

# Resource saving<sup>1</sup> at the heart of the enhancement of the built heritage



## **Contributors :**

- Léo Ben Amor, *Research and Expertise Engineer, CSTB*
- Valérie Ayache-Doubinsky, *Circular economy/professional waste officer, Grenoble Alpes Métropole*
- Sébastien Béclin, *Circular Economy Project Manager, CIRIDD*
- Marie-Dominique BOGO, *SUEZ project director and founder, BATIRIM*
- Julia Guennou, *Business Engineer, CSTB*
- Chloé Paillaud-Duboy, *Circular Economy Officer, CIRIDD*
- Catherine Premat, *Head of local authorities and sustainable public procurement, AURAE*
- Claire Vilasi, *Project Manager, Ville & Aménagement Durable*
- Edouard Sorin, *Research and Expertise Engineer, CSTB*

---

<sup>1</sup> Although the term resources also includes environmental resources (water, land, etc.), we will restrict the term to material and energy aspects in this fact sheet.

## Table of contents

<b>Part 1 - Background</b>	<b>3</b>
1.1 Definitions	4
1.2 Regulatory context	5
1.3 Key figures in the AURA region	6
<b>Part 2 - Building alternative solutions based on the approaches of actors in the Auvergne-Rhône-Alpes region</b>	<b>7</b>
2.1 Focus on three circular economy actors	7
2.2 The lessons	9
2.2.1 Existing acceleration factors in the territory	9
2.2.2 Development paths to be implemented in the territory	11
<b>Part 3 - Going further and implementing</b>	<b>15</b>
3.1 Directory of initiatives on Eclaira	15
3.2 Selection of CIRIDD resources and contributors	15
3.3 Appendix: Introduction of contributors	16



## Part 1 - Background

The Auvergne-Rhône-Alpes region emits 51.7 million tonnes of CO<sub>2</sub> of greenhouse gases (GHG) each year, 70% of which are of energy origin. In the building sector, although GHG emissions have fallen by 21% since 1990 in Auvergne-Rhône-Alpes, with a marked decrease between 2018 and 2019 (-9% for the residential sector and -7% for the tertiary sector), they still represent more than 11.7 million tonnes of CO<sub>2</sub> equivalent each year, i.e. slightly less than a quarter of regional emissions<sup>2</sup>, making the **building sector one of the major areas of decarbonisation of the territory and the fight against global warming.**

In terms of energy, the building sector accounts for around 25% of the regional footprint with an annual energy consumption of 91.4 TWh (residential and tertiary combined), or 0.95 tonnes of oil equivalent per year and per inhabitant (Bilan Annuel 2021 CERC ARA). Although energy consumption in the residential sector has fallen slightly by 2.1% in Auvergne-Rhône-Alpes since 2010, it is still far from the 23% reduction target set by the region between 2015 and 2030 (49.5 TWh in 2030 compared to 62.8 TWh in 2019). This high energy consumption can be explained in particular by the relatively high percentage of thermal flats still present on the territory (18%), which generate a significant share of energy dedicated to heating (61% of the total in 2019), and which is associated with significant departmental energy disparities (up to a factor of 12). **The objectives set can only be achieved by improving the energy efficiency of new and existing buildings in the Auvergne-Rhône region.**

In terms of waste, the construction sector generates 13% of the national waste production in France, i.e. 46 million tonnes of waste per year<sup>3</sup>. Of this, 49% comes from demolition, **38% from rehabilitation**, and 13% from new construction. The overall recovery rate of this waste varies, according to sources, from 48 to 64%, with a strong dependence on the type of waste (60 to 70% for inert waste and 30 to 50% for non-hazardous non-inert waste) and on the activity (60 to 80% for demolition, 40 to 60% for new construction, **and only 10 to 30% for rehabilitation**). **Thus, with 17.5 million tons of waste generated at the national level and a maximum recovery rate of 30%, the rehabilitation sector's margin of progress in the economy of material resources is important, offering good prospects for the development of the sector's circularity.**

Whether in terms of GHG emissions, energy or materials, the **potential for resource saving in the building sector is significant in Auvergne-Rhône-Alpes**, making this sector **a real opportunity to improve the region's energy, carbon and environmental footprint**. This opportunity can be used to enhance the region's built heritage. Making the building sector more sober in terms of energy, carbon and the environment on a territorial scale requires massive renovation of the existing built heritage, in particular by promoting the local reuse of materials, improving the thermal insulation of residential and tertiary buildings, and reducing the production of waste, while improving its traceability and recycling rate.

This opportunity is now favoured by national and European legislation in favour of sustainable construction and the circular economy, by the support of regional territorial policies, but also constrained by resource shortages and the current global energy and climate crises.

**Saving resources in the building sector is therefore becoming a major challenge for the enhancement of the built heritage, which requires both a strong commitment from all the players in the building sector and increased awareness of this subject among elected representatives. This technical sheet, co-produced with the participation of Auvergne-Rhône-Alpes Energie Environnement, the company Batirim, the Centre Scientifique et Technique du Bâtiment, Grenoble Alpes Métropole, and Ville &**

<sup>2</sup> <https://www.orcae-auvergne-rhone-alpes.fr/analyses-thematiques/climat/emissions-de-gaz-a-effet-de-serre>

<sup>3</sup> <https://www.ecologie.gouv.fr/dechets-du-batiment>

**Aménagement Durable**, aims to provide all stakeholders in the building sector with the lessons learned from recent initiatives in the Auvergne-Rhône-Alpes region.

