9. FRANCE

9.1 Legal Framework – Waste Management Plans and Strategies

France has a powerful legal and regulatory framework with pre-audits on demolition sites, national and regional waste management plans including CDW, amongst others, benefiting CDW management. However, according to the stakeholders contacted by BIO by Deloitte for their study more significant financial and human resources need to be allocated to CDW legislation enforcement. Furthermore, the study highlighted insufficient regulation of backfilling and ground raisings.

9.1.1 National Legislation concerning CDW

Law 2009-967 of 3 August 2009, known as "*Grenelle I*" law, and **Law 2010-788** of 12 July 2010, known as "*Grenelle II*" law, make **pre-audits compulsory on demolition sites** (Articles 46 and 190, respectively). This measure is made compulsory for certain categories of buildings by **Decree n°2011-610** of 31 May 2011, which created articles R. 111-43 to R. 111-48 of the French Construction and Housing Code, and is supplemented by the Ministerial Order of 19 December 2011. The pre-audits, named "diagnosis on waste arising from demolition works", aim to characterise the materials present on site and plan the CDW management.

Order n°2010-1579 of 17 December 2010 amends the Environment Code to transpose the legislative part of the Waste Framework Directive 2008/98/EC (abbreviated WFD) into French law. It specifies the definition of waste, introduces the hierarchy in treatment operations, enforces waste prevention and sets the obligation to have a national waste prevention plan. **Decree n°2011-828** of 11 July 2011 then finalised the transposition of the WFD (regulatory part). It reformed waste territorial planning, set a limit on incineration and landfill, and imposed separate collection for recovery on large bio-waste producers. The **Environment Code** also impacts CDW by specifying the responsibility of waste producers and through its definition of waste prevention. Additionally, **waste traceability** is compulsory in France following **Decree n°2011-828** of 11 July 2011 and a couple of accompanying Ministerial Orders from 2012.

Since the 2010 Order, all companies are supposed to implement **source separation and collection** of waste. **Five waste streams** are targeted: paper, metal, plastic, glass, and wood. However this particular measure was not applied until the **Decree n°2016-288** of 10 March 2016, which sets the regulatory grounds for implementing source separation and collection of these five waste streams by companies in Article 3, hence its nickname: the 5-stream Decree ("*Décret 5 flux*" in French). Large producers of waste must do so for all five waste streams whereas small companies will gradually have to sort only paper. This piece of legislation specifies that several producers situated on a common site with the same waste management operator count as one larger producer. Furthermore, Article 5 of this Decree sets the legal framework for measures relative to the **recovery of construction material,**

product and equipment waste. Indeed, distributors whose distribution unit is at least 400 m² and whose annual turnover is at least 1 M€ must organise the recovery of waste from the same type of construction materials, products and equipment as they distribute, within a radius of ten kilometres. Waste professionals hope this Article, which entered into force on 1 January 2017, will help reduce illegal dumping (Barrault, 2016). This Article 5 of the 5-stream Decree is a direct implementation of Article 93 of the **Law 2015-992** of 17 August 2015, related to energy transition for a green growth. The energy transition law (abbreviated "*LTECV*") also includes various other measures regarding CDW:

- Article 70 sets numerical targets for CDW prevention and recovery
- Article 78 prohibits inert waste disposal on agricultural lands
- Article 94 states that if waste destined for development, rehabilitation, or construction works is received by someone on a land they own, this person cannot receive financial compensation for using said waste
- Article 96 was the precursor to Article 3 of the 5-stream Decree, and further forbids and sanctions discriminations against recycled or reused materials offering the same performance level.

Decree n°2014-1501 of 12 December 2014 modified the classification of facilities for environmental protection (ICPE in French, facilities classified for environmental protection). Following this Decree, inert waste landfills, known as ISDI, short for inert waste storage facilities in French, were submitted to ICPE legislation from 1 January 2015 with the objective of improving consistency in the status of landfills and facilitating penalisation of illegal landfills.

Transport of CDW is also regulated as **non-inert waste transport** must be registered with local authorities, the "*Préfecture*", if quantities exceed 100 kg of hazardous waste or 500 kg of non-hazardous waste. **CDW regulation infringement** such as illegal dumbing or incineration on site is punishable by law, with sanctions of up to 2 years imprisonment and a fine of 76 000 €.

Although not specific to CDW, France has 18 extended producer responsibility (EPR) schemes, some of which impact a small fraction of the waste which can arise on a construction, renovation, or demolition site: waste electric and electronic equipment, tyres, furniture, gas bottles, batteries and accumulators, and light bulbs.

9.1.2 Waste management plans (WMP) and Strategies

National level

The first national waste prevention plan was adopted in February 2004, followed by the 2009-2012 Waste action plan in September 2009, which covered both prevention and management. In 2012, to meet the requirements of the Waste Framework Directive, waste prevention and management were separated to have distinct plans addressing each.

