the **After-sales service barometer**

Launch of the **smartphone collection program** by **WeFix**

2021

Launch of strategic plan **Every Day**

Creation of a **Circular Economy Committee**

Extension of the **"Sustainable Choice" Label**: 150 Fnac Darty products are covered by the label

LEONARD

Source: Fnac-Darty Our History (2021)

FNAC DARTY: INFORMATION AND KEY FIGURES

Employees

25 000

Activities

FNAC and Darty were born in the 50s and joined forces in 2016. Today, the Group is the **leader of omnichannel distribution** for electronics, household appliances and publishing in Europe.

Turnover in 2021

+8 bn.€ (+7,4% compared to 2020)

> ***Committing to an informed choice and sustainable consumption - Core Group Values.***

Implantation

750 stores in France and **950** in total.
Presence in **13 countries** (including a network of franchises).
Acceleration of deployment outside of Europe

Strategy

The Group placed a bet on **omnichannel distribution** to become an **international** player in a retail strategy combining brick and mortar stores with digitisation. The objective for 2025 is to achieve 25% of profits on the web. The Group is also highly invested in its **services offer *(see next slides)***.

Recognition

2018: **Grand Prix de l'Économie Circulaire** delivered by the French Minister for Ecological Transition and ADEME (Environment and Enterprise Prize)

Source: Fnac-Darty around the world (2022),

DARTY AFTER SALES SERVICE MEETS FNAC TESTING LABS: A BOOST FOR CIRCULARITY

By applying its **Everyday strategic plan,** launched in 2021, the Fnac Darty group wishes to become a major player in the circular economy, notably by promoting product lifespan extension. Today, the group is in fact **France's most important repair service** with 4 workshops, 100 technical bases, 2000 technicians and 2.5 million interventions every year. Furthermore, Fnac-Darty have managed to **anticipate evolutions in regulations** deriving from the GAEC law by launching studies on the **durability and repairability index** (complied in a "sustainability score"), before the introduction of this law in 2021. Following new trends in consumption and on the market, the Group has also mobilized the necessary means, starting in 2019, to **structure and deploy their 'Seconde Vie' offer** on a wide scale. Finally, thanks to its **After-sales service barometer** published every year, Fnac-Darty **incites manufacturers** to prolong the length of spare part availability by displaying after-sales performance **according to brand.**

3000

People dedicated to **after-sales,** i.e., **8%** of group employees.

30 000

Second-hand products sold on fnac.com and darty.com

Everyday Strategic Plan

In February 2021, the group launched its new Strategic plan with a view to remaining the "essential ally of clients, to accompany them towards sustainable consumption in their daily usage, in the home." This rests on 3 pillars including 2 which are directly connected to the CE: encouraging consumers in the adoption of sustainable behaviour and the deployment of the Darty Max assistance offer.

EVERYDAY
everyday au service de nos clients

"[...] we sell fewer products in terms of units, [...]. Yet our profit margin is progressing, and on average, clients spend more. Deconsumption is not a threat for us.

Enrique MARTINEZ, General Manager of the Group

THE DARTY MAX OFFER

2.1 million

products repaired by the Group in 2021

Source: Fnac Darty (2022)

Repair based proposals in full expansion

The historic Contrat de Confiance (The Contact of Trust) pioneered by Darty was turned into **Darty Max in October 2019**: a **subscription package guaranteeing repairs for life.** Initially restricted to larger home appliances, this offer has been extended to smaller electrical appliances, home cinema TVs, photography, sonic equipment and multimedia products. After 1.5 years of existence, the service already numbers more than **500 000 subscribers.**

To support this new offer of repairs, Fnac Darty has opened **30 training schemes** between 2019 and 2021, to **train** home based electrical appliance technicians and it aims to open 21 more in 2022, institutions called ***Tech Academies*** (work-study placements lasting 1 year).

Since May 12th 2022, Darty Max has moved its offer forward by integrating **preventative maintenance services via video conferencing** and offers 3 subscription formulas for the categories of appliances to cover.

More widely, customers are **accompanied in their choice to determine which brands are easier to repair** thanks to the sustainability score displayed on certain products, as well as the yearly publication of the After sales Barometre.

Objectives of Darty Max by 2025:

- 500 technicians hired and trained
- 2 million subscribers
- 2.5 million devices repaired

THE FNAC-DARTY CIRCULAR STRATEGY

Catalysers

An ambitious positioning strategy

"Fnac-Darty are now integrating sustainability to their strategic model, to position themselves as a **pioneer retailer in** ecological transition." as underlined by Frédérique Giavarini, General Secretary.

Anticipation of regulation

Fnac-Darty has placed **information for the consumer** and **product durability** at the heart of its strategy and have, for example, worked with the **French government** in the elaboration of repairability and sustainability indexes.

Complementarity between Darty and Fnac

The alliance of two entities which have joined forces around the Group's circular projects is chiefly facilitated by a **common policy** shared by FNAC and Darty, based on the central role of the client and their long-term satisfaction.

furthermore, Darty has historically benefited from **sterling after-sales services** and the FNAC from an **innovative lab**: by joining forces the two entities in the Group managed to deploy new services and offers, notably resting on the concept of an **economy of functionality.**

Challenges

Competition and differentiation

Fnac Darty, like many other retailers, is faced with **very strong competition** from retail giant Amazon.

Because of this, the Group must **renew itself and innovate on a permanent basis,** in particular to develop high-performance services which foster client **loyalty,** and this also allows the group to **acquire new market shares.**

Fnac Darty is now faced with increasing competition on its second-hand market and repair services, notably by **teams of experts.**

Access to spare parts

In order to guarantee **quality after sales services** and its Darty Max offer, the Group must be benefit from easy access to manufacturer spare parts **for several years.** Yet policies on the matter strongly differ from one manufacturer to the next.

Technological Evolution

Fnac-Darty performs tests and analyses for an increasing number of product categories, to determine their sustainability. However, devices, especially in multimedia, are evolving rapidly and call for **constant updates.**

CASE STUDY: SCHNEIDER ELECTRIC

> *We must create the conditions for the circular economy to become an attractive business*
>
> *Hélène MACELA-GOUIN,*
> *Strategy and Business Development VP*

SCHNEIDER ELECTRIC : A BEACON OF SUSTAINABILITY, FUTURE CIRCULAR INDUSTRIAL LEADER

2008

Launch of **méthodologie Green Premium™:** a sustainable development program for products

2015

Setting up ofthe **Schneider ecoDesign Way™,** an eco-conception method applied to the development of all new products

2020

Officialization of the first **centre for circular distribution** by Schneider Electric at Bourguebus which accompanies the acceleration and transformation of the Group in favour of the circular economy

September 2020

Creation of a label for the sale of products derived from the circular economy on the French market: **Schneider Electric Circular Certified**

January 2021

Launch of the **Sustainability Impact and Sustainability Essentials programs,** the most ambitious of the Group to date regarding sustainable growth (2021-2025)

To access more key info on Schneider Electric, click here

THE CIRCULAR ECONOMY AS A GUIDING LINE

The circular economy has been part of the Group's **DNA,** which, in the last 15 years, has put together **models of circular services** (repairs, waste collection, lifespan extension) which make sense from an economic point of view, as well as from an environmental one. The **Schneider Sustainability Impact** program (SSI 2021-2025) is part of this drive to place the circular economy at the heart of the Group's activities.