*The entire CIRIDD team warmly thanks all of these actors for their active and benevolent participation in the development of this technical sheet.*

## 1.1 Definitions

**Built heritage:** The built heritage includes all the properties with a heritage value, whose durability must be guaranteed. According to the traditional approach, which is still dominant today, the built heritage is identified with remarkable monuments (castles, churches, squares, gardens, etc.), vernacular and industrial architecture, as well as popular heritage (repertoire of singular and autonomous objects to which the tools of protection, maintenance, conservation and restoration apply).

**Construction waste:** Construction waste, or building and public works waste, refers to any waste from the building and public works sector resulting from the deconstruction, rehabilitation and demolition of buildings. The term includes inert waste, non-hazardous and non-inert waste, and hazardous waste, each with different regulations.

**Prevention:** Any measure that reduces the amount of waste produced and/or its hazardousness by influencing both the production and consumption of products. In the context of renovation/rehabilitation in the building sector, this includes the conservation of building elements.

**Reuse:** Reuse refers to any operation by which substances, materials or products, which are not waste, are used again for a purpose identical to that for which they were designed.

**Reuse:** Reuse is any operation whereby substances, materials or products, which have become waste, are used again.

**Recycling:** Recycling is any recovery operation by which waste, including organic waste, is reprocessed into substances, materials or products for its original function or for other purposes (Article L. 541-1-1 of the Environmental Code). Recycling allows substances, materials or products to be substituted for other substances, materials or products.

**Resource:** The term resource first refers to the development of a capital, either natural (mineral resources, energy, water resources, forest resources, etc., but also location advantages) or material (machines, etc.), exploited by a given society at a given time with the aim of creating wealth. The term resource was then extended to intangible goods, such as capital (financial resources), or human resources (work capacity, innovation, etc.). The question of how resources are developed and used is inseparable from the nature of the resources themselves.

**PEMD diagnosis:** Before a demolition, renovation or significant rehabilitation of a building, the Products, Equipment, Materials, Waste (PEMD) diagnosis must be carried out by a construction professional, independent of the project owner or the demolition companies. It distinguishes between products (as well as equipment and materials) that can be reused and waste that must be treated in accordance with the hierarchy of treatment methods (see AGEC law in the next section for more information).

## 1.2 Regulatory context

The European Directive [2010/31/EU](#) of 19 May 2010 aims to improve the energy performance of buildings in the European Union (EU). It sets minimum requirements and a common framework for the calculation of energy performance. In 2018, Directive 2010/31/EU was amended by Directive (EU) [2018/844](#) of the European Parliament and of the Council of 30 May 2018, the objective of which was to accelerate the cost-effective renovation of existing buildings and to promote smart technologies in them.

[Law 2015-992](#) of 17 August 2015 on the energy transition for green growth aims to take action for the climate by setting France quantified objectives and means of action to implement the Paris Climate Agreement of 12 December 2015. The law on the energy transition for green growth includes several strong provisions in favour of the recycling of construction and public works waste in order to create a favourable environment for the development of the recovery of this waste:

- 50% of the materials used by the State and local authorities for road construction sites must come from the reuse or recycling of construction waste in 2017, 60% in 2020.
- The establishment of a network of professional waste collection centres for the building and public works sector via an obligation for distributors of construction materials, products and equipment to organise the collection of waste from the same types of materials they sell from professionals.
- A framework for waste-based developments whereby developers will have to justify to the authorities the nature of the waste used and prove that their work constitutes waste recovery, not disposal.

The [law n°2020-105](#) of 10 February 2020 on the fight against waste and the circular economy aims to accelerate the change of production and consumption model in order to limit waste and preserve natural resources, biodiversity and the climate. Applied to the building and public works sector, the AGEC law aims to limit the waste of materials and to promote the circular economy in its entirety (by reducing waste and promoting the recycling, reuse and re-employment of materials and products). It is based on several levers, including

- The implementation of an Extended Producer Responsibility (EPR) scheme for the construction industry, with reuse and recycling targets of 2% in 2024 and 5% in 2027, a collection and recycling rate of 45% in 2027, and a collection and recovery rate of 90% in 2027.
- The fight against illegal dumping.
- The implementation by the project owner of a diagnosis relating to the management of products, equipment, materials and waste (PEMD) during demolition work or significant rehabilitation of buildings completed by the traceability with the CERFA (Centre d'enregistrement et de révision des formulaires administratifs) of diagnosis and the CERFA of recollection.

[Decree No. 2021-950](#) of 16 July 2021 on the sorting of paper, metal, plastic, glass, textile, wood, mineral and plaster waste (7 streams), which extends the 5-stream sorting obligation for construction and demolition waste to mineral and plaster waste (7 streams), and defines the conditions for exemption from this obligation.

From an energy point of view, existing buildings are also subject to [three thermal regulations](#) which regulate their thermal characteristics and set the maximum quantities of energy that an existing building can consume: a so-called "elemental" regulation for buildings of less than 1,000 m<sup>2</sup> or more

than 1,000 m<sup>2</sup> (under certain conditions), a so-called "global" regulation for buildings of more than 1,000 m<sup>2</sup>, and a so-called "work-in-progress" regulation for major building renovation.

