10. GERMANY

10.1 Legal Framework – Waste Management Plans and Strategies

10.1.1 National Legislation concerning CDW

The European Waste Management Directive (Directive 2008/98 / EC, AbfRRL) has been implemented into German law, modernizing the existing German waste legislation through the new Circular Economy Act (KrWG), which is currently Germany's main waste disposal statute. This Act replaces the first uniform National Waste Disposal Act (AbfG), adopted in 1972. The objective of the new Act is to achieve a sustainable improvement in environmental and climate protection as well as resource efficiency in waste management by strengthening waste prevention and recycling of waste. At the same time, the adoption of EU legal concepts and definitions as well as the clarification of central regulations are intended to facilitate the practical and legal application of the law [103].

As Germany consists of 16 federal states, certain aspects of the CDW disposal, which are not regulated centrally are governed by the states themselves, such as the determination of entities, which are subject to waste disposal obligations, authorizing bodies for waste disposal matters and municipal waste disposal ordinances.

Prior to dismantling a building, it is important to determine the age of construction and the buildings use to identify typical pollutants or polluted building materials of that time or contamination in relation to the operation of the building. In case of relevant findings, a technical investigation with sampling has to be carried out.

Although not mandatory, a dismantling and disposal concept is recommended. Building materials containing pollutants must be removed prior to dismantling or demolition. In case that fraction of the CDW are classified as hazardous waste, the Waste Register Ordinance (AVV) in connection with instructions set out by the Federal Ministry for Environment must be taken into account.

For the recycling or dismantling of commercial CDW the Ordinance on the Management of Municipal Waste (Gewerbeabfallverordnung) applies. In case of hazardous waste, evidence (proof of disposal and accompanying documents) according to the Proof Ordinance (Nachweisverordnung) must be provided to the Central Body for Waste Supervision (Zentrale Stelle Abfallüberwachung (ZSA)) at the State Office for Environment (LfU). In case of transport of commercial waste, the notification and permit regulation (AbfAEV) must be applied. The respective county administration authority (County Council or Environment Agency) is responsible for granting the transport license.

Other regulations (Abfallverzeichnisverordnung, AVV) regulate the types of wastes, classified into hazardous and non-hazardous wastes [103].

10.1.2 Waste management plans (WMP) and Strategies

There is no national waste management plan or strategy in place. The Circular Economy Act sets out a clear hierarchy how to deal with CDW listed below:

- prevention
- preparation for recycling
- recycling
- other types of recovery, particularly use for energy recovery
- disposal

The Circular Economy Act (Section 30 (1)) stipulates that the Federal States are responsible for the development of WMP's, which should cover the following aspects:

1. aim of waste prevention and recovery, and in particular preparation for re-use and recycling, as well as waste disposal,
2. existing situation in waste management,
3. necessary activities to improve the recovery of waste and waste disposal, including an evaluation of their aptitude to achieve the objectives
4. waste treatment installations to ensure waste disposal, as well as the recovery of mixed waste from private households including which is collected in other areas of origin within the national borders.

The waste management plans shall list the following:
1. authorised waste treatment installations
2. areas suitable for landfilling, for other waste disposal installations, as well as for waste treatment installations

The waste management plans can also determine which bodies responsible for waste management are to be chosen and which waste treatment installations the parties obliged to carry out waste treatment must use.

10.1.3 Legal framework for sustainable management of CDW

The legal framework for sustainable management of CDW is rather complex in Germany as countrywide legislations are not in place yet. The Table 37 sets out regulations and frameworks in place.

Table 37. Legal framework for sustainable management of CDW.

National or regional obligation towards	Germany
National or regional obligation for selective demolition	No obligation exists on a national level; several states have put a recommendation for selective demolition in their respective waste management plans. Furthermore, the Ordinance on the Management of

	Municipal Wastes, which is currently under revision, is likely to contain national obligations for selective demolition in its new version
National or regional sorting (on-site or in sorting facility)	Defined at national level (Section 8, Management of Municipal Wastes Ordinance). Separation and requirements for the pre-treatment of CDW.
National or regional separately collect different materials (iron, steel, plastic, glass, hazardous waste etc.,)	
Green public procurement requirements	Guidance for sustainable construction (Leitfaden Nachhaltiges Bauen, 2013) provides recommendations with regards to strategies for dismantling for the next generation of buildings, dismantling is not fully covered yet, in addition the document is not legally binding

10.1.4 Targets

The targets with regards to waste recycling are defined under § 14 Promotion of recycling and other material recycling of the Circular Economy Act (KrWG).

From the 1 January 2015 paper, metal, plastic and glass waste shall be collected separately in order to achieve a safe and high quality recycling. Technical and economical considerations shall be applied.