The **2014-2020 National waste prevention programme** was drawn up in 2012 and approved by Ministerial order in August 2014. Waste streams were classified into 3 levels of priority, with CDW identified as a priority 1 stream due to the huge amounts generated. Therefore one of the key objectives of the national waste prevention programme is to at least stabilise CDW generation by 2020 (260 Mt). The following actions are foreseen to meet this objective:

- Implement specific awareness-raising for building owners / construction developers, and other stakeholders from the buildings and public works sector.
- Develop voluntary commitment charters for the building and public works sector to encourage waste prevention
- Identify and use incentive levers to develop construction material re-use
- Review the regulation relative to demolition audits and improve it if necessary.

The **waste reduction and recovery plan 2016-2025** was published in January 2017 in a document acting jointly as the basis for the "national strategy of transition towards a circular economy". It summarises work carried out so far and objectives linked to the energy transition law. The energy transition law set objectives to increase material recovery to 55% in weight of non-hazardous, non-inert waste by 2020 (65% by 2025) and 70% recovery of CDW by 2020. By 2025 the amount of waste sent to disposal (landfill of incineration without energy recovery) must be reduced by half.

Furthermore, this same law aims to reinforce public procurement for a circular economy via its Article 79. Indeed, regarding CDW, public authorities must ensure that their tenders for construction or road works include a requirement to give priority to reuse or recycled materials. They must ensure that 50% of materials used for road works come from reuse or recycling of CDW in 2017, increasing to 60% in 2020. Additionally, amongst these materials, from 2017 onwards at least 10% of materials used in surface layers and at least 20% of those used in foundation layers must come from reuse or recycling. From 2020 onwards this must reach 20% for surface layers and 30% for foundation layers.

The waste plan also highlights the need to bring framework regulation up to date regarding waste status (end-of-waste, by-product status, for example). Indeed, the government will continue ongoing work on the clarification of regulation and will prepare modifications if necessary to facilitate waste recovery whilst maintaining the same insurances regarding environmentally-sound waste treatment.

<u>Local level</u>

France is divided in Regions, which are, in turn, subdivided into Departments. The France factsheet for the study "Resource-Efficient Use of Mixed Waste" describes plans and strategies at national (p. 11), then at local level (p. 13). Indeed, the Ministerial Circular of 15 February 2000 established the Departmental CDW prevention and management plans. The Grenelle II law then made these plans mandatory and under the responsibility of the Departmental Councils (Regional Council in the Île-de-France Region).

However, Article 8 of Law n.2015-991 **of 7 August 2015 on the New Territorial Organisation of the French Republic**, known as the "NOTRe" law, has transferred this responsibility to the Regions of France (which have also been redefined). Furthermore, the regional waste prevention and management plan will act as a unique framework for all types of waste, whereas until now departments had to develop plans for three separate streams: hazardous, non-hazardous, and CDW.

The modalities of this new regional plan are specified in Decree n.2016-811 **of 17 June 2016**. The regional plan must include:

- A state of play of waste prevention and management
- A six- and twelve-year forecast of the trends of waste quantities produced in the territory
- Waste prevention, recycling and recovery targets setting out the national targets adapted to regional specificities, and relevant indicators
- A six- and twelve-year waste prevention planning and waste management planning
- A regional action plan for circular economy

Certain waste streams will be covered by specific planning within the regional plan, amongst which is construction and demolition waste, for which the plan must include:

- A summary of actions related to the deployment of waste recovery
- A qualitative and quantitative identification of secondary mineral resource available at a regional scale.

The regional plan will be revised every six years at least.

The official deadline for the regional plans was February 2017 according to the NOTRe law, which set a limit of 18 months to write these plans. However this deadline was near impossible to meet with the Decree implementing the law was only published mid-June 2016 and the numerous changes faced by the Regions. Indeed, their borders were modified, departments were fused, and waste management was also severely changed by the NOTRe law.

The regional CDW prevention and management plan for the Paris Region (*Région Île-de-France* in French), known as PREDEC, was adopted in June 2015 (Conseil régional d'Île-de-France, 2015). A new single regional waste management plan will be published in the coming months. In other regions, current departmental waste prevention and management plans will apply until the publication of a new regional plan.

9.1.3 Legal framework for sustainable management of CDW

Table 28, adapted from BIO by Deloitte [88] identifies specific national or regional legislation which can create good conditions for a sustainable management of CDW.