SSI objectives in France :

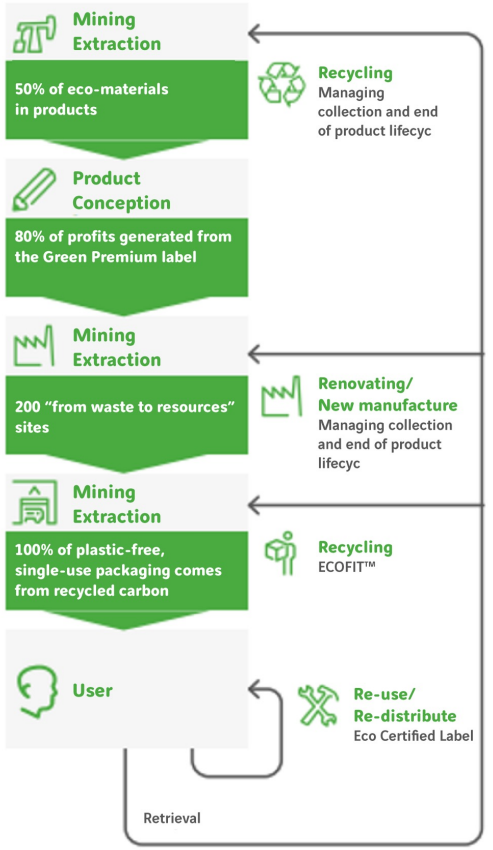
80%

of income issued from products with a positive impact on the environment in 2025

4360 t

of CO_2 prevented, just in France, thanks to the development of Circular Certified products

Introduction to Schneider circular activities present at every stage in the value chain, DEU 2021



We are still writing the first chapters of this story; we must stay humble when it comes to the road left ahead.

Hélène MACELA-GOUIN,
Strategy and Business Development VP

MasterPacT

45%

Of reduction in CO_2 use achieved for the purchase of a circular MasterPacT vs new products

A new flagship circular product

In May 2022, and due to the acceleration of its collection, retrieval and reconditioning activities aimed at products formerly destined for destruction, Schneider launched a new offer of **MasterPacT circuit breakers certified as belonging to the "circular economy".**

Product characteristics:

- **Remanufactured** General-Purpose Low-Tension Circuit Breakers
- **Collected from a variety of sources,** the MasterPacT, must be less than 5 years old, and must have experienced a limited amount of manoeuvres
- **Dismantled, repaired and tested, before being reconfigured very specifically** according to client needs.

The Schneider Electric MasterTech site near Grenoble **has devoted one of its production lines** to this circular range. The renovation of the MasterPacT called for a **complete reworking of the industrial process.**

SCHNEIDER ELECTRIC CIRCULAR STRATEGY

Catalysers

360° Piloting

Schneider have combined a **strategic bottom-up approach,** developing local initiatives allowing them to test models and markets, with a **top-down** approach structuring a global strategy of circularity, - both strategies running parallel to one another.

Staff commitment

Employees are the **primary ambassadors** of the circular economy transformation of the company and regularly receive training on the challenges involved

Regulations

Legislation plays a major role in making the **business models of the circular economy scalable and profitable** and supporting the Group's activities in this sense

Clients

Clients are increasingly positioned in **anticipation of regulations** and ask for circular products and solutions. The **context of shortages** also prompts SE to search more actively for solutions of **re-use,** to address client demand.

Challenges

Standards

Security standards as well as existing specifications for certain products make the **circular application of Schneider difficult to deploy**

Logistics

The shorter circular economy loops set up by Schneider have induced a **rethinking of logistics as well as processes**, IT tools and data collection, and this is true at every level of the Group.

Culture and paradigm

The new circular economic models have exposed a **strong need for a change in philosophy** regarding the industrial chain, R&D and sales teams that still "think in terms of new products"

Price and attractivity

It is necessary to display a great deal of **transparency and pedagogy** concerning the price of products and circular solutions which are **not systematically cheaper than new ones.**

CASE STUDY: MICHELIN

> *It is absolutely imperative that tomorrow's world be sustainable.*
>
> *Our conviction is that tomorrow, everything shall be durable at Michelin.*
>
> **Florent MENEGAUX,**
> **President of the Michelin Group**

MICHELIN: A PLEDGE TO BECOME CIRCULAR LEADERS

1950-80
Development of a range of **circular services,** like re-treading, which allowed Michelin to save **70 %** of raw materials as well as modifying product yield per km using the circular model of the "product as a service"

2002
Beginning of the sustainable development approach of the Group based around 12 themes with a strong focus on **the durable and environmental performance of its products**

2014
Formalisation of the Michelin circular economy **strategy** based **around the 4Rs** : Reducing, Re-using, Recycling and Renewal

2017
The Group shares its **vision of sustainable mobility** and determines its objectives of commercialising an airless tyre, with a rechargeable rolling strip, thanks to 3D printing and elaborated with sustainable materials

2019
During the "Movin'On 2019" summit devoted to sustainable mobility Michelin presented **UPTIS** (Unique Puncture-proof Tire System), a prototype for an automobile tyre which is "airless", a prototype which has received many awards in France and internationally

2021
Publication of the "All durable" approach structured around the pillars that are People, Planet and Profits. In terms of the circular economy, Michelin fixes the objective of **reusing 100 % of tyres that have reached the end of their lifespan** and aims for **100% bio-sourced or recycled** materials by 2050

A technical introduction to the Michelin group can be accessed here

THE CIRCULAR ECONOMY: AN APPROACH INHERENT TO THE GROUP STRATEGY

Circular business models have always been at the core of Michelin products and services development. **Forerunners of the economy of functionality on an industrial scale**, Group notoriety in terms of circular economy can notably be explained by the fact that the circular economy **makes sense from an economic point of view**. Positioned on the premium tyre sector, Michelin have turned **lifespan into an angle of strategic differentiation**. Historical pioneers in the development of materials that are innovative and more ecological, Michelin has, in these past years, multiplied its **acquisitions** (Pyrowave and Lehigh) and **strategic partnerships,** so as to **create the most circular tyre in the world** (participation in the BlackCycle European Consortium for the manufacture of new tyres from used ones).

29%

Of renewable or recycled materials in Michelin tyres in 2021

25%

Objective in the reduction of the quantity of waste generated by global production in 2030, compared to 2019

"The concept of lifespan is etched into the company DNA. There is a concern with product performance over time which is an echo of the principles of the circular economy"

— **Gaël QUEINNEC**, Directir of Prospective Research

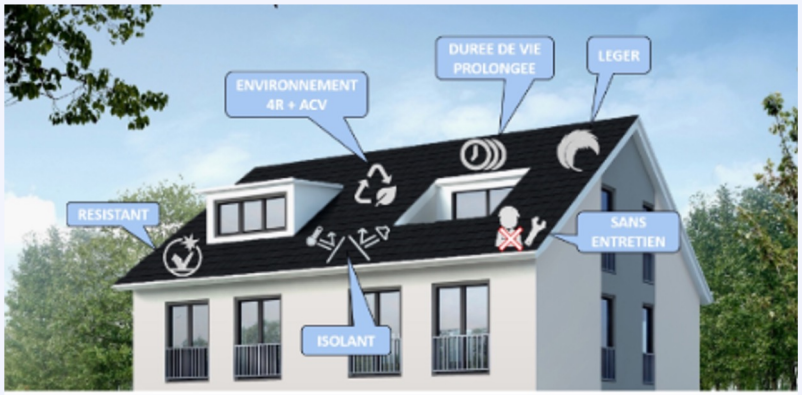
Projet EMPREINTE

Launched in 2020, the EMPREINTE project aims to find solutions for the recycling and eco-conception of products notably through the development of sustainable new materials and the improvement of industrial processes.
This is part of the Group's "All durable" strategy which seeks a substitute for the non-sustainable materials its tyres are made from.

TYRES AND CONSTRUCTION: 2 MICHELIN INTRAPRENEURIAL PROJECTS

50%

Economies of CO_2 achieved thanks to the substitution of fibres in steel and concrete with the AraNea Composite



The advantages of Recycl'Toit roofing

These projects are part of the Michelin "Tout durable" program and its strategic positioning "beyond tyres"

AraNea Composite

As part of the Michelin incubation program, the AraNea Composite was originally developed for a lunar tyre, for NASA. The Composite Verre Résine (Composite Glass Resin/CVR) technology behind this material was then extended to the UPTIS airless tyre before being offered as a low carbon alternative to metallic supports for concrete.

