

19. NETHERLANDS

19.1 Legal Framework – Waste Management Plans and Strategies

19.1.1 National Legislation concerning CDW

The **National Waste Management Plan** sets out the policy for waste management in the Netherlands. The Second Waste Management Plan covers the period 2009-2017, looking ahead to the period up to 2021. The National Waste Management Plan covers all waste to which the Environmental Management Act applies. This Act stipulates that all authorities must observe the National Waste Management Plan.

The **Environmental Management Act** of 1 May 2004 sets out an integrated approach to environmental management in the Netherlands and provides the legal framework by defining the roles of national, provincial or regional, and municipal government.

The Act stipulates the tools to be used in environmental management and, in Section 10 it deals with waste management, set that the Dutch Minister shall adopt a waste management plan at least once every four years and given a set of prescription to do it.

In order to implement Directive 2008/98, the Minister of the Environment submitted a proposal in May 2010 to amend the **Environmental Protection Act**, the Law on environmental taxes and the Law on economic offenses. The so-called Implementation Act EG-regulation directive waste was then implemented on December 12 2010.

Based on the Environmental Protection Act, some decrees are made:

- **The Decree on landfills and waste bans:** Waste is usually recovered or incinerated and may usually not be dumped. For a number of waste materials a landfill ban exists, laid down in the Decree on landfills and bans waste (BSSA).
- **The Decree on notification of industrial and hazardous waste:** In the Notification of industrial and hazardous wastes the rules about disposal, transporting and receiving waste are pointed out. The decision applies from 1 January 2005. 10
- **Arrangement collectors, transporters, dealers and brokers of waste:** In accordance with the Environmental Management Act, waste is issued only by companies that have a license to take over this waste or companies authorized to collect waste. It is also laid down in the Environmental Management Act that only the owner of the waste is allowed to dispose of the waste. So it is not allowed (for example, as a contractor, consultant or carrier) to act as a disposer of waste of others. Transporters, collectors, dealers and brokers of waste must be registered.

19.1.2 Waste management plans (WMP) and Strategies

In the Netherlands the entire policy for waste can be found in the National Waste Management Plan (LAP). LAP2 will expire in December 2017. LAP3 covers the period 2017-2023, looking ahead to the period up to 2029.

In October 2016 the draft LAP3 was sent to the European Commission. The standstill period ends on 12 January 2017. LAP3 sets out the main points of waste policy. For example, it covers the national objectives for the separate collection of waste and general principles for

the use of instruments such as licensing and enforcement. The sector plans flesh out the policy framework for specific categories of waste.

Concretely LAP-2 includes the following quantitative and qualitative objectives (from DELOITTE Factsheet):

- Encouraging waste prevention, such that the total waste production in 2015 may not be greater than 68 Mt and in 2021 not more than 73 Mt.
- Increasing the recovery of the total waste from 83% in 2006 to 85% in 2015.
- Increasing the recovery of all household waste from 51% in 2006 to 60% in 2015.
- Increasing the recovery of total HDO (trade, services and government) waste from 46% in 2006 to 60% in 2015.
- At least maintain the already in 2006 achieved rate of 95% recovery of CDW, despite the expected increase in the production of this waste stream in the coming years (24 Mt in 2006 to 32 Mt by 2021).
- At least maintain the already in 2006 achieved rate of 90% recovery of industrial waste, despite the expected increase in the production of this waste stream by 16 Mt in 2006 to 18 Mt by 2021.
- Reduction (indicative objective) of 20% environmental impact in 2015 for each of the seven priority streams.
- Optimal utilization of the energy-content of waste that cannot be reused.
- Better utilization of the waste heat from waste incineration.
- Realization of a levelled European playing field for waste management.
- Promoting of market forces and shaping special responsibility of the government for landfilling.
- Using the Cradle-to-Cradle (C2C) concept as a source of inspiration in the seven priority streams.