Table 28 – Legal framework for sustainable management of CDW

Description	Occurrence (Yes/No), Key scope or exemptions	Policy reference & year
Obligation for selective demolition	No – mandatory pre-demolition audit for certain categories of buildings before demolition work, but no obligation for selective demolition	Law 2009-967 (Grenelle I) of 3 August 2009 – Article 46 Law 2010-788 (Grenelle 2) of 12 July 2010 – Article 190 Obligation from March 2012 for specific types of buildings
Sorting obligation (on-site or in sorting facility)	No – though it is prohibited to mix hazardous waste with other waste	Environment Code Article L. 541-7-2
Separate collection obligation for different materials	Yes – source separation & collection for paper, metal, plastic, glass, and wood is compulsory for companies, not specific to C&D operations	Decree n°2016-288 of 10 March 2016 – Article 3 Smaller companies will gradually have to sort paper only
Obligation for separate collection and management of hazardous waste from C&D operations	No	
Related Green public procurement requirements	No – though in 2017, 50% of materials used for road works should come from CDW reuse or recycling, 60% in 2020	Law 2015-992 (LTECV) of 17 August 2015 – Article 79

9.1.4 Targets

As mentioned in previous sections, several targets have been defined in existing policy and regulation:

- **Stabilise the generation of CDW by 2020** at the level reached in 2010 (260 Mt), an objective set by the 2014-2020 Waste prevention plan
- **70% CDW recovery and recycling by 2020**, an objective set by the WFD present in Article 19 of the bill on energy transition for a green growth and reiterated in the Waste reduction and recovery plan 2016-2025. However, this has not yet been transposed into French law, and the wording excludes neither hazardous CDW nor naturally occurring material, contrary to the WFD target.
- **30% reduction in the amount of non-hazardous, non-inert waste sent to disposal** (landfill or incineration without energy recovery) by 2020 compared to 2010, and 50% reduction by 2025, an objective set by the same Article 19 of the energy transition bill.
- Public authorities will have to ensure that **50% of materials used in road works** originate **from reuse or recycling of CDW in 2017**; 60% in 2020, according to Article

79 of the bill on energy transition for a green growth and reiterated in the Waste reduction and recovery plan 2016-2025.

9.1.5 End of Waste (EoW) status

The Environment Code describes the principles of end of waste status in Article L.541-4-3, created by Order 2010-1579. This was supplemented by Decree 2012-602 of 30 April 2012, which specified the terms according to which the EoW criteria are adopted and the related procedure.

Only two types of materials are currently covered by EoW criteria. European regulation adopted in 2011 covers recycled metal. In France, Order of 29 July 2014 states that shredded wood packaging waste shall no longer to be considered waste when it is used as a biofuel in boilers. EoW criteria for steel industry slag for use in road and public works are currently under discussion.

Decree 2016-1890 of 27 December 2016 brings various adaptation and simplification measures in the field of waste prevention and management. Article 6 specifies the composition and operation of the advisory board on EoW.

Finally, French jurisprudence recognised that it is possible to end the waste status in an implicit way, without requiring specific regulatory criteria. This is only possible for production processes which use waste instead of raw materials, in part or completely. The resulting product is not considered waste, though it must be similar to the products which would have resulted from the process had only raw materials been used. The "implicit" end of waste status in production processes is explained in a notice published in the Official Journal of 13 January 2016[5].

9.2 Non legislative instruments (best practices, guidelines, recommendations…)

Non-legislative instruments include best practices, guidelines, recommendations, and the like. They are an essential part of CDW management and they can create conditions for a sustainable management of this type of waste. See section 9.4.1, as many initiatives received national funding and/or issued recommendations.

The key instruments in France are:

- **Landfill tax** ("*TGAP*" in French for general tax on polluting activities): this tax from 2009 raises the cost of polluting activities so as to divert economic actors away from them
- **Incentives and budget lines dedicated to waste prevention and management**: various funding possibilities are available in France, for stakeholders ranging from

[5] The notice in the Official Journal of 13 January 2016 is available at the following link : https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031825201

companies to local communities. One of the better known funding bodies is the French Environment and Energy Management Agency, ADEME, though others include European funds, Caisse des Dépôts et Consignations, etc.

- **Environment Agency**: founded in 1991, the French Environment and Energy Management Agency, **ADEME** provides full support to individuals, companies, and local communities regarding waste prevention and management, in the form of information, technical assistance, or funding.
- **Sustainable Construction Methodological Guidebook**: Edited by the Saine-Saint-Denis General Council in 2009
- **Building certification standards covering CDW**: HQE (2005), BREEAM (1990) and LEED (1998) exist in France
- **Industry sustainability standard covering CDW**: the Quarries Environment Charter (2004) is a global environment voluntary commitment, and the Clean Building Approach (2005) aims to improve working methods and quality of life on building sites.
- **Public sector sustainability standard covering CDW**: the Green Site and Clean Site charters were initiate by ADEME and consist in an approach that covers all environmental aspects of a site
- **Environment Assurance Plan**: this contractual obligation is an operational document drafted by the environment coordinator or the client. Each company which will work on the construction site must fill it in before starting the work, indicating which provisions they will take to limit and monitor the nuisances and impacts of their operation on the environment.