Resulting from the Loi Elan, the **tertiary sector decree** or **tertiary sector eco-energy scheme published in July 2019**, requires owners and occupants of private tertiary sector buildings, local authorities, government departments, building professionals, contracting authorities, project managers, thermal design offices, operating companies, property managers, and energy distribution network managers to implement actions to reduce final energy consumption in existing tertiary buildings in order to achieve a reduction in final energy consumption for all buildings subject to the obligation of at least 40% in 2030, 50% in 2040 and 60% in 2050 compared to 2010.

### 1.3 Key figures in the AURA region

- **81,400 establishments and 145,600 employees in the construction industry**
- **9.1 billion turnover in maintenance and renovation**
- **62,808 GWh and 29,575 GWh: energy consumption of the residential and tertiary sectors in 2019<sup>4</sup>, respectively**
- **18% of premises subject to the Eco Energie Tertiaire scheme account for 65% of the sector's energy consumption<sup>5</sup>**
- **56,852 MaPrimeRenov' files committed at the end of Q3 2022**
- **18% of the territory's energy failures<sup>6</sup>**
- **27 Mt of construction waste (90% inert waste, 8% non hazardous waste, 2% hazardous waste)**
- **88% and 62%: performance and recycling rates for inert construction waste<sup>7</sup> respectively**

<sup>4</sup> <https://auvergnerhonealpes.territory.fr>

<sup>5</sup> [Knowledge and renovation strategy for the tertiary sector in Auvergne-Rhône-Alpes - CERC ARA](#)

<sup>6</sup> [Annual review 2021 Energy transition and sustainable building in Auvergne-Rhône-Alpes - CERC ARA](#)

<sup>7</sup> [Recycling and recovery of inert waste from the building and public works sector - CERC ARA](#)

## Part 2 - Building alternative solutions based on the approaches of actors in the Auvergne-Rhône-Alpes region

### 2.1 Focus on three circular economy actors

**BATIRIM** is a company created in 2019, a Joint-Venture of SUEZ (60%) and Kairnial (40%), with the aim of accelerating the development of innovative and digital solutions dedicated to the renovation and selective deconstruction of buildings to serve the circular economy. BATIRIM relies on an anticipatory and advisory approach to meet its clients' circular economy challenges by digitalising business processes related to deconstruction and rehabilitation, in compliance with regulations. As a Qualiopi-certified training organisation, BATIRIM has already trained around fifty diagnosticians in digitalized EDP diagnosis, including APAVE, AC Environnement, Sodiatic and Diagamter, all of which are present in Auvergne-Rhône-Alpes. BATIRIM offers three feedbacks from sites with different dimensions:

**1. Greater Paris Metropolis (Saint Denis - 93) from March 2020 to February 2021:** Deconstruction of a former Engie site (70,000 m<sup>2</sup>, 38 buildings, 12 ha) for the construction of an Olympic swimming pool and housing. The results of this project in terms of circular economy are :

- **435 T in reuse**, including 2 wooden buildings (over 300 m<sup>2</sup>) and 80% of reused office furniture (approximately 160 tonnes)
- **94% material recovery of waste** (higher than the regulatory target of 70%)
- **50% recycling of the second work**

An exemplary and collaborative achievement, with a strong commitment from the project owner, the local authorities and the deconstructor despite a difficult context (COVID-19). For the first time in France, more than 400 tonnes of products and equipment were reused and traced, including 80% of reused office furniture.

**NEXITY: REIWA project (Saint Ouen - 93):** Deconstruction of the Colisée 1 building (15,000 m<sup>2</sup>) for the construction of Nexity's future head office. The results of this project in terms of circular economy are :

- **95% material recovery of waste** (higher than the regulatory target of 70%)
- **67% reuse/recycling of products, equipment, materials** (above the regulatory target of 55%)
- **14 single-stream source-sorted flows** (higher than the target of 7 regulatory flows BTP + WEEE)
- **Reuse of 9000 m<sup>2</sup> of technical floor, 3000 m<sup>2</sup> of carpet, sale/donation of 2000 items.**

This was an exemplary operation which showed that it is possible to achieve 67% reuse and recycling of the finishing work without any delays or additional costs compared to the initial budget.

**3. NACARAT - Carré Constructeur - Loger Habitat (Lambert - 59):** Deconstruction of the TDF group buildings (4500 m<sup>2</sup>, 3 buildings). The results of this project in terms of circular economy are :

- **91% material recovery of waste** (higher than the regulatory target of 70%)
- **42.4% reuse/recycling of products, equipment, materials** (below the regulatory target of 55%)
- **10 single-stream source separation flows** (for 7 regulatory flows BTP + WEEE)

An interesting case with the realization of a digitized PEMD diagnosis at the beginning of the project and a complete follow-up of the construction site which made it possible to show that the tonnage estimated at the time of the PEMD diagnosis was very close to that at the end of the construction site (difference of 200 tons on a total of 6000 tons).