Recycl'Toit

Housed by the Michelin incubator, Recycl'Toit have developed roofing made from recycled tyres. This innovative material is characterized by its great resistance to poor weather (such as hailstones), its thermal and phonic insulation capacities as well as ease of maintenance (few deposits of moss or lichen).

Source: AraNea Composite, Michelin

MICHELIN CIRCULAR STRATEGY

Catalysers

Clients

An increasing number of Michelin clients have shared their **environmental concerns** when it comes to the constraints of **managing the end of lifespan** of its tyres, notably in countries that do not have the infrastructure to process them.

Price of raw materials

The tension on the market of petrochemical raw materials supports the investments of the Group in innovative sustainable materials.

Legislation and influence

Legislation is a key driver for the transition of the tyre industry. Michelin has therefore participated in **structuring the EPR tyre channel** in France. In parallel to this, through its strategy of influence "**Michelin bigger than ourselves"**, the Group is trying to propel the ecosystem of mobility towards greater sustainability.

Opportunities and strategy

The premium positioning of Michelin is conducive to circular activities and has led to the emergence of opportunities with partnerships like those with cement producers which **use tyres as a combustible.**

Challenges

Climate or circularity?

For Michelin, the primary environmental criteria of a tyre is its carbon impact. **Antagonisms** may therefore emerge between **climate and circular objectives** implying difficult compromises. For example, certain synthetic made tyres lead to a lower fuel consumption, but these petrochemical materials create many environmental problems, notably regarding end of lifespan management and pollution.

Life Cycle Analyses deployed by Michelin not only use environmental **support for the eco-conception** of its products and materials, but also as a **guide for dealing with these antagonisms**.

Technological Challenges

The integration of sustainable and recycled materials in a tyre calls for the **transformation of the production process**. This implies very heavy changes in terms of procedure and mechanic adaptation.

Systemic Inertia

Despite economic relevance, the transition towards a circular model calls for **breaking the codes of a linear economy rooted in industrial habits and processes.** Michelin considers that public authorities have a role to play to alleviate this systemic and organizational complexity.

CASE STUDY: ICADE

> *Conceiving, Building, Managing and Investing in cities, neighbourhoods, and buildings that are innovative places, places where different people meet, inclusive spaces, spaces connected to a reduced carbon footprint. Environments that are great to live, to work and to have a home in.*

Extract from the Group's Declaration of Intent

ICADE - SUSTAINABLE REAL ESTATE PIONEERS

2005

First sustainable development policy within the Group. The Parc des Portes de Paris becomes the first private building of the tertiary sector to obtain the **HQE Construction Certification** in France.

2014

Icade obtains the **BiodiverCity label**, the first international label taking into account biodiversity in real estate, construction and innovation projects.

2015-2019

Publication of the 2015-2019 strategic plan which confers **a very important place to CSR policies**. Icade joins the **Nature 2050** program in 2016 and creates Cycle-Up **i**n 2018, a platform for the **re-employment** of materials from deconstruction and building site surplus.

2020

Icade joins "Booster du Réemploi" whose objective is to accelerate and **democratise re-use** in the construction sector thanks to the development of a platform centralising needs and collaboration.

2021

Icade creates its new **Urbain des Bois** subsidiary specialising in low carbon construction. Icade simultaneously launches **AfterWork,** a service which aims to reconvert office space into housing.

2022

"Say on Climate & Biodiversity" resolution presenting the **commitment to climate and biodiversity** of Icade is **adopted to the tune of 99%** by the general assembly. It is reviewed by the Science Based Target Initiative and commits to aligning three poles of activity with a trajectory of 1.5°C,.

Key info on Icade accessible here

THE CIRCULAR ECONOMY AT THE SERVICE OF LOW CARBON TRANSITION AND PRESERVATION OF RESOURCES

Aware of the issues caused by the rarefaction of resources and the reduction of biodiversity, Icade has defined the circular economy as **one of the 5 key pillars of its CSR policy**. Icade applies the principles of the circular economy to reduce **its usage of virgin materials**, to democratise re-use and promote innovation to find **more sustainable materials.** The Group also bases itself on the circular economy to reach its low carbon objectives and increase the resilience of its assets. Icade is also concerned with **accompanying the users** of its housing when it comes to the responsible and rational consumption of resources, whether this affects mobility, water consumption or impact on biodiversity. **Nature** has in fact been designated as a strategic priority for this Group which stands out through its will to **regenerate** nature instead of minimizing its impact.

-30%

Reduction of CO_2 emissions of tertiary sector real estate between 2015 and 2021

-36%

Reduction in the water consumption of tertiary sector buildings between 2015 and 2021 (in m^3/m^2/year)

"The collaboration of all company levels and businesses is essetial for the circular economy to be integrated to operational and economic processes in the company"

François LAFARGUE

Head of Environmental Transition

AfterWork by Icade

Starting with the redevelopment of tertiary sector capital, the objective, here, is to imagine a new life for former office buildings, turning them into housing, for example, without needing to demolish them or build new entities. Icade Promotion benefits from a dedicated multi-expertise team and offers tools to help make decisions based upon studying different scenarios for potential transformation.

RE-EMPLOYMENT & WATER – 2 ENTREPRENEURIAL PROJECTS SUPPORTED BY ICADE

50%

Of materials coming from waste are not materially revalued in France (re-use, re-valuation, recycling)

70%

Of the world's population will be city dwellers in 2050, and this raises the stakes very high in terms of water quality and managing flood risks

The launch of these two innovative projects in 2018 illustrates how committed Icade is to integrating the principles of the circular economy to its portfolio.

Cycle Up

This startup, borne from **co-innovation between the Icade and Egis groups**, has developed the first **digital platform** allowing users to create a **link between the supply and demand of materials collected from** deconstruction sites, or construction site surplus. This solution stimulates collaboration between players on the real estate market by simplifying exchange, and by offering **practical, local and low carbon alternatives** to new materials.

Vertuo

Incubated by **startup studio Urban Odyssée, owned by Icade**, Vertuo offers **urban solutions for rainwater revalorisation.** This startup has notably participated in the "Bocage Urbain" project in Aubervilliers, a modular landscaping rehabilitation project which serves to minimize the risk of flooding in densely urbanised environments. In 2021, thanks to the results of this project, the startup **was awarded a prize during the first European Metabuilding/Seed Call competition** in the "Construction and solutions founded on nature" heat,.

LEONARD

Sources: Cycle-Up, Vertuo

ICADE CIRCULAR STRATEGY

Catalysers

Circular economy and climate

The challenges of a circular economy are not just one of the pillars of Icade's CSR policy, but also serve to **irrigate its global low-carbon strategy**. The circular economy is in effect one of the **levers** the Group has activated to **reach its climate objectives.**

Committed stakeholders

Icade mobilises its employees and associates to extend its environmental strategy to the whole of its divisions and operational levels. The Group also benefits from an **ecosystem of external stakeholders and shareholders strongly invested** in these issues to accelerate its low carbon policy and circular transition.

Influence

Icade , has pledged, through "Boosting re-use" to **structure re-use channels.** The Group considers that **legislators also have a key role to play** in the spreading and application of circular economy concepts..

Certification and environmental labels

Icade takes part in the elaboration of **labels and certification** applying the principles of the circular economy. The Group have thereby participated in the elaboration of a **Biodiversity Score** in 2020, which encourages undertaking impact evaluation studies regarding biodiversity.

Challenges

Client Acceptability

Certain clients of the Group are reticent towards the employment of re-used materials when it comes to the construction of new buildings. This refusal can partly be explained by:

1) **Price** of materials sourced through re-use channels

2) Doubts over the **quality of these materials**

3) **Cultural prejudice** when it comes to products from circular loops.