About CDW, the LAP2 sets that:

- Construction and demolition waste is released during the construction, renovation and demolition of buildings and other construction works including in civil engineering.
- This sector plan covers mixed construction and demolition offered by companies in the construction sector, but also similar composed industrial and household waste, such as waste that is unseparated released during construction, demolition or remodeling of private households.
- The minimum standard for the processing of CDW is sorting or otherwise processing. The object of the treatment in this respect is to get as much mono streams as possible to be separated which are suitable for recycling, with the restriction that the resulting residue must at least be able to be burned. The sorting process is arranged - if present in the mixture to sort - at least to separate as mono stream:
 - All the components as mentioned in art. 4.1 of the Building Regulations 2012
 - Stone-like material,
 - Wood,
 - Plastic,
 - Metal,

- Sieve sand, and
- Hazardous waste marked other than those specified in Chapter 17 of the Waste List under the Regulations for European Waste Catalogue.
- The minimum standard for sorting residue for which recycling is not possible or where the recycling route is so expensive that the cost of delivery by the producer / disposer is more than € 175, per ton, is incineration as a disposal method.

19.1.3 Legal framework for sustainable management of CDW

All the above mentioned legislation and all the non-legislative instruments described in paragraph 2.2 contribute to create good conditions for a sustainable management of CDW.

19.1.4 Targets

In Netherland, the European target of 70% recovery of CDW by 2020 is already passed for many years, so in the National Waste Plan it's fixed that "At least maintain the percentage already achieved in 2006 in Netherlands of 95% recovery of CDW, despite the expected large increase in the production of this waste stream in the next few years (from 23 Mtonnes in 2006 to 31 Mtonnes by 2021)".

19.1.5 End of Waste (EoW) status

The Netherlands uses the EU defined EoW criteria. Any waste that fulfils the criteria for the 'end of waste' has no longer the status waste.

Moreover, for waste for which no European end-of-waste criteria is developed European Member States themselves may introduce schemes with end-of-waste criteria. For the following waste a Dutch regulation applies: Recycling Aggregates from stony waste: Regulation No IENM / BSK-2015/18222 of February 5, 2015.

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

Rijkswaterstaat Environment is part of Rijkswaterstaat, the executive of policies and regulations of the Ministry of Infrastructure and the Environment. Rijkswaterstaat Environment performs various knowledge and implementation tasks relating to the environment. Rijkswaterstaat Environment also manages programmes for other clients than the Ministry of Infrastructure and the Environment, such as local authorities and other ministries.

To evaluate policy effectiveness, Rijkswaterstaat monitors quantities and characteristics of waste streams, transboundary movement, waste treatment and processing activities, and (inter)national market developments. To gather this data, Rijkswaterstaat coordinates the monitoring activities of various organisations and compiles the results in a central database. Monitoring activities also include developing indicators and waste output scenarios. The generated data is analysed and processed to deliver monitoring reports to the Dutch government and the EU (Eurostat).

To formulate sound and reliable policy advice, Rijkswaterstaat executes research (e.g. lifecycle analyses), contracts external experts and/or analyses third-party research. Rijkswaterstaat also regularly consults private and public stakeholders to take into account their views and experiences.

It thus bridges the gap between policy and practice. Rijkswaterstaat uses different methods for stakeholder consultation, such as participatory workshops and network meetings.

Thus, Rijkswaterstaat has extensive experience with knowledge and data management. It is continuously developing its knowledge base, promoting knowledge exchange and correct use of information sources.

Rijkswaterstaat has developed a web-based tool. With it, businesses can assess their own material or object status. This e-tool will show whether the assessed material or object is a by-product (Article 5 of the Waste Framework Directive) or if it has end-of-waste status (Article 6 of the Waste Framework Directive). This e-tool will help the waste industry (as collectors of waste) and manufacturers. They can use it to make proper decisions about many different types of waste-derived products or production residues.

The program **Waste To Raw material** (VANG) is the effort by the government to encourage the transition towards a circular economy. The common goal is to bring more sustainable products on the market, consume consciously and recycle more and better. The VANG program has eight operational objectives. These objectives include sustainability at the front of the chain, improving waste separation and collection, directing existing waste policy to a circular economy and addressing specific chains and waste streams, but it does not describe a part specifically focused on CDW.

REBus (Resource Efficient Business Models) is a project financed by EU Life+ with the goal of acquiring knowledge about the potential of circular business models and investigating whether they can help achieve the target of 15% resources and costs savings. REBus Netherlands aims to inspire purchasers and market participants to focus on retaining the value of raw materials throughout the supply chain from the very first request for a product or service. This includes the possibilities for reuse and recycling. The goal is to learn how new business models can be used for circular procurement and what the effects of this are on sustainability.