**Grenoble Alpes Métropole (GAM)** is a French metropolis under common law, located in the department of Isère, made up of 49 municipalities and organised around the city of Grenoble. Like all local authorities, GAM is called upon to set an example in terms of the circular economy, on its territory and at different levels: waste reduction and promotion of reuse, exemplary project management in terms of urban development as well as in terms of building, awareness-raising and communication actions aimed at the general public and professionals. GAM also has the capacity to federate actors on its territory, in particular public project owners, which it did in 2020, by creating a working group that brings together Grenoble Alpes Métropole, the suburban municipalities, the Etablissement Public Foncier Local (EPFL) du Dauphiné, social landlords, the CROUS, Grenoble Alpes University, and the Société d'Aménagement Inovia-Sages in order to enable a collective increase in skills on the reuse and recovery of building site waste, training in the drafting of clauses in the Cahiers des Clauses Techniques Particulières (CCTP) and the exchange of good practices on current and future building sites. The federation of actors has taken concrete form with the creation of the regional network of MAT'AURA material libraries, led since 2021 by the Regional Chamber of the Social and Solidarity Economy (CRESS AURA), the aim of which is to share tools and network the entire Auvergne-Rhône-Alpes territory.

### **Eco-exemplarity in urban development: Sundial operation in La Tronche**

In terms of urban development, GAM, together with the EPFL du Dauphiné, has initiated an experimental approach to the Sundial operation in La Tronche, near Grenoble. After several resource diagnoses, 4 of the existing buildings were carefully dismantled (selective deconstruction) and many elements were put up for sale directly on site by Aplomb-Ecomat38 in a temporary site shop (the Batitec). At the same time, 8 other buildings were deconstructed more quickly with more powerful mechanical means.

**The results show a material recovery rate of 99%, much higher than the initial objective of 85%, which was already higher than the regulatory requirement (70%). In addition, the careful cleaning of the site required 70% more time than a quick deconstruction, but the cost of managing the waste per m<sup>2</sup> was divided by 10. The overall financial saving was estimated at 40% for the entire development project, thanks to the on-site reuse of 54 tonnes of roof tiles, 74 tonnes of wood, and numerous ashlar. From an environmental point of view, the reuse of tiles and frameworks alone represents a carbon benefit of 148 tonnes of CO<sub>2</sub>. Finally, the selective deconstruction site created 12 full-time jobs, and 6 jobs were maintained at the end of the site.**

Thanks to a rigorous evaluation process, this operation has highlighted the decisive advantages of reuse on several levels (economy, environment, employment, nuisance). The operation won a Euro Cities Award on 10 June 2022 in the "Lead Together" category for implementing climate-friendly solutions by integrating the circular economy into the construction industry.

**For Grenoble Alpes Métropole and the public players, the choice of reuse is not an easy one. It requires a sometimes lengthy process of learning and acculturation in different departments. Awareness-raising, coordination and internal training actions were necessary to promote cross-cutting action. The evaluation and capitalisation of experiences have made it possible to increase skills and to advance the objectives, which are becoming increasingly ambitious.**

The impetus given by the top, in particular by the public MOU on a territory, for a change in practices, is determining. But it is necessary that this dynamic of change of practices spreads rapidly to all the actors of the value chain of the building site and in particular that the channels of reuse of materials find their place and their economic model in this new ecosystem of the construction.

The **Centre Scientifique et Technique du Bâtiment (CSTB)** is a public enterprise of an industrial and commercial nature (EPIC), at the service of its clients and the general interest. Its ambition is to imagine



the buildings and cities of tomorrow by supporting and securing sustainable construction and renovation projects, to improve the quality of life of their users, by anticipating the effects of climate change. In order to help actors in the building sector optimise their selective deconstruction operations, the CSTB and the ORÉE association published a practical guide in 2022, entitled "Building sector: how to better recover & deconstruct" (see section 3.2 of this document). The CSTB also proposes to help local authorities in the implementation of their circular economy strategies, in particular via BTPFlux, a digital tool that **analyses the material flows of the building sector on the scale of a territory** from a precise estimate of the stock of components of existing buildings and by applying scenarios of mutation of the stock. BTPFlux is based on two other tools developed by the CSTB: the **National Building Database (BDNB)**, which concatenates a large amount of information on the scale of each building in Metropolitan France, and **TyPy**, a tool that makes it possible to model a building from limited information using a macro-component approach. The CSTB, at the request of the Direction de l'Habitat, de l'Urbanisme et des Paysages (DHUP), is also in charge of developing the future regulatory platform associated with the new Products, Equipment, Materials, Waste (PEMD) diagnosis.

At the regional level, the CSTB has been working since 2022 on the innovative regional study Renov'santé for the Observatoire Régional de la Santé Auvergne-Rhône-Alpes (ORS AURA). This multi-partner study brings together ORS AURA, SOLIHA, the Compagnons Bâisseurs Rhône-Alpes and Auvergne, the CSTB and the HOPE Chair and involves five departments of the Auvergne-Rhône-Alpes region: Ardèche, Isère, Loire, Puy-de-Dôme and Savoie. Its objective is to **analyse the evolution of the health status of people who have benefited from renovation work in their homes**. It concerns in particular households benefiting from programmed housing improvement operations. The CSTB's contribution to the Rénov' Santé project is based on three actions:

- **The evaluation of the gains associated with the improved health of households living in renovated housing**, notably through studies assessing the impact of exiting fuel poverty on the health of households through the evolution of health costs.
- **Cost-benefit analysis of energy works** that includes the valuation of health externalities.
- **The generalisation of this work on a national scale.**

A first progress report on the Renov'santé project will be produced in 2023 and the final report will be delivered in early 2025. The CSTB also participated, within the framework of a partnership with the Grenoble Alpes Métropole, in the optimisation of the recovery of deconstruction waste during the sundial operation in La Tronche (the results of which are cited above). Within the framework of this project, the mission of the CSTB consisted of :

- **The realization of a waste diagnosis**, based on pre-demolition audits which allowed the CSTB to assist GAM in the recovery of waste at the end of its life.
- **Characterisation of the performance of materials resulting from the recovery of products with a view to their re-use**, in particular by proposing a credible framework via validation with all the players (insurers, inspection offices, etc.) of the field of use envisaged.