Furthermore, various guidance and tools have been developed to improve CDW management regionally and nationally in France. These include guidebooks written by ADEME or the French Building Federation (FFB), smartphone applications, and a website called OPTIGEDE which acts as an online information sharing platform. A comprehensive table of such guidance and tools is available in BIO by Deloitte (2015). New instruments arise regularly, such as the guide on the environmental acceptability of recycled aggregates from CDW in road works published by CEREMA in January 2016, for example, which aims to encourage the use of recycled aggregates [89].

9.3 CDW management performance – CDW data

The latest official national data on CDW dates back to a survey from 2008 (SOeS, 2010). The French Ministry of the Environment, Energy, and the Sea launched a new survey on CDW produced in 2014, conducted by Observation and Statistics department (SOeS). The description of the survey was published on 27/1/15[6] and the data and final report, though

[6] SOeS "Survey on waste and excavated materials produced by the construction and public works sector in 2014" description, from 27/01/2015: http://www.statistiques.developpement-durable.gouv.fr/sources-methodes/enquete-nomenclature/1542/0/enquete-dechets-deblais-produits-lactivite-btp-2014-edd.html

initially due end 2016, should be available in spring 2017[7]. The 2008 survey has served as a benchmark for biennial estimates sent to Eurostat and for national publications by ADEME. As all this data relies on a survey on 2008 statistics, which is therefore almost a decade old, a certain amount of caution should be applied when interpreting the data.

Raw materials consumed in France in 2013 add up to 784 Mt (either from France or imported), of which half (**391 Mt**) were construction materials. This amount is obtained by adding raw materials extracted from the territory or imported and subtracting material exports. Construction material apparent consumption in France in 1990 was 12% higher than that in 2013 [90].

9.3.1 CDW generation data

Eurostat data was updated in February 2017 with 2014 data (Eurostat, 2017), whilst the ADEME published data relevant to 2012 in its summary of key waste statistics in December 2016. Total **waste production** in France was 328 Mt in 2014 (345 Mt in 2012), of which **232 Mt** were from the construction sector (247 Mt in 2012). The breakdown of total waste generation and that of CDW is shown in Table 29 [90] [93].

From 2006 to 2010, waste generation grew, but in 2012 the trends was reversed with a 2.8% reduction. This is mostly due to a slowing construction sector, for which waste generation dropped by 5% [90].

Table 29 – Waste generation in France, total (left) and from the construction sector (right) (Eurostat, 2017)

Type of waste	2012 (Mt)	2014 (Mt)		Type of CDW	2012 (Mt)	2014 (Mt)
Non-hazardous	333.43	317.52		Non-hazardous	244.33	229.16
Hazardous	11.30	10.41		Hazardous	2.38	2.58
Total waste generated	**344.73**	**327.93**		**Total waste generated**	**246.70**	**231.74**

Construction waste in 2014 was made up of **229.16 Mt** of **non-hazardous** waste, covering 216.49 Mt inert waste and 12.67 Mt non-inert waste, and **2.58 Mt** of **hazardous** waste, adding up to a total of 231.74 Mt [93].

[7] SOeS thematic surveys on construction and building works: http://www.statistiques.developpement-durable.gouv.fr/logement-construction/s/entreprises-btp-enquetes-thematiques.html

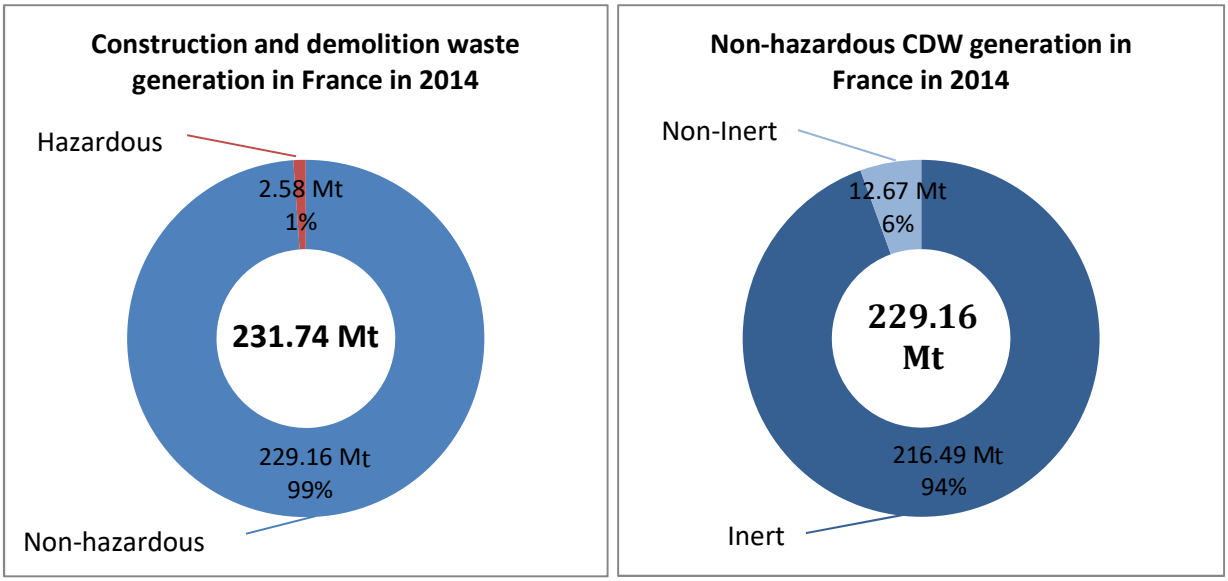

Figure 5 – CDW generation in France in 2014, total (left) and breakdown of non-hazardous waste generation (right) [93]

