

5. CROATIA

5.1 Legal Framework – Waste Management Plans and Strategies

5.1.1 National Legislation concerning CDW

The main legislation for Waste Management in Croatia is the Law on Sustainable Waste Management (OG 94/13), which has been in force since 23.07.2013.

The relevant legislation governing various aspects of CDW management is in line with the European WFD which was officially transposed into the Croatian law. Related regulations include:

- Act on Sustainable Waste Management (OG No. 94/13)
- Waste Management Strategy of the Republic of Croatia (OG No. 130/05)
- Ordinance on waste management (OG No. 23/14, 51/14, 121/15, 132/15)
- Ordinance on by-products and end-of-waste status (OG No. 117/14)
- Waste Management Plan of the Republic of Croatia for 2007-2015 (OG No. 85/07,126/10, 31/11, 46/15)
- Ordinance on the waste catalogue (Official Gazette 90/15)
- Ordinance on the methods and conditions for the landfill of waste, categories and operational requirements for waste landfills (Official Gazette 114/15)
- Ordinance on construction waste and waste containing asbestos (Official Gazette 69/16)
- Ordinance on thermal treatment of waste (Official Gazette 75/16)
- Decision on the adoption of the Waste Management Plan of the Republic of Croatia for the period 2017 – 2022 (Official Gazette 3/17)

5.1.2 Waste management plans (WMP) and Strategies

On the national level, two relevant waste management development frameworks are in force: the Croatian Waste Management Strategy for the period 2005–2025 and the related Waste Management Plan for the period 2007–2015. A draft National Waste Management Plan 2015-2021 was published on September 21 2015 for public consultation.

The Croatian Waste Management Strategy includes the assessment of the current situation, main waste-management objectives and measures, hazardous-waste management measures and guidelines for the recovery and disposal of waste.

The Strategy also tackles the area of CDW in two separate sections (2.3.2. and 4.2.2) and provides an overview of the current state of CDW in Croatia as well as guidelines for the CDW management system improvement, such as:

- educate and inform all participants in the construction waste management process,
- prevent uncontrolled disposal of construction waste in municipal landfills and elsewhere,
- establish full control over construction waste streams, from the place of waste generation to the place of final use/disposal, including improvement of the information system,

- introduce recovery systems for all types of construction waste and for up to 80 percent of total quantities,
- encourage use of construction materials that are environment-friendly,
- regulate construction waste management through implementation regulations and namely:
 - ✓ specify the obligation to plan construction waste management in the period following removal of a built facility, and
 - ✓ specify the obligation to also plan such management for other construction waste situated on the same lot,
- inspect, at the county level, all landfills in which construction waste is disposed of; based on the analysis of data about all landfills, use appropriate landfills for the disposal of inert waste, while other landfills must be improved and closed down,
- make sure that maximum quantities of construction waste are submitted to recovery and/or recycling so as to obtain new construction materials which are, by their quality, equal to other construction materials,
- inert landfill sites will be opened in individual counties and in the City of Zagreb - either as separate sites or next to municipal waste landfills; as a rule, they will be organized in the scope of waste management centres and will have mobile or stationary treatment facilities; in the transition period, portions of municipal landfills may be used for sorted and recovered construction waste as needed for some parts of landfills (subject to approval by the competent authority),
- advance and improve the system for the separate collection and recycling of individual types of construction waste, and establish centres for the recovery and disposal of construction waste.

The recently published NWMP (National Waste Management Plan) includes the following measures aimed at increasing waste prevention activities, about CDW:

1. Encourage the reuse of materials from demolition but establishing an incentive fee for these materials.
2. Promotion of sustainable construction by developing a guide to sustainable construction.
3. Encouraging the exchange and re-use of products through development of a framework and guidelines for undertaking reuse activities in Croatia.

Although some detail is provided on some of these measures, the current version of the plan does not include a timetable of when these measures will be implemented.

5.1.3 Legal framework for sustainable management of CDW

Measures for a sustainable management of CDW in Croatia are contained in the mentioned National Legislation. Particularly, the Act of Sustainable Waste Management, at Art.35, defines the obligation of separate collection for different materials.