In the Netherlands, REBus is working with other governments and progressive companies to explore models that make circular procurement possible within five industries: IT, office furniture, construction, textiles and catering. By conducting pilot projects, REBus is learning more and more about what is needed for circular procurement. REBus also applies the knowledge gained in new pilot projects and stimulates participants to share their knowledge.

Other numerous initiatives for CDW management are described in DELOITTE Factsheet, such as research projects and private initiatives. More interesting are:

- **ADR Technology:** the development of advanced innovative technologies for turning demolition concrete into clean aggregates and cement, started by the Delft University of Technology and 13 partners and is European-funded.
- **Neptunus:** offers a demountable building concept. In this innovative proposition, houses are built for 10-20 years and take them completely apart afterwards. It works in a lease construction.
- **Slim Breken (Smart Chrusher):** a new breaking technology to better separate concrete granulates into its three components (proposition by Koos Schenk).

19.3 CDW management performance – CDW data

19.3.1 CDW generation data

EUROSTAT database reports the data in Table 68 for CDW generated between years 2010 and 2014.

Table 68. EUROSTAT CDW generation data.

	2010 [tons]	2012 [tons]	2014 [tons]
Mineral waste for construction	20.444.617	21.855.155	19.430.472
Metal wastes, ferrous	677.693	701.882	840.968
Metal wastes, non-ferrous	175.932	163.898	193.205
Glass wastes	78.805	48.543	82.367
Plastic wastes	32.173	34.091	26.576
Wood wastes	1.306.264	1.321.587	1.376.779
Total	78.063.887	81.354.111	90.734.851

19.3.2 CDW treatment data

Data published by EUROSTAT deals with different waste categories but becoming from all the economic activities. Therefore, only for the category “Mineral waste from construction”, data can be considered reliable, as in the Table 69.

Table 69. EUROSTAT CDW treatment data.

Mineral waste from construction [tons]	2010	2012	2014
Landfill / disposal (D1-D7, D12)	49.286	61.419	37.653
Deposit onto or into land	49.273	61.419	38.652
Land treatment and release into water bodies	13	0	0
Incineration / disposal (D10)	534	3.383	8.565
Incineration / energy recovery (R1)	7.728	6.589	102.217
Recovery other than energy recovery	20.055.549	21.559.847	19.986.937
Recovery other than energy recovery - backfilling	0	0	0
Recovery other than energy recovery - except backfilling	20.055.549	21.559.847	19.989.937
Total waste treatment	20.113.097	21.631.238	20.135.372

19.3.3 CDW exports/imports data

The National Waste Management Plan gives some indication about export/import waste.

Cross-border transport of waste: (Temporary) removal

- Shipments from the Netherlands to landfill are not allowed on the grounds of national self-care.
- Shipments from the Netherlands in other types of (temporary) removal than landfill are in principle not allowed because recycling is possible. However, this prohibition does not apply to sorting residue under the condition that it appears from the notification that components such as wood, paper, metals, glass and plastic are not suitable for recycling. In this case, transmission for incineration is basically permitted.
- Shipments to the Netherlands for landfill are in principle prohibited under national laws and / or on the basis of national self-sufficiency.
- Shipments to the Netherlands for incineration as a disposal method are in principle not allowed.
- Shipments to the Netherlands for other types of (temporary) removal than incineration and landfilling are in principle not allowed.

Cross-border transport of waste: (Temporary) recovery

- Shipments from the Netherlands for recycling and for interim recovery followed by recycling is permitted in principle, unless eventually much of the transferred waste material is landfilled that the degree of recovery does not justify the transmission or when the degree of recycling is less than is common in processing of waste in the Netherlands.
- Shipments from the Netherlands for other types of (temporary) recovery than recycling or interim recovery followed by recycling is not allowed in principle because recycling is possible.
- Shipments to the Netherlands for (temporary) recovery is permitted in principle if the processing is in accordance with Dutch standard minimum.