In France, CDW is divided into two sectors: building and public works. The 2008 SOeS survey gives the breakdown of waste generated per sector, with building works further divided into structural and finishing works, as shown in Table 30:

Table 30 – Waste generation per construction sector in 2008 [100]

Sector	Amount generated (Mt)	% inert waste	% non-haz., non-inert waste	% hazardous waste
Building works	38.2	72.4	26.1	1.5
Structural works	*28.1*	*80.8*	*18.0*	*1.2*
Finishing works	*10.1*	*49.0*	*48.6*	*2.4*
Public works	216.3	97.6	1.5	0.9
Total	**254.5**	**93.8**	**5.2**	**1.0**

In a Q&A document on construction and demolition waste for construction professionals, the FFB also mentions waste generation per type of building works: 90% of the 38.2 Mt generated originate from renovation or demolition sites. 65% comes from demolition, 28% from renovation, and 7% from new construction [94].

9.3.2 CDW treatment data

The 2008 survey does not mention the final destination of CDW sent to collection, grouping, or sorting facilities. Despite this barrier to reliable recovery and disposal data, it does give a certain insight into the type of treatment used per type of waste, as detailed in Table 31.

Table 31 – CDW destination per type of waste in 2008, in million tonnes [100]

Type of CDW	Collection, sorting centre	Reuse, recycling	Quarry filling	Incineration, cement plant	Landfill	Other, incl. take-back	Total
Inert	73.58	77.16	41.57	-	36.55	10.03	**238.89**
Non-haz., non-inert	9.66	1.24	-	0.17	0.70	1.41	**13.18**
Hazardous	0.50	0.86	-	0.03	1.00	0.12	**2.51**
Total	**83.74**	**79.26**	**41.57**	**0.20**	**38.25**	**11.56**	**254.58**

Although it is chemically inert and therefore does not require specific treatment, inert waste poses a definite challenge, both regarding transport and storage, due to its sheer amount. It can be used for quarry filling, or crushed into aggregates for road works, landscaping, or to make concrete. The remaining waste which is not recycled is then sent to specialised landfills.

Of the 241 Mt of inert waste produced in 2012 (231.3 Mt of it being CDW), almost half (49%) was recycled and 17% was used in road works or backfilling. The remaining 34% were landfilled [90]. It is worth noting that landfills are called storage facilities in France, hence many documents talk of storage rather than landfill. Furthermore, backfilling performed in the framework of an inert waste landfill is recorded as landfilling, but this is not the case if it is performed at a non-inert waste landfill, which introduces a certain bias in statistics.

The SNED indicates that the average recovery of deconstruction waste is around 90% for inert waste and 45% for non-hazardous waste [98].

9.3.3 CDW exports/imports data

In 2013, reported imports of waste reached 2.5 Mt, among which 1.6 Mt of uncontaminated soil and stones were imported from Switzerland and Luxemburg to be recycled.

In 2013, reported exports of waste reached 1.6 Mt.

Data taken from the service de l'Observation et des Statistiques (SOeS) publication "Rapport 2013 sur les mouvements transfrontaliers de déchets dans le cadre de la Convention de Bâle et du règlement (CE) n° 1013/2006 du Parlement européen et du Conseil", published in August 2016, accessed from [99].

9.3.4 CDW treatment facilities data

CDW landfill data is relatively simple to obtain in France. However, it is much more difficult to obtain precise information on CDW recycling facilities.

ADEME reported a total of 228 non-hazardous landfills in France, 16 for hazardous waste, and 657 for inert waste by end 2014 [90]. However, this only includes landfills with a prefectural authorisation. Indeed, BIO by Deloitte cites data from 2013 that is double that amount for inert waste landfills, as there were some awaiting regularisation, and close to 500 illegal ones [88].

9.3.5 Future projections of CDW generation and treatment

The only indication on future CDW generation is the objective set by the 2014-2020 Waste prevention plan to stabilise the generation of CDW by 2020 at the level reached in 2010 (260 Mt).

9.3.6 Methodology for CDW statistics

The 2008 survey was conducted by the French Environment Ministry (at the time, its name was Ministry for Ecology, Energy, Sustainable Development and the Sea, though this changes regularly after elections). 7 000 establishments were surveyed by post between November 2009 and March 2010. The survey reports waste amounts based on the latest destination known by the producer, not the final one, as they are not always aware of the final destination of their waste. Asbestos removal companies are not classified as construction companies in French nomenclature but they were surveyed nonetheless to include this data into the survey.