Icade must integrate these hesitations to its thought process so as to be able to anticipate and best address client needs whilst reaching its circular economy ambitions.

Territorial specificities

Different areas where Icade's Pôle Promotion are implanted are not equal when it comes to the local structuring of re-employment channels because of **cultural differences and political trends.** Equally, **the degree of urbanisation** can more or less facilitate practices of reemployment on sites.

Tensions concerning resources

Increasing tensions, which can be observed on the raw materials market, could also spread to new channels of more sustainable materials (low carbon re-enforced concrete, biosourced material, etc.), if this risk is not anticipated. For Icade, the acceleration of the circular economy could bring elements to address these challenges in a resilient manner.

ACKNOWLEDGEMENTS

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The Circul'R team would like to thank all the persons who contributed to this study, and notably: **Isabelle SPIEGEL**, Global Head of Environment for the VINCI Group - **Isabelle LAMBERT,** Lead Foresight, LEONARD, and **Charlotte AMIEL**, Environment Project Officer.

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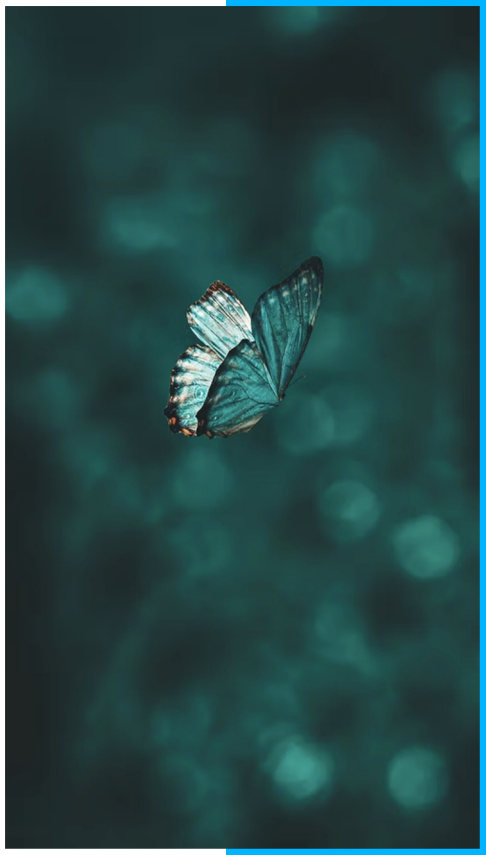
- **SCHNEIDER ELECTRIC**: Hélène MACELA-GOUIN, Strategy and Business Development VP & Gabriel DE MALLERAY, Strategy and Sustainable Growth Director, France
- **MICHELIN**: Gaël QUEINNEC, Director of Prospective Research
- **ICADE**: François LAFARGUE, Head of Environmental Transition



V. ANNEXES

TRIODOS BANK HEADQUARTERS

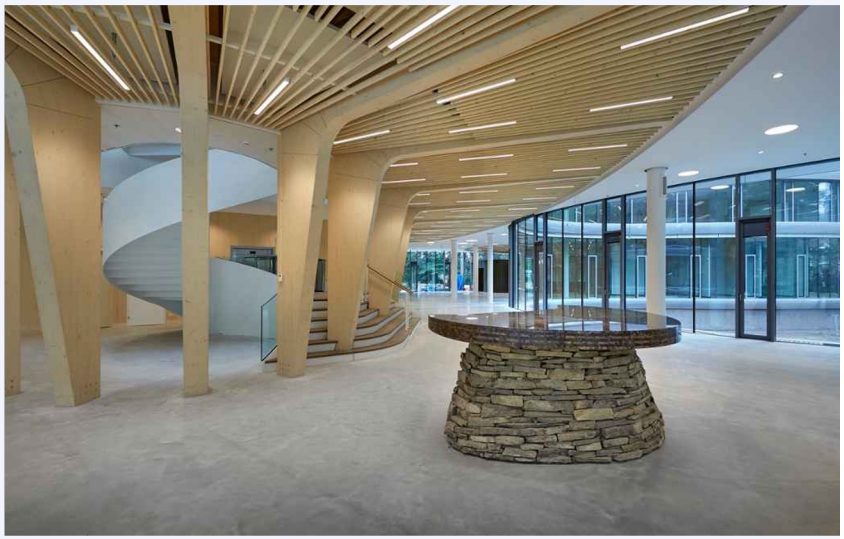
Triodos Bank

A BUILDING THOUGHT OUT IN A COMPLETELY CIRCULAR MANNER

Situated in Zeist, Netherlands, the new Triodos offices illustrate the integration of circular concepts to the creation of a building:

- **Sustainable materials:** 5 floors made almost exclusively from wood (90%)
- **Economy of functionality:** the fixed facade of the structure remains the property of the suppliers who are responsible for the maintenance of the panel kits
- **Lifespan extension**: building created to be dismantled by joining the wooden elements, using screws, existence of a digital passport for all of the materials, internal structure that can be dismantled and easily reconfigured
- **Interdependence and sobriety**: study of local cultural and natural eco-systems (taking into account the flight trajectories of bats and the height of surrounding trees), construction of a huge solar roof allowing for the recharging of electric cars, retrieval of rainwater, etc.

> ***Though we are nothing but guests on Earth, we behave as if we were its hosts. This is why a change of mentality is necessary. I willingly speak of a "mexit" - a mental exit.***
>
> **Thomas Rau, Architect**



THE FIRST CIRCULAR VIADUCT IN THE NETHERLANDS

Rijkswaterstaat
Ministry of Infrastructure and Water Management

A VIADUCT DESIGNED FOR A SECOND LEASE OF LIFE

Since this project was initially drawn up, in 2016, its stakeholders wished to commit to a circular conception - the Kampen viaduct can be **dismantled and re-used.** Circular principles have therefore been applied:

- **Collaboration**: partnership between 60 parties who shared their circular economy knowledge
- **Analysis of impact**: the environmental analysis of the viaduct revealed that its impact will be inferior to that of a traditional viaduct, but only if this viaduct is dismantled and used a second time (entirely dismantled and rebuilt on another site)
- **Local Sourcing**: 40 elements made from reinforced concrete manufactured in the region
- **Lifecycle Extension**: modular, evolutive and re-usable construction to the tune of 95% - all the materials have a digital passport

HOW DOES IT WORK?

Pretension cables pass through holes in the blocks of reinforced concrete that form the beams once the cables are extended. Like the blocks of concrete, pretension re-enforcement systems can be re-used after dismantling.

> ***The main benefit of the development process of the circular viaduct wasn't the reduction of CO2, but knowledge sharing, not just with our partners, but also with the whole sector. This has allowed us to accelerate innovation.***
>
> **Rob Valk, Rijkswaterstaat**

Sources : Rijkswaterstaat, Holland Circular Hotspot, TNO, Circulaire Bouweconomie. (2022). Circular Infrastructure: the road towards a sustainable future, Consolis. First circular viaduct in the Netherland

THE STAR APARTMENTS MODULAR BUILDINGS

A SOCIAL AND MODULAR PROJECT

Situated in downtown Los Angeles and built in 2014, the Star Apartments is a homeless shelter made up of 5 floors of premanufactured modules **placed** above a **pre-existing one-story building.**
The modules supply **102 apartments** as well as a community centre for residents. The complex was granted Platinum LEED certification in 2015.

CIRCULAR ADVANTGES OF THE PROJECT

- **Re-use**: the modules can easily be dismantled, transported and readapted, thereby facilitating the re-use of the structure or materials
- **Reduction of pollution and waste**: the construction site generated very little waste and pollution. Furthermore, as the quantity and typology of materials necessary for each module were precisely identified, the waste generated by the construction could be valued and this waste re-used more effectively. This categorisation is the first step towards the creation of passports for materials.
- **Sobriety in the use of resources**: as the building is made up of different, independent modules, it is possible to determine the precise quantity of materials necessary to build the different sections.