5.1.4 Targets

The only national target concerning CDW is consistent with WFD target and is defined in Article 55 of the Act on Sustainable Waste Management; it states that 70 % of the CDW mass have to be recovered and recycled, according to the Directive 2008/98/EC of the European Parliament and of the Council. By 1 January 2020 the Republic of Croatia shall take measures to ensure the preparation for re-use, recycling and other material recovery of nonhazardous construction waste, including the backfilling and spreading of waste, when such waste are used in place of other materials, excluding the material from nature specified under waste code 17 05 04 – soil and stones.

5.1.5 End of Waste (EoW) status

In chapter 4 of the Ordinance on construction and demolition waste management and use of recycled building materials, specific criteria are established when construction and demolition waste becomes a recycled building material.

More details are contained in the “Ordinance on by-products and end-of-waste status (OG No. 117/14)”, in which special EoW status requirements have been established for seven CDW types by reference to recovery activities for the manufacture of building products:

- Concrete, bricks, tiles and ceramics
- Wood, glass and plastic
- Bituminous mixtures
- Coal tar and tarred products
- Soil (including excavated soil from contaminated sites), stones and dredging spoil
- Insulating materials and asbestos-containing construction materials, gypsum-based construction material
- Other construction and demolition wastes.

Draft rules establishing the EoW status criteria, in line with the European ones, for aggregates derived from CDW and waste from public works for the use in road applications are being prepared.

5.2 Non legislative instruments (best practices, guidelines, recommendations...)

Among non-legislative instruments there is the publication “Construction and demolition waste management plan”, developed within the project LIFE05 TCY/CRO/00014 CONWAS “Development of sustainable construction and demolition waste management system for Croatia”. This document represents the implementation document of the Waste Management Strategy with the basic objective of establishing a complete and sustainable system of waste management. The study presents measures for realization of the objectives of the Construction and Demolition Waste Management Plan that refer to the legislation and regulations, to activities of counties, the City of Zagreb, towns and municipalities; measures of collecting, separating, recovery and recycling of construction and demolition waste, measures of disposal of construction and demolition waste and management of special-

category construction and demolition waste as well as informative-and-educational measures.

In Croatia, since 2010 there is the Croatia Green Building Council, with the aim to educate, and to spread the information and knowledge about planning and building of construction projects and their use with the goal of sustainability, taking in consideration the interests of those who use the facilities, environmental protection, social responsibility and economic viability.

In the last years, in Croatia, more and more investors turn to green building. Therefore the need for national certification consultants, according to international standards of green building, is increasing and one of the most known certification systems is LEED.

5.3 CDW management performance – CDW data

5.3.1 CDW generation data

EUROSTAT database reports the following data for CDW generated between years 2010 and 2014 (Table 11).

Table 11. EUROSTAT database for CDW generated between years 2010 and 2014 [tons].

	2010	2012	2014
Mineral waste for construction	1.064	169.361	164.440
Metal wastes, ferrous	2.038	82.721	128.446
Metal wastes, non-ferrous	7	10.162	11.623
Glass wastes	77	920	1.679
Plastic wastes	15	225	367
Wood wastes	23	289	3.274
Total	7.656	682.058	621.307

5.3.2 CDW treatment data

Data published by EUROSTAT deals with different waste categories coming from all the economic activities. Therefore, only for the category “Mineral waste from construction”, data can be considered reliable, as in the Table 12.

Table 12. EUROSTAT database for “Mineral waste from construction” [tons]

Mineral waste from construction	2010	2012	2014
Landfill / disposal (D1-D7, D12)	40.333	121.345	86.801
Deposit onto or into land	40.333	121.345	86.801

Mineral waste from construction	2010	2012	2014
Land treatment and release into water bodies	0	0	0
Incineration / disposal (D10)	1.500	0	0
Incineration / energy recovery (R1)	1.522	30	3.160
Recovery other than energy recovery	997	128.818	197.478
Recovery other than energy recovery - backfilling	0	0	5.701
Recovery other than energy recovery - except backfilling	997	128.818	191.777
Total waste treatment	44.352	250.193	287.439

The practice of CDW pre-treatment activities (mechanical sorting, biological treatment, physic-chemical treatments) is not followed in Croatia. According to the provided information, waste originating from construction or demolition operation are disposed on the site (heaped together) or they are immediately covered. In addition, CDW are not treated/recycled on the site and no such data exist.