The description of the methodology for the new survey, on 2014 data and due to be published in spring 2017, is available from the SOeS website: http://www.statistiques.developpement-durable.gouv.fr/sources-methodes/enquete-nomenclature/1542/0/enquete-dechets-deblais-produits-lactivite-btp-2014-edd.html.

9.4 Construction and demolition waste management in practice

9.4.1 CDW management initiatives

Various initiatives currently exist in France. Four interesting cases are highlighted in the following pages:

- **Paprec/Raboni partnership**, allowing construction SMEs to deposit their construction waste and pick up new materials on the same site
- **RECYBETON project**, a national R&D programme, which aims to find solutions to recycle each cubic metre of deconstructed concrete as a component of new concrete.
- **DEMODULOR project**, which approached construction waste prevention from the disassembly angle
- **DEMOCLES project**, on recycling of waste from **finishing works** on demolition/rehabilitation sites.

Of course, many other initiatives exist. For example, the National Syndicate of Demolition Companies (SNED) and the French Building Federation (FFB) launched a joint initiative in May 2016: **Imaterio**, a free **construction waste and material database** (www.imaterio.fr). It connects owners of inert waste and reuse materials with potential users. Although intended for professionals, Imaterio can also be used by individuals who might wish to respond to an advertisement. In March 2015 the SNED and FFB launched a **waste traceability software** called **Investigo** (www.investigo.fr), free for use by members of the SNED [98].

Name	**Paprec/Raboni partnership**
Description	The Paprec Group is a company specialised in recycling and recovery whereas Raboni is a distributor of construction/renovation materials. Faced with the observation that building industry tradesmen struggle to find solutions for their **building site waste**, and therefore end up sending it to landfills instead of recycling, Paprec and Raboni decided to set up a partnership to counter this issue. Construction SMEs can **deposit their waste and pick up new construction materials on the same site**. The waste is then directed to Paprec recovery/recycling facilities.
Scope	Raboni has 12 recycling centres, with one full-time Paprec employee per site. 4 sites have fluvial access: collection is therefore done by a barge with a capacity of 360 tonnes of waste per rotation (equivalent to 60 waste collection vehicles). Paprec has 2 recycling centres dedicated exclusively to CDW in the region.
Year established	2004, renewed in 2014 for 5 years
Geographical coverage	Paris Region (Île-de-France)
Leadership	Industry-led
Tonnes recycled	Approximately 70 000 m^3 collected per year, with a recycling rate close to 80%

A new pilot operation initiated by the Syndicate for **PVC pipes and fittings**, STR-PVC was launched in October 2016 to increase collection and recycling of plastic pipes and fittings in France. PUM Plastiques, a distributor, and Paprec Plastiques, the plastics recycling branch of the Paprec Group, partnered up to capture this stream from tradesmen and to offer new services for their clients, to anticipate landfill bans, and to encourage sustainable practices. At the launch of the pilot, Paprec containers were placed in PUM Plastiques agencies in two cities initially, Rennes and Limay, with more locations planned in coming months. Customers can bring their waste pipes and fittings for recycling.

Name	RECYBETON
Description	RECYBETON (complete recycling of concrete) is a national R&D programme which aims to **increase reuse** of materials from **deconstructed concrete** as constituents of new concrete or hydraulic binders, including fine particles.
Scope	Collaborative research project on deconstructed concrete, involving 47 partners for 5 years with a budget of 5 M€
Year established	2012
Geographical coverage	National
Leadership	Public-private partnership

Part of the scientific programme of RECYBETON is covered by the ECOREB project, funded by the National Research Agency (ANR) for 4 years, from end 2012. As part of the RECYBETON project, ECOREB addresses scientific issues associated with the use of crushed concrete aggregate as a constituent of new concrete.

Name	DEMODULOR
Description	DEMODULOR demonstrated the technical, environmental, and economic feasibility of **disassembly** in renovation or deconstruction for simplified recovery and recycling of materials and products. The project was led by the Materials and Equipment for a Sustainable Construction (MECD) alliance, gathering the network of technical and industrial centres in the construction sector. Its aim was to develop constructive waste prevention solutions using a systemic approach of disassembly (dismountable structures).
Scope	The project focused on bearing elements (walls and floors) as well as the building envelope (roof and walls).
Year established	2012-2015
Geographical coverage	National
Leadership	Industry-led, supported by ADEME

Name	DEMOCLES
Description	The DEMOCLES project aimed to increase recycling of elements from **finishing works** on demolition/rehabilitation sites. DEMOCLES followed a collaborative and operational approach, integrating actors from all across the value chain – over 40 partners were involved. Thanks to 6 pilot sites and technical working groups, the project successfully: • Identified operational and economic challenges linked to sorting waste

	on-site and downstream treatment • Defined a common and reliable framework for on-site sorting to ensure an adapted recycling stream, at limited costs • Formulated concrete and operational recommendations on waste management for both the client and the contractor • Developed recommendations on the competence-building needs for on-site sorting.
Scope	Waste from finishing works, which represents about 10 million tonnes, or 30% of all waste produced by the construction sector
Year established	2014-2016
Geographical coverage	National, with six test building sites in Île-de-France and Rhône-Alpes
Leadership	Public-private partnership

9.4.2 Drivers / barriers to increase CDW recycling

Drivers and barriers to increase CDW recycling were presented in a clear and concise fashion in the factsheet of the Resource Efficient Use of Mixed Wastes study [88]. Most of these are listed in the following table.