Modular construction

Modular construction is a method for the conception of a building divided into different modules **built outside of the construction site and then assembled on-site**.

Sources : Khushro Ansari. (2020). Star Apartments by Michael Maltzan Provided Homes For 102 Homeless

RE-EMPLOYMENT
PRACTICAL CASE STUDIES

La Crèche Justice

What? Building more with less - 620 front doors in solid oak from a neighbouring construction site administered by RIVP were scheduled to be sent to waste because they no longer met current legal standards. These doors were re-employed within in order to build a creche for 99 children, with a surface area of 1 200 m^2.

Where? 20th arrondissement, Paris, France

Who? BFV Architectes

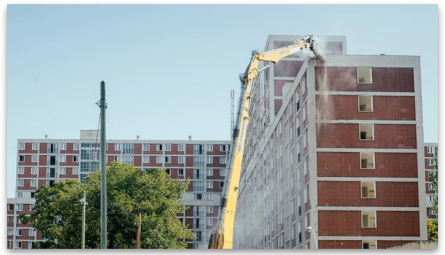
Brummen Town Hall

What? In Brummen, the local authorities decided to create a building with a fixed lifecycle of 20 years. Working within these limitations, architect Thomas Rau designed a Lego type structure where 90% of the materials can be dismantled and re-employed after 20 years.

Where? Brummen, Netherlands

Who? BAM, Thomas Rau

Deconstruction of Gagarine



What? The Gagarine demolition scheme is an example of selective deconstruction. Its 13 floors and 370 apartments fell one after the other, creating hundreds of tons of rubble to be evacuated daily. Furthermore, dozens of blocks of letter boxes, 2 242 doors, 1 525 cast iron radiators as well as dozens of fire extinguishers were all re-used.

Where? Ivry-sur-Seine, Greater Paris, France

Who? Grand Paris Aménagement

RECYCLING
PRACTICAL CASE STUDIES

Fiber glass

What? Construction of a plant for recycling mineral fiberglass issued from deconstruction so as to create a new raw material.

Where? Visé, Belgium

Who? Knauf Insulation

Raw Earth

What? Clay and straw mortar techniques use fibre, which is a by-product, or even a waste product of agriculture, and the bricks created do not need to be baked in a kiln or have a binding agent added to them to be employed. This implies that they can easily be removed from their mould with water, to be reused.

Where? Parc naturel regional des marais du Cotentin et du Bessin (National Park) France

Who? CobBauge Project

The O-House

Quoi ? The O-House is a modular home made from recycled wood. It was moved to six locations in the Kongsvinger municipality so as to show the potential of retrieving and reusing local construction materials. This circular construction project aims to use demolition materials for its construction.

Where? Kongsvinger, Norway

Who? House Sustainable Living

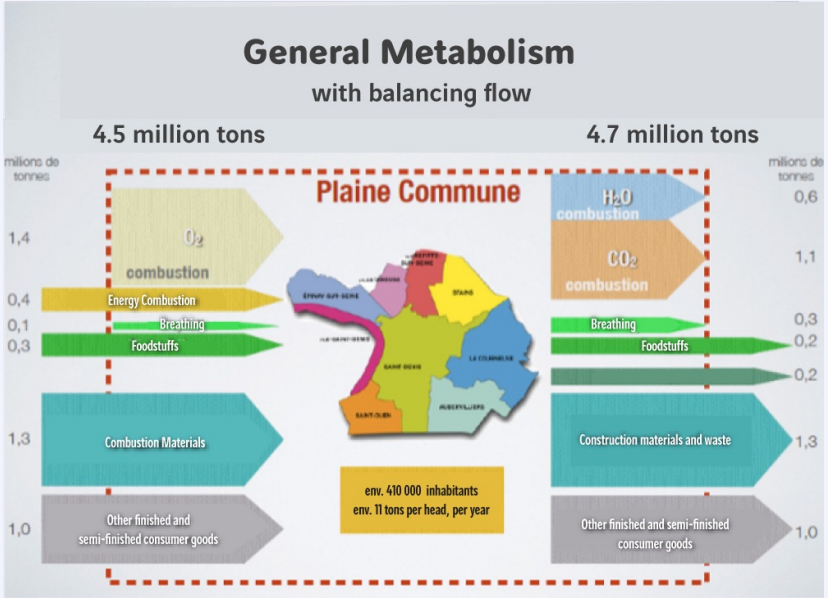
THE URBAN METABOLISM OF LA PLAINE COMMUNE

A METABOLIC ANALYSIS TO CIRCULARISE THE TERRITORY

This project, undertaken from 2017 to 2020 in the Plaine Commune district of Seine-Saint-Denis in the suburbs of Paris, and coordinated by Bellastock, **bases itself on the principles of urban metabolism** so as to accompany the **transformation of this specific neighbourhood** and **circularise the materials** used on local construction sites. In particular, those involved wished to utilise a maximum of materials already present locally by applying circular strategies of **re-employment, re-use and recycling** on a massive scale**.**

PROJECT OBJECTIVES

- Experimentation of re-employment, re-use and recycling activities, for materials on **30 pilot sites**
- Fostering the **deployment of local circuits for the valorisation** of materials
- Setting up of **platforms for sorting, storage and valorisation of waste** from construction sites
- Development of a **traceability tool** for materials, **to encourage re-use**
- **Training of those involved in the project** on the importance of the circular economy



Application of the concept of Urban metabolism at Plaine Commune

> ***We know full well that the circular economy will become the new norm. When you enter a construction site, you clearly see that it makes sense. Despite all this, it is a change that requires new skills on-site and new processes of supply to source materials for re-use. We have to be open to new partnerships and alternative ways of doing things [...].***
>
> **Justine Emringer, Head of the Urban Metabolism Project at Plaine Commune**

France

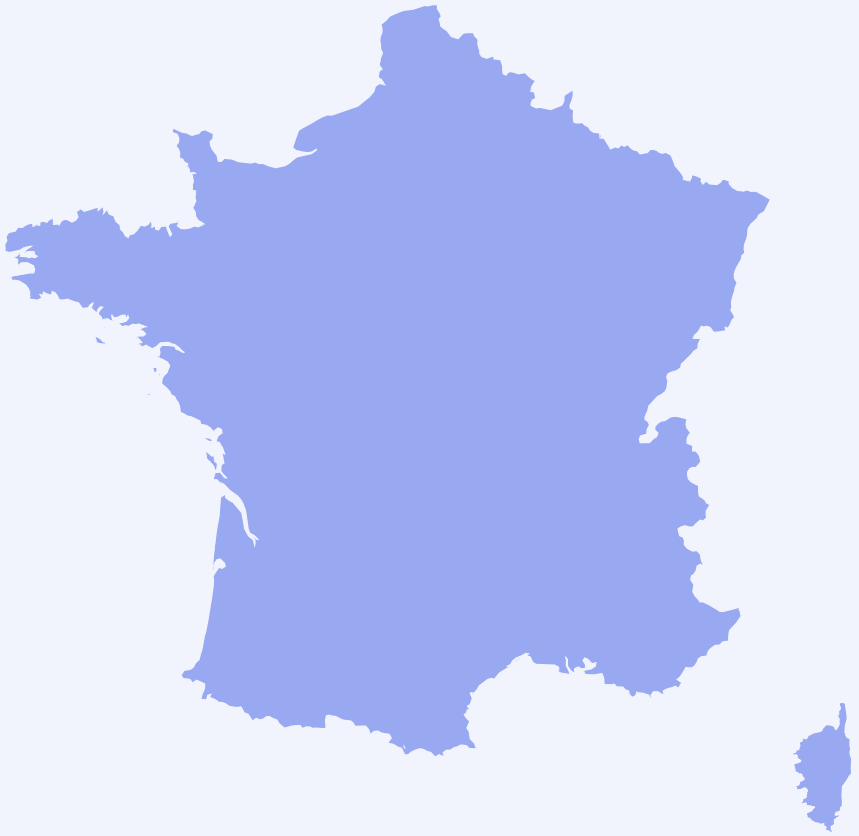
KEY CIRCULAR LEGISLATION

RE 2020
RÉGLEMENTATION ENVIRONNEMENTALE

As predicted by the ELAN law in 2018, the 2020 Environmental Regulation determines energy performance objectives and the reduction of the carbon footprint for new buildings.