About exports/imports data, the only one found are those listed in the DELIOTTE Factsheet:

Export

- In 2012, 710,405 tonnes of CDW were imported into The Netherlands.
- Around 70% of this was hazardous CDW.
- Moreover, 45% of the total was ground and stones that contain hazardous substances.
- Since 2006, the export of CDW has dropped drastically, in 2006 the CDW export was 705,952 tonnes.

Import

- In 2012, 232,113 tonnes of CDW were exported out of The Netherlands.
- Around 85% of this was non-hazardous CDW.
- Since 2006, the import of CDW has drastically risen by more than 300%, in 2006 the CDW import was 215,812 tonne.
- 70% of the CDW that was imported in 2012 was recycled.

19.3.4 CDW treatment facilities data

The Dutch approach to waste management is that landfilling is only allowed for waste streams for which no recovery or incineration is possible. This approach is known as 'the order of preference'.

According to EUROSTAT database about "Number and capacity of recovery and disposal facilities by NUTS 2 regions", In Luxembourg there are no landfill for inert waste, while there are 38 landfill for non-hazardous waste and only 1 landfill for hazardous waste.

19.3.5 Future projections of CDW generation and treatment

Efforts have shifted to encouraging companies and governments to start applying the concepts of "by-product" and "end-of-waste" themselves. This is accomplished by providing information and through discussions in meetings, as well as by means of so-called legal rulings (opinions of the Ministry of Infrastructure and the Environment concerning a specific case given at the request of a company). This policy will be given a significant boost in 2017 through an explanation of the concepts of "waste", "by-product" and "end-of-waste" in the third National Waste Management Plan (LAP3).

19.3.6 Methodology for CDW statistics

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

19.4 C&D waste management in practice

19.4.1 CDW management initiatives

See paragraph 19.2.

19.4.2 Drivers / barriers to increase CDW recycling

The introduction of a circular economy in the construction sector creates opportunities for innovation. The scope of a circular economy for the construction sector extends beyond the mere reuse of waste. A circular economy for the construction industry calls for the following three questions to be considered with respect to each building:

- 1) How can we minimize the use of construction materials? This involves not only the need for raw materials, but also the options for reuse and transformation of the building itself;
- 2) How can we meet the remaining material requirements as sustainably as possible? The use of sustainable construction materials should be considered here, as should reuse;
- 3) How can we meet the material requirements still remaining as efficiently as possible?

With this aim, market will encourage CDW recycling and it will be a driver for it.

The introduction of tax on landfilling and burning waste is an enabler of more recycled CDW.

Even if in Netherland there are many initiatives about CDW management or in construction sector in general, sometimes there is a lack of maturity of these initiatives.

19.5 CDW sector characterization

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

Product description and applications

The composition varies for different user groups:

- Housing
- Utility
- Road and waterworks.

Main component is the stone fraction, which accounts for 89, 96 and 99% respectively. The high recyclability grade of 98% for the total construction and demolition waste market is achieved due to the good recycling possibilities of stone rubble.

Processed stone rubble can be used in new concrete, road foundations, waterworks and ground works. The trends and expectations for the future show a growth of 80% in construction and demolition waste for the year 2005-2025.

Main products and applications of CDW are:

- Secondary asphalt for reuse in hot mixtures
- Secondary aggregates for new concrete
- Cement bound asphalt granulate road base
- Cement bound granulates for road base
- Secondary aggregates for new road base
- Secondary sand for sub base.

Quantitative analysis

See paragraph 17.3.1

Recovery techniques

During the demolition process the aim is to separate different materials on-site, since recycling of gypsum, wood, plastic is only possible when separated properly and is hard to separate afterwards. The extra work on-site saves in processing costs afterwards. Besides separation, processing on-site is also possible with mobile equipment. Transportation to a processing plant is no longer necessary, material can be directly used on-site, transported to a temporary storage location or to the end-user.

A demolition license is required when the waste generated in the process exceeds 10 m³. In the application for a license the use of mobile processing equipment must be stated. Beside the license, national governmental rules on handling and processing CDW, like the Bouwstoffenbesluit are active.

Excavators, shovels, skid steers and dozers are used for on-site transportation of bulk materials. Except for the dozers, these machines can be equipped with a quick coupler and act as a tool carrier. Tool carriers are able to use different attachment types for demolition, separation and processing activities. Special case are the extended reach equipment, tool carriers exceptional long booms to get to hard to reach places. Processing wood is done with shredders, grinders or chippers, while stone is being processed by crushers. Separation based on size difference, screening, can be done with drum sieves. Separation based on density difference, sifting, with a wind shifter. Transport over the roads is done with trucks.