A more recent study analysed drivers and barriers to reuse of construction products and materials [96].

Category	Drivers	Barriers
Legislation & regulation	• CDW management plan implementation (national and departmental, though soon regional) • Compulsory pre-demolition audits • Objective of stabilising CDW production by 2020 at 2010 level • EoW status and criteria defined by law	• Delay in entry into force of departmental CDW management plans • Insufficient support through public procurement of the use of recycled materials from CDW • Requirement for contractors to demonstrate technical feasibility of use of construction materials from recycling • Insufficient regulation of backfilling and ground raisings in the Town planning Code
Allocation of resources	• ADEME has a large intervention budget on waste & circular economy – 191 M€ in 2017	• Insufficient resource allocation (financial, human) to the enforcement of CDW legislation • Sanctions are too low and rarely applied
Reuse		• Uncertainty in EU Construction Products Regulation as to the obligations of EC marking for reclamation products
Sorting & recycling	• Large number of innovative companies and R&D programmes • Guidance from the road works sector could benefit building works	• Very limited number of mechanised sorting lines in France • Demolished buildings not designed for easy deconstruction and recycling • Lack of space on building sites
Treatment facilities		• Insufficient number of treatment installations, therefore too distant from sites, which encourages illegal dumping • Apparent reluctance of local authorities to authorise new facilities
Market conditions	• Landfill tax (TGAP) as a tool to improve recycling	• The landfill tax is low compared to other EU Member States • Operating costs of CDW sorting, recovery, and recycling are declared as being too high by most construction companies
Definitions & statistical data	• Separate targets for inert waste and non-inert non-hazardous waste	• Difficulty to assess CDW sources and streams precisely • Inconsistencies with backfilling reporting and definition
Contracts for building & public works		• Waste management is often neglected in contracts • Lack of traceability and control of the recycling rate to check commitment in tenders

9.5 CDW sector characterization

9.5.1 CDW materials (CONCRETE, BRICKS, TILES AND CERAMIC, ASPHALT, WOOD, GYPSUM)

Product description and applications

No updates

Quantitative analysis

The 2008 survey gives more detailed information on waste generation in the French construction sector. As reported in Table 32, inert waste is by far the predominant type of waste generated, with 94% of CDW. Unpolluted soil and stones make up most of it, as they account for 73% of inert waste, or 71% of CDW [100]. However, they should not be included in the calculation of recycling performances towards the 70% objective of the Waste Framework Directive. Table 33, instead, instead, reports the amount of non-hazardous waste generated in 2008.

Table 32 – Inert waste generation in 2008 [100]

Type of inert waste	Amount generated (Mt)
Concrete	17.84
Bricks, tiles, ceramic, and slate	2.87
Glass	0.10
Tar-free bituminous mixtures	9.30
Unpolluted soil and stones	175.11
Other materials from road demolition	11.82
Non-polluted track ballast	0.97
Non-polluted dredging spoil	2.60
Other inert waste	1.18
Mixed inert waste	17.09
Total inert waste	238.89

Table 33 – Non-hazardous, non-inert waste generation in 2008 [100]

Type of non-hazardous, non-inert waste	Amount generated (kt)
Wood untreated or treated with non-hazardous substances (palettes…)	1 835
Plastic materials (incl. flexible floor coverings)	435
Ferrous or non-ferrous metals	1 201
Insulation materials: fibreglass, stone wool	118
Plaster	1 844
Plant material	651
Waste tyres (m^3 not shredded)	18
Other types of non-hazardous, non-inert waste	542
Mixed non-hazardous, non-inert waste	1 119
Mixed inert waste and non-hazardous, non-inert waste (Ordinary Industrial Waste[8])	5 421
Total non-hazardous waste	13 183

Updated information, on the year 2014, will be included in the survey which will be published in spring 2017.