## 2.2 The lessons

### 2.2.1 Existing acceleration factors in the territory

Resource saving in the building industry is currently being **accelerated by a number of factors** which provide opportunities for the development of resource saving practices in the building industry, including

- **An ecosystem that is aware of current environmental issues (materials, energy, water, soil)** thanks to the existence of dedicated tools and the presence of associative and public players in the area (ADEME, Ville & Aménagement Durable, Local Energy and Climate Agencies, Council for Architecture, Town Planning and the Environment, CIRIDD, Eco-building cluster, etc.). For example, [the French Building Federation](#), in partnership with ADEME, has created "Quarts d'heure environnement" (environmental quarter hours) kits that enable the organisation and running of a regular meeting to raise awareness of environmental issues in the building sector. [The Sustainable Building MOOC platform](#) also offers numerous online training courses on the sector's energy and environmental issues. The CIRIDD, through its [circular economy platform in the Auvergne-Rhône-Alpes region ECLAIRA](#), also provides documentary resources, geo-localized field feedback, a directory of referenced organisations in the region, and numerous tools on circular economy and sustainable development issues in the building sector. [The DEMOCLES collaborative platform of actors](#), launched at the end of 2014 on the initiative of the eco-organisation Ecosystem, allows for the improvement of practices in terms of prevention and management of secondary construction waste from heavy rehabilitation and demolition sites. Today, it brings together numerous partners representing the project owner/manager, construction companies, waste managers and recovery channels, and develops practical and harmonised tools for simpler management of construction site waste that respects the regulations and the environment. Initiated in 2019 by the State, the Auvergne-Rhône-Alpes region, ADEME, and the Banque des Territoires, [the regional resource centre for the energy renovation of tertiary buildings](#) aims to make available the available information and existing tools, create links, and encourage the exchange of experience between those involved in the energy renovation of buildings. Within this framework, the Resource Centre offers quarterly information webinars for stakeholders in the region, technical workshops for regional energy renovation advisors, annual regional meetings to amplify local dynamics and targeted information for the concrete implementation of actions for the renovation of public buildings. Finally, [the website Centre de Ressources pour les Territoires en Transition d'Auvergne-Rhône-Alpes \(Resource Centre for Territories in Transition in Auvergne-Rhône-Alpes\)](#) lists regional events, news from the territories, initiatives and portraits of territories, a media library, as well as tools and data for territories involved in the energy transition.
- **A favourable local, national and international regulatory context** thanks to French regulations, decrees and laws as well as the European directives passed since 2010 in favour of the circular economy and sustainable development (see section 1.2).
- **A national and European political will and commitment in favour of saving material, energy and environmental resources in the territories.** At the national level, several institutions within the Ministry of Culture (Institut National du Patrimoine, Cité de l'Architecture et du Patrimoine, etc.) have taken up the issue of sustainable development in the context of heritage. At the European level, the European Heritage Days in September 2022 were keen to emphasise to the public the environmental and sustainable dimension of heritage conservation through reflection on practices, the conservation and optimisation of know-how, the reuse and use of natural materials, the enhancement of intangible heritage, the economic and tourist development of territories, the revitalisation of old centres, reflection on the conditions for living together, etc.
- **Although unevenly distributed across the country, there is a demand from local authorities and companies in the tertiary sector for reuse projects in the building sector,** particularly driven by the AGECE Act of February 2020, which stipulates that local authorities and their groupings must, among other things, set up areas dedicated to reusable products within their

waste collection centres and allow social and solidarity economy companies that so request to use these centres as a place for recovering and reprocessing these objects. Thus, the challenge for local authorities managing waste collection centres lies in their ability to transform waste collection centres into preferred locations not only for recycling and eliminating waste, but also for collecting goods from users in the area with a view to reuse or recycling, all within a circular economy approach.

- **A shortage of virgin raw materials and an increase in their price.** Since 2022, construction companies have been facing a shortage of building materials, particularly in the wood sector, with price fluctuations of between 20 and 110%, which is a cause for concern for VSEs in the sector. In addition to the shortage of wood, there is also the growing pressure on the availability of sand, which has increased drastically over the last few decades due to the urbanisation of emerging countries and the global demographic explosion. Reuse is becoming more and more of a necessity, if not an obligation, to reduce the strain on our planet's natural resources.
- **Construction waste management becomes a cost saving when used as a resource.** The circular economy in the construction sector reduces the carbon footprint by helping to reduce the production of new construction materials, avoids overloading landfill sites, reduces site expenses associated with the purchase of new materials or tools, reduces disposal costs, and makes ecological commitment an argument to clients and prospects.
- **A growing and restrictive increase in the General Tax on Polluting Activities (TGAP)** which, according to the association AMORCE, should rise to €25 per tonne in 2025 for incineration and €65 per tonne for landfill, i.e. a threefold increase compared to 2019.
- **A global energy and climate crisis** that is forcing industrial ecosystems to modify their economic models and innovate by integrating circular economy strategies that are both efficient and economically viable. Saving resources during renovation/rehabilitation projects avoids sometimes significant greenhouse gas emissions and contributes to the decarbonisation of the building sector.