Adopted in February 2020, the Anti-waste and Circular Economy Law notably contains measures in favour of re-use and the better management of waste coming from construction and demolition sites.

LOI ANTI-GASPILLAGE pour une économie circulaire



LOI CLIMAT ET RÉSILIENCE

This law dated August 2021 serves to interpret part of the measures encouraged by the Citizens Convention for Climate in order to accelerate the ecological transition of the French economy.

RE2020

RE 2020
RÉGLEMENTATION ENVIRONNEMENTALE

Adopted in 2020 and effective from January 2021 onwards, this Environmental Regulatory Framework for 2020 fixes **new climate objectives for the construction of new buildings**.

This framework is based upon 3 major themes:

- Improving **energy performance** (notably the performance of insulation)
- a **reduction of carbon footprint** achieved by taking into account building emissions all through a building's lifecycle
- Guaranteeing **the health and comfort of occupants** notably in the context of heatwave intensification

ASSOCIATED CIRCULAR OPPORTUNITIES

Analysis of Lifecycle and eco-conception

To reduce emissions over the whole of the building's lifecycle

Application of circular loops

To reduce consumption of resources whilst preserving user comfort

Circular Ecosystems

To rethink the inclusion of these buildings within the urban landscape, to combine them them with biodiversity, thus minimising their impact on soils and maximising the wellbeing of their occupants

AGEC LAW

SUBJECT

La loi Anti-Gaspillage pour une Économie Circulaire (Anti-waste and Circular Economy Law or AGEC) dated 2020 is the **first French law dedicated to a circular economy** and is structured around 5 pillars:

- Better production
- No more usage of 100% disposable plastic
- Better consumer information
- The fight against wastage and encouraging solidarity in re-use
- Acting against built-in obsolescence

CONSEQUENCES FOR THE CONSTRUCTION SECTOR

This law has led to many legislative changes for construction:

- Creation of the **ERP channel** for the construction industry in 2023
- Obligation to **perform Products-Materials-Waste Diagnostics** (PMWD) by site contractors
- Obligation to acquire a proportion of **goods issued from re-use or recycling when a public tender is launched**
- Obligation to **sort materials into 6 channels at the on-site source** (wood, mineral fractions, metal, glass, plastic, plaster)

Extended producer responsibility for Products and Materials issued from Construction in the Building sector (REP PMCB, 01/2023)

1. **Responsibility** of Product and Construction Material Providers in the building sector to **manage waste** generated by the products they put on the French market

1. **Obligation of adhesion** to a certified eco-organisation that will handle waste which has reached the end of its lifecycle, in exchange for the payment of **eco-contributions**

1. Meeting the expected objectives in the **increase of recycling and re-use,** in the setting up of **eco-conception** actions, and in the improvement of managing waste from construction and demolition sites

Sources: Ministère de la Transition Écologique et de la Cohésion des Territoires. (2022). La loi anti-gaspillage pour une économie circulaire, Vie Publlque. (2022). Projet d'arrêté ministériel portant cahier des charges des éco-organismes

Climate and Resilience Law

SUBJECT

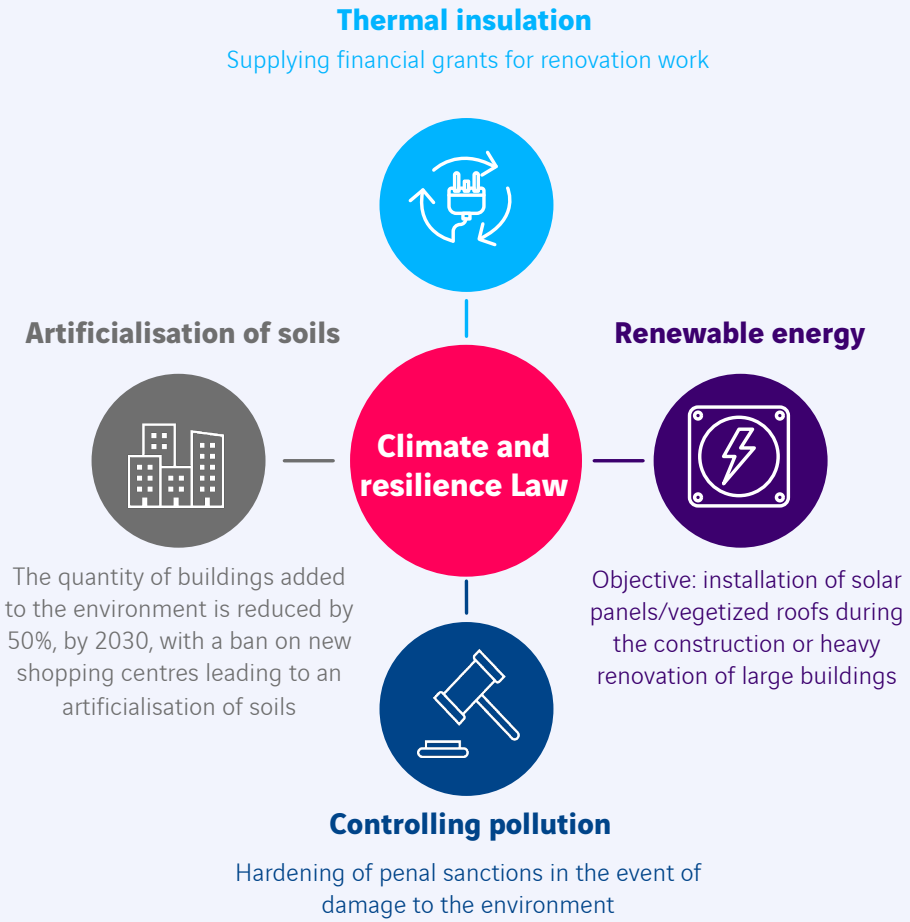
This law, dated August 2021, aims to **anchor ecological transition in all the different aspects of the daily life of French citizens**. Based upon 6 major themes, this law implies a certain number of restrictions and opportunities for buildings and infrastructures.

CONSEQUENCES FOR THE CONSTRUCTION SECTOR

This law therefore implies that the constructions which have already been completed draft **their own decarbonation roadmap.**

At the request of the government, this responsibility rests upon the shoulders of the **Plan bâtiment durable and the Centre scientifique et technique du bâtiment (Scientific and Technical Centre for Construction, or CSTB).**

MEASURES CONCERNING PLAYERS ON THE CONSTRUCTION MARKET



ALLIANCES FOR A CIRCULAR ECONOMY

STATE

Created by the World Economic Forum and the Minister of the environment of Rwanda, in 2016, the African Alliance for a Circular Economy (AACE) has now rallied 10 countries so as to **anchor a deep-seated transition towards a circular economy,** thus stimulating the economic growth of the continent:

- Launch of the Africa Circular Economy Support Programme (ACESP) so as to **fund circular solutions** in member states
- Support from the African Development Bank with the approval, in 2022, of a facility for the circular economy in Africa worth **4 million Euros**

x2

Increase in the import of plastic to certain African countries (Egypt, Nigeria, Morocco, Tunisia), by 2030

20%

Proportion of the African population, some 6.7 billion people, who shall dwell in cities by 2050

PRIVATE

Multinational firms are also coming together to organise and help with the **structuring and development of circular solutions** on a continental scale:

- In 2019, the **African Plastics Recycling Alliance** was formed so as to find solutions to improve the collection and recycling of plastics