5.3.3 CDW exports/imports data

No data found.

5.3.4 CDW treatment facilities data

No data found.

5.3.5 Future projections of CDW generation and treatment

No data found.

5.3.6 Methodology for CDW statistics

The methodology for CDW statistics of data reported in this document follows Eurostat guidelines.

5.4 C&D waste management in practice

5.4.1 CDW management initiatives

Voluntary agreement between government, business and construction industry are examples of initiatives in CDW management but not public information are found.

5.4.2 Drivers / barriers to increase CDW recycling

Main obstacles and drivers to sustainable CDW management are:

a) Legislation and regulation

- Clear CDW recycling policies or rules are yet to be defined and implemented, including legal provisions regarding the enforcement of the CDW legislation. The current human and financial resources seem insufficient.
- EoW status and criteria have been defined by law.
- Croatian Government is working on strategic documents and regulation and it will soon introduce new CDW rules providing a more detailed and clearer definition and explanation of the regulation.

b) Treatment facilities and their territorial network:

- There is a need for more (organized) CDW collection sites, there are still insufficient selective separation facilities in place and most CDW is disposed in regular solid-waste landfills (around 50 % according to the data from the Croatian Waste Management Strategy).
- There is a high transportation and disposal costs.
- National strategic programs and EU funding priorities promote the establishment of treatment facilities.

c) Monitoring system:

- There are still a number of wild landfills, as indicated by large unreported quantities of waste.
- There are a relatively low rate of data collection about treated waste and related facilities.
- There is a strong engagement of the Croatian Environmental Agency in improving the system based on the announced changes to the data management system.

d) Public awareness:

- There is a lack of interest in not only CDW waste management, but the waste management in general, with relatively scarce CDW-specific information, brochures and education. A higher engagement by all stakeholders is needed.

e) Public procurement:

- There are no specific initiatives around public procurement to support the use of recycled materials from CDW or environmentally sound materials.

f) Market conditions

- Market prices and operating costs of CDW sorting, recovery and recycling are still considered too high according to the stakeholder interviews.

5.5 CDW sector characterization

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

Product description and applications

The types of materials that can appear in construction and demolition waste depending on the type of construction work are shown in Table 13.

Table 13. Types of materials that can appear in construction and demolition waste

Excavation	Structural Engineering	Building Construction	Mixed construction and demolition waste
Earth (peat) Sand, gravel Clay, loam Stone	Bitumen (asphalt) or concrete-bound material Sand, gravel, crushed stone	Concrete Brick Limestone Mortar Plaster Expanded clay Gaseous concrete Clinker Natural stone	Wood Plastics Paper, cardboard Metal Cables Paint, lacquer Rubble

According to CONWAS publication, CDW are sorted into two basic groups immediately at waste origin:

1. **Homogeneous construction and demolition waste** whose recovery or recycling is easier in technical-technological sense, and recycled materials are technically applicable without any special restrictions, is divided into following types:

- **Asphalt scrap** (waste from destruction of asphalt curtains) and **mixed asphalt and concrete scrap** – from the Waste Catalogue: 17 03 – Bitumen mixtures, coal tar and products containing tar
- **Concrete scrap** (waste from demolition of concrete structures) – from the Waste Catalogue: 17 01 01 – Concrete
- **Stone waste** (construction and demolition waste containing stone materials only) – from the Waste Catalogue: 17 05 – Soil, stones and excavator yield
- **Separated brick and roofing-tile scrap in building demolition (“ceramic” scrap)** – from the Waste Catalogue: 17 01 02 bricks and 17 01 03 – roofingtiles/tiles and ceramic ware
- **Glass, paper, plastics** from the Waste Catalogue 17 02 01, 17 02 02, 17 02 03

2. **Mixed construction waste** whose recovery is complicated in technical-technological sense, and the recycled materials are technically applicable as building materials with predetermined restrictions and are divided into following types:

- **Mineral (inert) construction waste, rubble** (mixed inert construction waste of mineral composition from demolition of recent construction without considerable brick content) – from the Waste Catalogue: 17 01 06* – Mixtures or separate fractions of concrete, bricks, roofing-tiles/tiles and ceramic ware containing hazardous substances, and 17 01 07 – Mixtures or separate fractions of concrete, bricks, roofing-tiles/tiles and ceramic ware which are not listed under 17 01 06
- **Mineral (inert) construction waste with brick and roofing-tile scrap** (mixed construction waste from demolition of older construction with a considerable

content brick and roofing-tile content) – from the Waste Catalogue: 17 01 06* – Mixtures or separate fractions of concrete, bricks, roofing-tiles/tiles and ceramic ware which contain hazardous substances, and 17 01 07 – Mixtures or separate fractions of concrete, bricks, roofing-tiles/tiles and ceramic ware which are not listed under 17 01 06 and 17 08 Plaster-based construction materials

- **Uncategorised construction waste** (mixed construction or demolition waste of various composition with a possible partial content of non-mineral elements) – from the Waste Catalogue: 17 09 Other demolition waste.

Raw materials obtained from recycling of construction and demolition waste can be also used as:

- • material for structural layers of roads, pathways, car parks
- • admixture for new asphalt-concrete mixtures
- • admixture to various types of concrete
- • material for production of concrete elements and constructions

Some possibilities of re-use waste materials from building construction and structural engineering after recycling processes are:

Table 14. Possibilities of re-use of waste materials from building construction and structural engineering

Type of material	Origin	Application
Pure brick scrap	Brick production	Admixture for production of wall elements, concrete, light concrete, stabilization, drainage layers, filling, levelling
Mixed demolition scarp in building construction with brick scrap (rubble mixed with brick)	Housing construction, Building construction	Admixture for production of wall elements, concrete, light concrete, stabilization, drainage layers, filling, levelling, final floor layers.
Mixed demolition scarp in building construction	Industry, building construction	Levelling stabilization, construction of sports grounds.
Mineral waste	Industry, building construction	Levelling, construction of sports grounds – drainage
Recycled sand	Industry, building construction	Basis for laying infrastructural pipes (gas, water etc.)
Asphalt scrap	Road construction	Unbound upper supporting layers, unbound lower

Type of material	Origin	Application
		supporting layers, bound supporting layers, construction of farm roads, admixtures for asphalt production
Concrete scrap	Road construction, bridge construction, industrial construction	Unbound upper supporting layers, unbound lower supporting layers, cement-bound supporting layers, construction of farm roads, admixtures for concrete production, drainage layers
Mixed asphalt/concrete scrap	Road construction, car parks, bridge construction	Unbound upper supporting layers, unbound lower supporting layers, bound supporting layers, construction of farm roads
Pure brick scrap	Brick production	Admixture for production of wall elements, concrete, light concrete, stabilization, drainage layers, filling, levelling

After recycling process there is also some “useless material” left which could be used for filling up areas planned to be levelled and designed, or used as road base, especially farm roads and construction of noise buffers near some roads. Such “useless materials” are environmentally non-hazardous materials when permanently disposed or materials whose further processing does not yield raw material for products of value.

Quantitative analysis

No data found

Recovery techniques

Recovery techniques in Croatia are:

- Disposal, recovery and storage: this technique is regulated by the Minister responsible for environment protection by way of the Ordinance on Construction and demolition waste management. Disposal of CDW is proposed following the classification given in paragraph 5.1.1.
- Separation, collection, recycling and recovery. This technique is possible if conducted by means of separate collection at waste origin and afterwards packaging waste is handled in

the way defined by regulations for such waste type. Only if such separation is ecologically and economically unjustified the waste does not have to be separated and it is collected in joint containers and sorted at waste sorting facilities.

Environmental and economic impacts of CDW waste management

- Saving the natural resources
- Low material consumption
- Low transport costs
- Low emissions
- Low cost for landfilling
- Preserve the environment and human health.

5.5.2 Recycled materials from CDW

Even if there are different possibilities to recycling CDW, as reported in paragraph 5.1.1, active recycling activities are not yet developed. As a result, there are no CDW products or their consumption. End-of-waste criteria for aggregates are not established. So far, the criteria have been adopted for iron, aluminum, copper and glass.

5.5.3 Market conditions / costs and benefits

There are no financial incentives for recycling CDW and there are no penalties either.