### **2.2.2 Development paths to be implemented in the territory**

Thanks to this favourable context, resource saving initiatives during building recovery projects are multiplying in the Auvergne-Rhône-Alpes region (see section 2.1). However, **many obstacles still prevent their systematic duplication** and generalisation to other territories, whether the resource savings are environmental, material<sup>8</sup> or energy. Within the Auvergne-Rhône-Alpes region, the development of resource saving in the enhancement of built heritage requires **a real evolution of the whole sector which can be achieved by the implementation of targeted local actions:**

Thus, **the acculturation and the general awareness of all the actors** (project managers, construction companies and building industry, educational and training institutions, insurance companies, administrative bodies and politicians) on these subjects **is necessary for the effective deployment of the resource saving approach in the framework of the enhancement of the built heritage.** To encourage it, **it is important to be able to experiment, prove and above all communicate to all the actors of the sector, as well as to the average citizen, the efficiency of the approach and the**

<sup>8</sup> [Identification of the obstacles and levers to the reuse of construction products and materials - ADEME - 2016](#)

**measurable positive externalities** generated in economic, social and environmental terms. Several inspiring approaches exist in the Auvergne-Rhône-Alpes region. For example, **Ville & Aménagement Durable (VAD)** supported the Direction Départementale Des Territoires du Rhône in the organisation of a day on the Water-Air-Soil strategy in July 2022 for some fifty elected officials in the north-western part of the Rhône Department. VAD also co-organises, alongside 10 other associations, [the Sustainable Development Offering](#), which aims to give visibility to pioneering, avant-garde, frugal projects that have implemented with great ambition architectural, technical or usage solutions anticipating the future context. The Reuse collective action, which brings together about a hundred members, also enables VAD to produce tools and feedback to support the sector. In addition, VAD co-manages the Reuse Booster in Auvergne-Rhône-Alpes, with the aim of supporting contracting authorities in integrating reused materials into their operations. For its part, the Grenoble metropolis is preparing a guide to sustainable construction as part of its Exemplary Administration Plan, an approach that capitalises on the success factors of projects carried out on its territory ([the sundial project](#), the Peupliers Economic Activity Zone and [the renovation of the Forum](#)) in order to establish a reference system that will allow the generalisation of successful procedures and methods. **AURA-EE**, through its participation in the [European project CONDREFF](#), aims to advance public policies, investment and innovation for a better regional management of construction waste. Several workshops were organised in this framework, dealing with the management and recovery of construction waste or the preventive design and re-use of building materials. A guide on waste recovery and reuse in public procurement was published in March 2022. AURA EE also leads [the regional RREDD network](#), a space for exchanges, experience sharing and training in favour of the implementation of environmental and social clauses in public procurement. Finally, **the CSTB** accompanies the actors of the building sector via a technical assessment of experimentation (ATEX) which allows initial feedback on the implementation of products or processes prior to a technical opinion and also allows the validation of innovative designs. Acculturation can also be achieved through training in the circular economy (BATIRIM, CTSB, Labo'Cert) or directly with the project manager via comparisons between the resource saving estimates made by the EMSP diagnosis and the resource saving actually achieved during the construction site (example of the TDF Lambersart construction site with a difference of 200 tonnes out of an estimate of 6000 tonnes).

**The training and securing of new sustainable building professions** (particularly PEMD diagnosticians and certifiers) **are also crucial to meet the growing demand from local authorities and public and private project owners in this sector.** These new profiles are indeed difficult to find because they require broad cross-disciplinary skills and suffer from a lack of communication and networking at different territorial levels. Moreover, the lack of clarification on their exact roles, locations and functions on the value chain, the ambiguity on the definitions of the co-existing diagnoses (PEMD versus resources), associated with delays on the CERFA, hinder for the moment the advent and the generalisation of these emerging professions and also lead to distortions of competition between actors of the building sector. The resolution of these problems, particularly at the regulatory level, is however necessary for the securing and perpetuation of these new professions which constitute a real opportunity for the rebirth and remotivation of all the actors of a sector already marked by a major recruitment crisis. It is also essential because the players in the sector (craftsmen, engineers, etc.) are not currently able to meet the volume of reuse required to achieve the ambitious objectives set by the territories.

**The generalisation of the implementation of the traceability of the various waste and product deposits, and the provision of methodological guides and good practices for dismantling** are also key factors for improving the implementation of re-use. Indeed, being able to identify the technical performances, the initial fields of use, and the hazardous substances potentially contained in the products and construction materials at the time of removal, makes it possible to improve the reuse potential of a deposit. In addition, the development of methodological guides, proposing the detailed stages (removal, storage, reconditioning) to be followed, makes it possible to diagnose and evaluate



the technical performance of products with a view to their re-use. These guides, which currently only partially exist for certain product families, would eventually make it possible to frame and generalise good reuse practices, thus reassuring insurers and inspection offices and improving the insurability of reused materials, which is the current obstacle to the massification of reuse.