- Project of the **African Circular Economy Network** and the Ikea Foundation to transform the food and drink industry in Rwanda, using a circular approach

Sources: World Economic Forum. (2021). Five Big Bets for the Circular Economy in Africa: African Circular Economy Alliance, SDG IISD. (2019). Companies Lauch African Plastics Recycling Alliance, Fondation EllenMacArthur. (2021). Circular economy in Africa: Plastics

AN EMERGING LEGAL FRAMEWORK

CHALLENGES

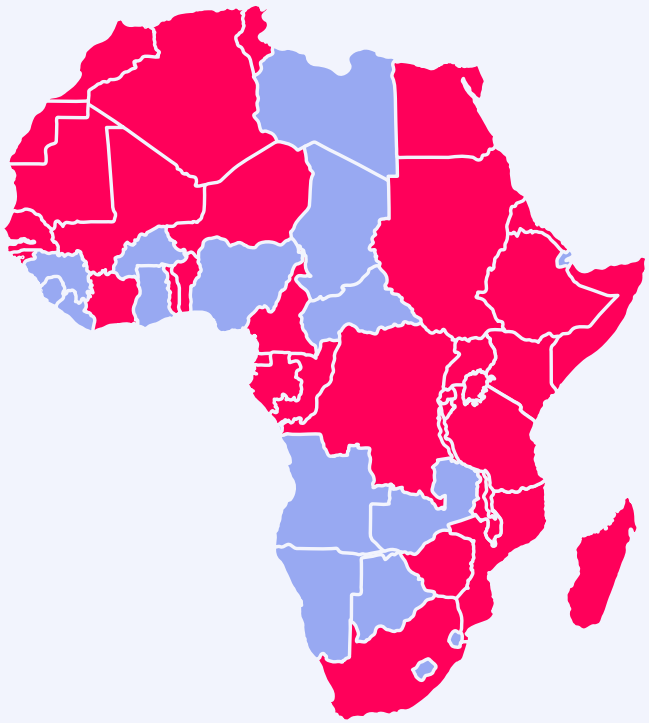
- Intensification and multiplication of **ecological, climate and social upheaval**
- Growth weakened by health crises and geopolitical instability
- **Demography in expansion**
  - Need for infrastructure
  - Need for solutions to manage urban pollution and waste

SOLUTION

Deployment of an economic model synonymous with economic growth, twinned with a smart, inclusive and rational use of resources :

- Several countries (Côte d'Ivoire, Egypt, Gabon, Kenya, Rwanda, etc.) have already integrated the principles of a circular economy **on a strategic scale**
- **Cities are also coming together** to create a framework conducive to a circular economy (ex: project to draft a Plan for a Circular Economy for the city of Cape Town)

LEGISLATION THAT LIMITS THE USAGE OF PLASTIC



Plastic is a central subject for the legislation in many countries, and **37 nations** have already limited the employment of single use plastics or created an EPR system for packaging.

Sources: EllenMacArthur. Fondation (2021). Circular economy in Africa examples and opportunities: Public policy,GRID, ACEAN, Footprints Africa, ICLEI. (2021). Circle Economy Earth, Circular Economy on the African Continent

CULTURAL PREDISPOSITIONS

CONTEXT

The solutions integrating the principles of the circular economy are **anchored in the habits** of African communities, often by necessity.

- Diversity of circular ***low-tech*** solutions existing on a local scale notably in the fields of agriculture and waste management
- Principles of the circular economy are intuitive and coherent for African cultures
- Solutions that bring together social and environmental impacts

CHALLENGES

These circular micro-models do need to be **propelled to an industrial scale** in order to maximise their potential, namely in terms of economic, ecological and social benefits.

Sources: GRID, ACEAN, Footprints Africa, ICLEI. (2021). Circle Economy Earth, Circular Economy on the African Continent, ACEN. African Circular economy Case Studies, Footprints Africa. (2021). The Circular Economy: Our Journey in Africa So Far, Africalive.net.(2022). Africa's Circular Economy Projects

2 EXAMPLES OF CIRCULAR SOLUTIONS

Based in Kenya, MycoTile develops sustainable, alternative and more accessible solutions to traditional construction materials from **agricultural waste and mycelium.** Their first product, suspended ceiling solar panels, displayed acoustic performances and superior antifungal properties, compared to traditional panels.

In Togo, SOGEA SATOM, a subsidiary of VINCI, joined forces with Africa Global Recycling (AGR) and Brasseries de Boissons (BB Lomé) to find a **solution for the valuing of glass waste** by incorporating it into the manufacture of hydraulic concrete. This glass concrete made from waste generated by the Brasserie BB brewery, as well as various medical and pharmaceutical centres, is used in the **production of hydraulic and sewage works.**

CIRCULAR ECONOMY COALITION

CONTEXT

Launched in 2021, the Circular economy coalition for Latin America and the Caribbean has a mission to **support and accelerate the circular economy** of the continent, thanks to collaborative work between governments, companies and society at large.

CHALLENGES

The publication of its common vision is fundamental to guide government and companies through this transition.

It is based around 3 basic issues:

- **Protection of biodiversity -** the region houses 40 % of the earth's biodiversity
- Social inclusion: **based on the informal sector** which represents 60% of all jobs in the region
- **Fight against climate change**: needed for major transformations of key sectors in the region (agriculture, mining and construction)

MAJOR CHALLENGES LINKED TO POLLUTION AND THE EROSION OF BIODIVERSITY

94%

Observed reduction in biodiversity in Latin America and the Caribbean since 1975

<5%

Percentage of waste recycled in the region. In Brazil, construction and demolition produce **50 to 70 %** of waste which ands up in landfill

Sources: Latin America and the Caribbean Circular Economy Coalition launches a vision for a circular economy for the region, Circular Economy in Latin America and the Caribbean, How does Latin America benefit from a circular economy?

NATIONAL LEGISLATION FOR THE CIRCULAR ECONOMY

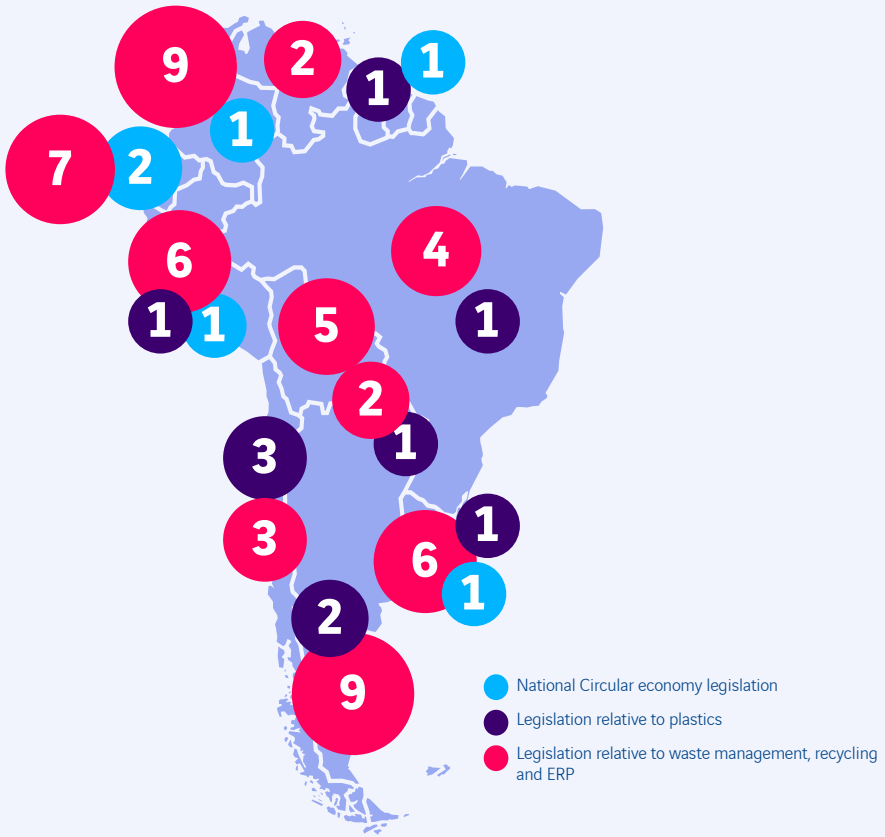
The last 5 years have been characterised by the emergence and **multiplication of local and federal measures** in favour of the circular economy.