Recovery techniques

No updates

Environmental and economic impacts of CDW waste management

No updates

Drivers / barriers to increase recycling

No updates

9.5.2 Recycled materials from CDW

Inert materials such as concrete and rubble are widely used in road works. Recycled aggregates are thus the main construction and demolition waste product. Plaster and wood are two other waste streams for which recycling is already operational. The DEMODULOR project gathered data indicating the destination of certain materials [97]:

- Steel: 98% recycling/reuse, 2% landfill
- Concrete: 67% recycling/reuse, 33% landfill
- Wood: 57.2% recycling/reuse, 17.3% landfill, 25.5% energy recovery

[8] Ordinary industrial waste is known as DIB in France, for "*déchets industriels banals*"

- Terracotta: 39% recycling/reuse, 6% landfill, 55% material recovery

In France, 35 million m³ of ready-to-use concrete were produced in 2015, by 516 companies, and consumption per capita is 0.54 m³ per year. This ranks France as the second producer and fifth consumer of concrete in Europe [102]. Yet despite this, concrete recycling into concrete is still rare in building works. The National Research Agency funded the ECOREB project aiming to change this tendency by removing scientific barriers associated with the used of crushed concrete aggregates as a constituent of new concrete.

There are two main barriers two the use of recycled materials from CDW in public procurement. The first is the requirement for contractors to demonstrate that it is technically possible to use construction materials from recycling. The second is linked to the price of recycled materials. They may be more expensive than raw materials, particularly if they are located further away and therefore lead to increased transport costs. As price is unfortunately the main criteria in public procurement, this can make recycled materials less competitive and therefore limits their increased use.

9.5.3 Market conditions / costs and benefits

Costs linked to legal management of building works CDW represent 2-4% of the total revenues in the building sector, or 1.2-2.4 billion Euro, depending on if waste is sorted or not, according to data from 1998 [94]; these information are summarised in Table 34.

Table 34 – General Tax on Polluting Activities (TGAP) rates for waste in 2016 [95]

Type of waste treatment facility			Tax rate in €/tonne
Non-hazardous waste landfill	Unauthorised landfill		150
	Authorised landfill	A. EMAS registered or ISO 14001 certified	32
		B. With biogas recovery >75%	23
		C. Bioreactor landfill (biogas capture and leachate reinjection, biogas recovery)	32
		D. Meeting both previous criteria	15
		E. Other	40
Non-hazardous waste incineration plant	A. EMAS registered or ISO 14001 certified		12
	B. With high energy performance		12
	C. With NO_x emissions <80 mg/Nm³		12
	D. Meeting both A and B		9
	E. Meeting both A and C		6
	F. Meeting both B and C		5
	G. Meeting A, B, and C		3
	H. Other		15
Hazardous	Landfill		25.57

	Incineration plant or other treatment	12.78

There is a General Tax on Polluting Activities (TGAP) in France, which must be paid by companies whose activities or products are considered polluting: waste, pollutant emission, oils, detergents, extracted materials, etc. The amount of the tax depends on the category of activity or product and is modified every year. It is based on the weight in tonnes of waste received in an installation to which it applies. The rate is also slightly higher in continental France and Corsica than it is in Guadeloupe, Martinique, and Reunion Island. The 2017 rates for continental France are listed in Table 34 [95]. These rates apply from 1 January 2017 to 31 December 2017.

The French Building Federation (FFB) gathered information on the costs of waste management which entrepreneurs should consider. These include:

- Labour for sorting or dismantling prior to the removal of waste from the building site
- Specific installations required on-site (storage area, skips, etc.)
- Scale effect linked directly to the amount of waste to remove
- Waste transport (linked to distance from treatment facilities)
- Waste treatment (grouping or sorting centre, treatment centre, recycling, incineration, landfill).

The estimated the costs per destination of the waste (excluding transport and skip costs), listed in Table 35. If waste is mixed, the highest cost applies.

Table 35 - Estimate CDW management costs per destination of the waste [94]

Destination	Estimated cost (excluding transport and skip rental)
Inert waste recycling plant	a few euro per tonne
Non-hazardous recycling plant	variable, can be zero (metal by-back)
Inert waste landfill	1-8 €/tonne
Non-hazardous waste landfill	80-120 €/tonne
Hazardous waste landfill	200-500 €/tonne
Incineration plant	60-110 €/tonne
Hazardous waste specific treatment	200-1200 €/tonne

Waste management adds up to 10-25% of deconstruction costs [98].

Finally, the National Syndicate for General Contractors in Building and Public Works, EGF.BTP, estimated the cost of waste removal per type of material and treatment for 2009, shown in Table 36.

Table 36 – Estimate CDW management cost per material and type of treatment [92]

Waste	Treatment	Cost excl. taxes, incl. transport

Inert	Recycling	10-19 €/tonne
	Landfill	10-31 €/tonne
Wood	Recycling	0-91 €/tonne
	Incineration, energy recovery	19-183 €/tonne
Plaster	Recycling	58 €/tonne
	Landfill	106 €/tonne
Mixed waste	Incineration	122 €/tonne
	Landfill	122-290 €/tonne
Hazardous waste	Treatment then landfill	230 €/tonne and over
	Directly to hazardous waste landfill	230-350 €/tonne

All these sources therefore highlight the importance of sorting CDW – if not from an environmental perspective, then at least to reduce costs.