The theory behind crushing is based on fracture mechanisms and propagation models. These different mechanisms are applied in different variants. In practice, the most common variants are the impact, jaw and cone crusher. For processing of recycling materials, only the impact and jaw crusher type are used in mobile equipment. This equipment can be a complete plant, or only an attachment for a tool carrier, which is called a bucket crusher. Automation of the crushing process in complete plants allows high throughput capacities and therefore low cost per unit material. There are bottlenecks that could occur which limit production.

Reinforced concrete is hard to crush and could clog the device. One of the solutions is to use a tough primary crusher, which enables extraction of iron by a magnetic overbelt. The secondary, more vulnerable crusher then delivers the desired end-product.

The use of an online marketplace for trading processed waste materials, such as granulate, offers advantages. A map shows the location, the quantity and the quality of the material. The client is able to find the nearest location with his required materials and can get directly in touch with the supplier. The total amount of transport kilometers can be limited, when using this trading method.

For large projects, combination equipment can be used, whether integrated in one installation or the combination and interaction of different single-piece equipment. A separate jaw crusher, impact crusher(s), wind shifter and drum sieve versus a complete processing plant. Also important factors to look at are the flexibility, scalability, robustness etc [225].

Drivers / barriers to increase recycling

See paragraph 2.4.2

19.5.2 Recycled materials from CDW

Main product obtained from CDW recycling are granulates, different each other depending on their composition: mixed granulates, concrete granulates, hydraulic granulates, asphalt granulates.

The reuse of Commercial and Non-residential Building CDW is already widespread (>95%), albeit that in many cases materials are not reused at the same or a higher level. The reuse rather involves, for example, construction rubble being processed to granulate to be used as a foundation material in Soil and Civil Engineering. The bulk of the material is subsequently reused at the same level in the Soil and Civil Engineering sector; after one road life cycle, the rubble is reusable in other road projects. The need for such foundation material in the Soil and Civil Engineering sector is expected to decrease, as this sector increasingly tends to use residual material from other sources. This “saturation” in Soil and Civil Engineering generates an incentive for developing more circular uses for construction materials in the Commercial and Non-residential Building sector.

Since February 2015, recycled aggregates have an EoW status. The criteria of the EoW status for aggregates describe details about:

- Requirements of the stony waste to be recycled into aggregates
- Production control
- Product quality
- Declaration of Conformity
- Quality assurance

The requirements of the stony waste contains:

- Quality
 - ✓ No hazardous waste
 - ✓ No asbestos, tar, residential waste, gypsum, ground, carbon black and timber
- Registration
 - ✓ Date of receipt, quantity, name and address of the supplier, and whether the offered stony waste is accepted or rejected
- A check on the presence of tar and polycyclic aromatic hydrocarbons
- A visual observation for asbestos.

An other recycled material is Styrofoam⁴⁷: Waste processor Sita collects EPS from the construction industry. It is broken down into smaller pieces and mixed together with new Styrofoam, which makes it 100% recyclable without any loss of quality.

19.5.3 Market conditions / costs and benefits

As natural resources are getting more scarce, prices for raw materials are increasing. This market mechanism and environmental government policy together stimulate the recycling of waste materials.

Although the annual volumes of construction and demolition waste seem to have stabilized for the last five years, a scenario study predicts a growth of 80% for 2025. The economical viability of mobile

crushing depends greatly on the market prices of recycled aggregate. These prices depend on demand and supply, a growth of 80% in supply would require at least the same growth in demand,

for prices not to collapse. Therefore, focus should be on quality and on new applications. High quality granulates are an advantage in a high competition market, while new applications ensure sufficient sales possibilities. Also the development of applications for low quality products is important, to prevent them being disposed as landfill.

Starting from 1 April 2014, a waste disposal tax has been imposed on the disposal and incineration of waste. The reintroduction of the waste disposal charge has resulted in a manifest and immediate reduction in the volume of waste deposited. As of 1 January 2015, this tax was expanded to include waste that is incinerated.