This new legislation incorporates the pillars of the circular economy that are the most relevant for local challenges and specificities:

- Several governments (Colombia, Chili, Ecuador, Peru and Uruguay) have published or are in the process of elaborating **roadmaps dedicated to the circular economy**. **Eco-conception** nonetheless remains a blind spot for these policies.

- Most countries have also adopted or re-enforced legislation to **improve waste management** notably through the setting up of channels for Extended Producer Responsibility and the banning of certain plastics (Brazil, Colombia, Chili, Costa Rica, Honduras, Mexico, Peru and Uruguay)

NUMBER OF LOCAL AND FEDERAL LAWS PER COUNTRY



Sources: UNEP. Regional Trends: Latin-America and the Caribbean, Circular Economy Earth

A PUSH TOWARDS CIRCULAR INNOVATION

CONTEXT

To accompany and accelerate legislative measures in favour of a circular economy, many players – public agencies, startups or multinationals – are structured into a network multiplying **programs to foster innovation,** thereby deploying circular solutions to ally the preservation of the environment with social inclusion..

EXAMPLES

Chili, 2018, launch of the **first public program to accompany** innovation in Latin America

Rale of large multinational companies in the support of circular innovation by direct participation, or by **launching their own open innovation programs** (Anheuser-Busch InBev)

Sources : Lanzan programa de innovación en economía circular pionero en América Latina

3 AXES TO SUPPORT CIRCULAR INNOVATION

Public mentorship programs

Deploying funds dedicated to energy transition or the organisation of aid schemes for environmental and social innovation

Startup Ecosystems

Extending a multitude of solutions involving innovative startups into address one or several challenges of the circular economy

Responsibility of multinationals

Taking part in the management of end of lifecycle regarding products and packaging everywhere in the world (regulations on Extended producer responsibility)

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PHOTO CREDITS

P1

Front cover image: Inside view of the Hangar Y, October 2022 (Caroline van der Velden)

P5

- Aron Visuals (Unsplash)
- Christopher Burns (Unsplash)
- Pile of scrap metal (Adam Fleks / Dreamstime.com)

P18

- Kalundborg Symbiosis (ARR)
- Almere, Pays-Bas, Jwvaneck (Unsplash)
- Bim, STW Architects/Bouygues UK
- Nakagin Capsule Tower, Japon, (Wikimedia)
- Engineers (Depositphotos)

P23

Factory as a Forest (ARR)

P25

Concasseur de pierre (123RF)

P28

Tourville-la-Rivière (Vinci)

P42

Initiatives concerning a circular economy in Africa (Vinci)

P50

Advertising Darty Max, 2022 (Darty)

P55

Schneider Electric, 2022

P60

The advantages of Recycl'Toit roofing (Michelin)

P69

The new Triodos Bank offices, Zeist, Netherlands (ARR)

P70

Circular viaduc, Netheralnds, Rijkswaterstaat and Holland Circular Hotspot (ARR)

P71

Star Apartments (Michael Maltzan / ARR)

P73

- La crèche justice (BFV Architectes / ARR)
- Brummen Town Hall, BAM (Thomas Rau)
- Destruction of Gagarine (***New York Times***)

P73

- Fiber glass (Istockphoto)
- CobBauge project (ARR)
- The O-House, House Sustainable Living (ARR)

P74

General Metabolism, 2022 (Bellastock)

P81

- MycoTile (ARR)
- Glass concrete (ARR)

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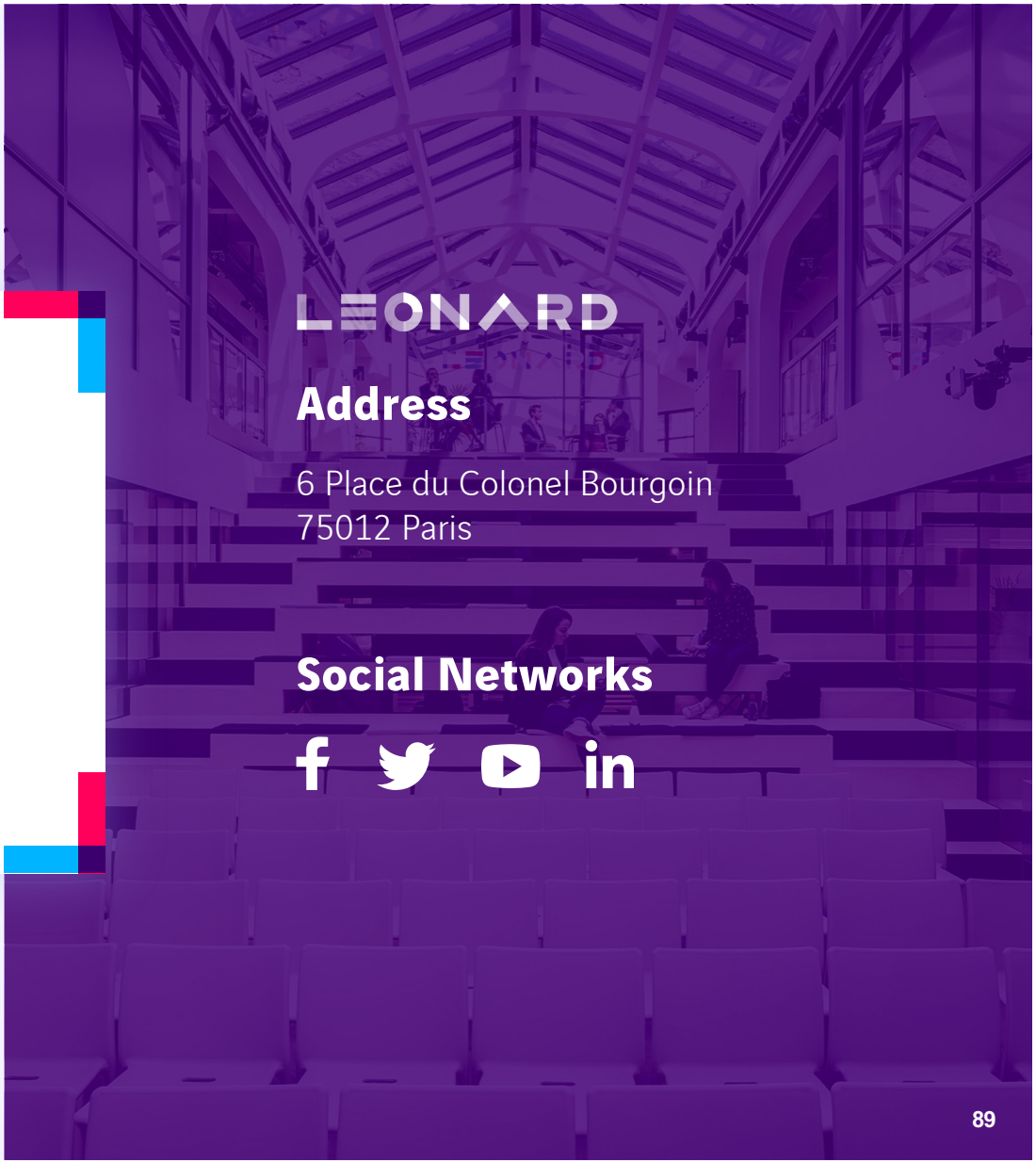

LEONARD

Address

6 Place du Colonel Bourgoin
75012 Paris

Social Networks