**The prescription and implementation of storage solutions for materials destined for reuse are important issues for the generalisation of the reuse of material resources in the valorisation of built heritage.** Concerning the first aspect, [a guide of prescription strategies](#) was produced by Rotor and Bellastock in the framework of the Interreg FCRBE project (Facilitating the Circulation of Reclaimed Building Elements) and published in February 2022 with the aim of facilitating the integration of reuse in large-scale projects and public contracts. This type of initiative, which provides a didactic tool aimed primarily at building owners, could be replicated for building projects in contexts other than public procurement. Concerning the second aspect, the *matériauthèques*, or materials recycling centres, and other recycling platforms play a major role in making these materials available to as many people as possible. However, these structures are still struggling to find viable socio-economic models because they require very large storage areas, easily accessible to a maximum number of actors, while having a relatively low land or rental cost, in order to be profitable and sustainable and to allow them to become autonomous. A few material libraries are currently in the experimental or emergence phase in the AURA region, including [the Matériauthèque in Chambéry](#) run by the Enfin! Réemploi (the Chantiers Valoristes, Nantet Locabennes, Trialp, ENSAM and Kayak architecture) and mainly oriented towards the wood reuse sector thanks to a dedicated joinery. Sharing the experience of these new structures with the players in the sector would encourage their development in the region. This is the challenge of the regional network of MAT'AURA material libraries, which has been run since 2021 by the Auvergne-Rhône-Alpes Regional Chamber of the Social and Solidarity Economy (CRESS AURA), and whose aim is to share tools and network the entire AURA region. A solution to the economic aspects could consist in the mutualisation of centralised platforms on the territories by allowing simultaneous access to the platforms for several work sites, but this requires a precise identification of the land development projects beforehand.

**Maintaining and accessing appropriate funding mechanisms, particularly at regional level, enables the AURA region to experiment with innovation on targeted products and materials, and to test the replicability of innovations and economic models already implemented in other regions.** Access to public funding for innovation allows companies to prioritise their research and development areas and to limit the risks they take in their investments. Indeed, some industrialists sometimes have the unfortunate tendency to focus more on recycling than on reuse, particularly for communication, marketing and investment reasons. A real change of mentality of the industrial actors of the sector is thus necessary to become aware of the benefits and added value of the practice of reuse. It is also important to remind all the players in the sector of the existence of the innovation contract (or partnership) between local authorities and companies, which makes it possible to support regional companies wishing to develop an innovation project, whether individual or collaborative. This scheme is not limited to technological innovation but also includes process, organisational and social innovation. Local authorities also have the capacity to implement experimentation on their territory without using a dedicated call for tenders up to an amount of €40k. This type of action has the advantage of testing the reuse capacity of certain products or families of products on the scale of a previously chosen building site and can act as a real lever for a more global experimentation.

**Finally, the improvement of the territorial vision of the planning would allow to improve the circularity of the sector at the territorial scale.** Indeed, an analysis of the building waste flows at the scale of one (or several) community(ies) would allow to identify and anticipate the development needs of the waste recovery channels by comparing it to the dimensioning of the existing waste recovery channels and to the future construction demand of the territory.



## Part 3 - Going further and implementing

### 3.1 Directory of initiatives on Eclaira

1. Minéka: Building materials to (re)use  
<https://www.eclaira.org/initiative/h/mineka-des-materiaux-de-construction-a-re-utiliser.html>
2. Operation on Resource and Reuse in Roanne  
<https://www.eclaira.org/initiative/h/operation-sur-la-ressource-et-le-reemploi-a-roanne.html>
3. An exemplary local parquet re-use loop in Villeurbanne  
<https://www.eclaira.org/initiative/h/une-boucle-locale-de-reemploi-de-parquet-exemplaire-a-villeurbanne.html>
4. FINALLY! REEMPLOI: a circular economy loop for building materials in Savoie  
<https://www.eclaira.org/initiative/h/enfin-reemploi-une-boucle-d-economie-circulaire-pour-les-materiaux-de-construction-en-savoie.html>
5. The step-by-step implementation of the circular construction industry in Lyon  
<https://www.eclaira.org/initiative/h/la-mise-en-place-etape-par-etape-de-la-filiere-circulaire-du-btp-sur-lyon.html>
6. Bed in Shop: unusual tourist accommodation in the city centre in old shops  
<https://www.eclaira.org/initiative/h/bed-in-shop-hebergement-touristique-insolite-en-centre-ville-dans-d-anciennes-boutiques.html>
7. RE.SOURCE  
<https://www.eclaira.org/initiative/h/re-source.html>
8. The Sundial Batitec, a pilot project for a material library  
<https://www.eclaira.org/initiative/h/la-batitec-du-cadran-solaire-un-projet-pilote-de-materiautheque.html>
9. Recycling of construction materials  
<https://www.eclaira.org/initiative/h/recyclage-des-materiaux-de-chantier.html>

### 3.2 Selection of CIRIDD resources and contributors

1. CIRIDD awareness-raising workshop for elected representatives - How to enhance the value of the built heritage of local authorities to move towards greater circularity?  
<https://www.eclaira.org/articles/h/temoignages-comment-valoriser-le-patrimoine-bati-des-collectivites-pour-aller-vers-plus-de-circularite.html>
2. Practical guide from Orée and CSTB on methodological and operational tools for building and public works actors to carry out a selective deconstruction operation in a circular economy logic. "Building sector: how to better recover & deconstruct" <https://www.cstb.fr/assets/documents/secteur-du-batiment-comment-mieux-valoriser-et-deconstruire.pdf>
3. VAD tools produced in the framework of the Co-Reemployment action since 2020 (VADometer, directory, webinars, etc.) <https://www.ville-amenagement-durable.org/Reemploi>
4. BDNB (Base de Données Nationale des Bâtiments), produced by the CSTB, which is a cartography of the existing building stock, constructed by geospatial cross-referencing of some twenty databases from public bodies. <https://www.data.gouv.fr/fr/datasets/base-de-donnees-nationale-des-batiments/>
5. Report to the Minister for Ecological Transition and Solidarity, the Minister for Territorial Cohesion and Relations with Local Authorities and the Minister for Urban Affairs and Housing - France Stratégie - 2019 - "Zero Net Artificialization" objective: what levers can be used to protect the soil?  
<https://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/atoms/files/fs-rapport-2019-artificialisation-juillet.pdf>
6. Materials Reuse Toolkit produced by Rotor vzw/asbl as part of the Interreg FCRBE project - Facilitating the Circulation of Reclaimed Building Elements, is aimed at designers, specifiers and construction project teams wishing to reuse the building material or product concerned - 2022 - [https://opalis.eu/sites/default/files/2022-02/FCRBE-All\\_sheets\\_merged-FR.pdf](https://opalis.eu/sites/default/files/2022-02/FCRBE-All_sheets_merged-FR.pdf)
7. Ville & Aménagement Durable in partnership with the Union régionale des CAUE Auvergne-Rhône-Alpes and the Collectif de la Frugalité Heureuse & Créative - Architecture Frugale, 20 exemples réhabilitations en Auvergne-Rhône-Alpes - 2022 - <https://www.ville-amenagement-durable.org/Ouvrage-Architecture-Frugale-20-exemples-de-rehabilitations-en-Auvergne-Rhone>

8. Studies, publications, training, workshops of the Interreg Condereff project on construction waste management - 2022 - <https://www.auvergnerhonealpes-ee.fr/projets/projet/condereff>
9. CERC AURA studies of the construction sector in the Auvergne-Rhône-Alpes region <https://www.cercara.fr/>
10. Reuse Booster approach (MO commitment, trophies, etc.) <https://boosterdureemploi.immo/> and regional approach <https://www.ville-amenagement-durable.org/Lancement-du-Booster-du-Reemploi-en-Auvergne-Rhone-Alpes-335>
11. Environmental regulation RE2020 for new buildings [https://www.ecologie.gouv.fr/reglementation-environnementale-re2020#scroll-nav\\_2](https://www.ecologie.gouv.fr/reglementation-environnementale-re2020#scroll-nav_2)

### 3.3 Annex: Presentation of contributors

**Auvergne-Rhône-Alpes Énergie Environnement, AURA-EE**, is an association under the law of 1901 created by regional elected officials and companies in 1978. Its aim is to increase the impact of regional energy and environmental policies on the territories and to support them in defining and implementing local transition solutions and strategies. AURA-EE leads, alongside the State (SGAR and DREAL), the Auvergne-Rhône-Alpes Region, ADEME and the Banque des Territoires, the Resource Centre for the energy renovation of tertiary buildings with the aim of massifying actions in favour of energy renovation. The Agency also leads the Regional Network on Eco-Responsibility and Sustainable Development (RREDD), to promote the implementation of environmental clauses and the development of the circular economy in public procurement.

**Ville & Aménagement Durable (VAD)** is a network of sustainable building and development professionals in Auvergne-Rhône-Alpes, which includes 420 member structures. All the professions are represented, so that together they can inform themselves, train themselves, debate and co-construct new standards. Each year, VAD involves and mobilises more than 2,000 professionals. In particular, some thirty events are organised each year and various collective actions mobilise its members and partners on a variety of subjects (rehabilitation, RE2020, health-building, reuse, CO-Lab', territorial planning, urban agriculture, eco-materials, etc.).

**The International Resource and Innovation Centre for Sustainable Development (CIRIDD)**, an association under the law of 1901 created in 2005 and recognised as being of general interest, aims to contribute to the emergence of new models of society, more respectful of living beings in their diversity, of future generations and of the planet. The CIRIDD promotes change towards sustainable development, based on cooperation within organisations, territories and sectors. Innovation and the right to experiment are the spearheads of CIRIDD. Its activities are deployed at different territorial levels, from local to international.

The **Centre Scientifique et Technique du Bâtiment (CSTB)** is a public enterprise of an industrial and commercial nature (EPIC), at the service of its clients and the general interest. Its ambition is to imagine the buildings and cities of tomorrow by supporting and securing sustainable construction and renovation projects, to improve the quality of life of their users, and to anticipate the effects of climate change.

**BATIRIM** is a company created in 2019, a Joint-Venture of SUEZ (60%) and Kairnial (40%), with the aim of accelerating the development of innovative and digital solutions dedicated to the renovation and selective deconstruction of buildings to serve the circular economy. BATIRIM relies on an anticipatory and advisory approach to meet its clients' circular economy challenges by digitalising business processes related to deconstruction and rehabilitation, in compliance with regulations.

**Grenoble Alpes Métropole (GAM)** is a French metropolis under common law, located in the



department of Isère. With a surface area of 546 km<sup>2</sup> and a population of 450,000, GAM is made up of 49 communes in the heart of the Vercors, Chartreuse, Belledonne and Taillefer massifs, organised around the city of Grenoble. 23 of these 49 communes are members of the Chartreuse and Vercors Regional Nature Parks.