For the reuse and recycling of CDW the Federal Government aims to implement ambitious goals set out by the EC under Directive 2008/98/EC [104]. 70% (by weight) of non-hazardous building and demolition waste shall be reused or recycled, with the exceptions of materials occurring in nature from the 1 January 2020. This figure includes the filling up in which waste substitutes other materials. The Federal Government will review this target in light of the development of the construction industry and the general conditions for the recycling of CDW by 31 December 2016 [105].

10.1.5 End of Waste (EoW) status

The end of waste status is defined under the Circular Economy Act in Secrion §5. A substance or an object is no longer considered as waste, if it has passed a recycling or recovery process and it is characterised by all of the following criteria:

- it is usually used for certain purposes,
- there is a market or a demand for it,
- it meets all technical requirements applicable to its particular purpose, as well as all legislation and applicable standards for products, and
- its use as a whole does not lead to harmful effects on human beings nor the environment.

In order to fulfil the last aspect listed above, the Federal Government is authorized to determine threshold values for pollutants and harmful substances. The end of waste status is also valid for CDW and ends with the successful recovery or recycling technique, while fulfilling the requirements of the waste regulations [105].

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

The Federal Government developed a Guideline for Sustainable Construction that provides in its latest edition guidance with regards to the demolition of buildings. However, these recommendations relate to the design and construction of new buildings in order to minimise CDW for future generations. The Guidelines are binding in case of governmental projects and only informatory character for all other projects.

In add,ition several Federal States have developed guidelines for the dismantling of buildings (e.g. Brandenburg, Bavaria) but also the Federal Institute for Occupational health and safety and medicine.

The LAGA (Bund/Länder Arbeitsgemeinschaft Abfall) is a working committee of the Conference for Ministers for Environment (UMK). Founded in 1963 the LAGA aims to ensure the implementation of waste legislation in the Federal Republic of Germany as far as possible within the Federal States through information and fact sheets as well as guidelines [106].

10.3 CDW management performance – CDW data

10.3.1 CDW generation data

Construction and demolition waste in Germany consist of building rubble, road construction, soil and stones, as well as building site waste. Construction gypsum plasters are collected separately.

Construction and demolition waste, including road construction waste accounted in 2014 with 209.5 million tonnes (52.3%) for the largest share of waste. The largest fraction of CDW was excavated soil, of which 85% was utilised for landfill in construction or at the pithead excavations. The remaining mineral construction waste was also used to a considerable extent [107].

In 2012, CDW accounted for 192.0 million tonnes of waste, with 109.8 million tonnes through excavation, which was utilized to a total of 88 %, for the same purposes as identified in 2014. The remaining 82.2 million tonnes of CDW consisted of building rubble, road construction, construction site waste as well as construction waste based on plaster. These waste streams were recycled up to 95.5%.

Figure 6 shows mineral waste figures from 2012, broken down into different streams.

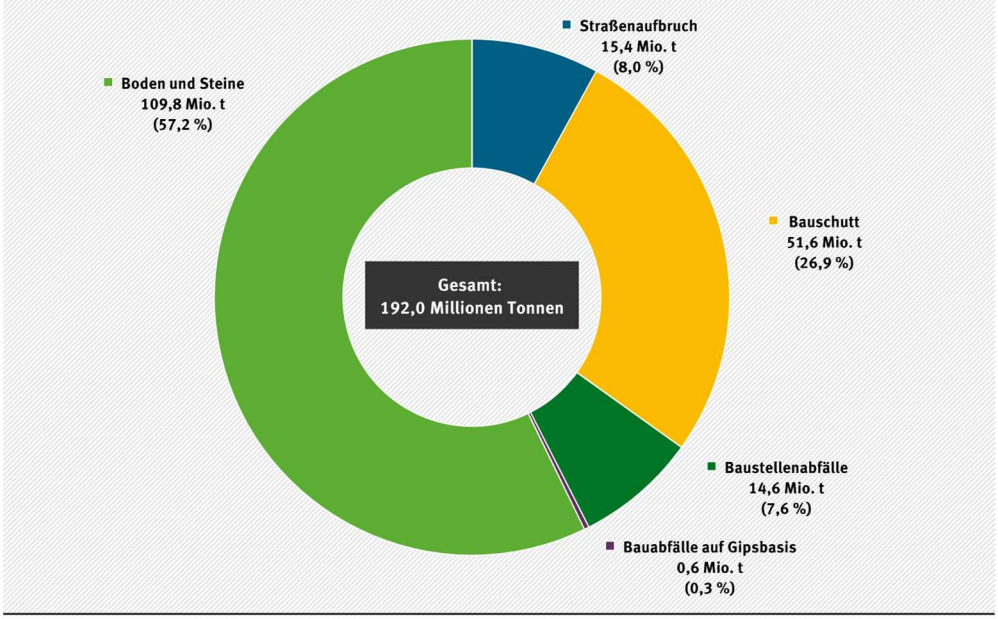

Figure 6. Groups of waste in Germany (2012 broken down into different streams), source Federal Ministry for Environment.

Hazardous waste

From 1999 onwards, hazardous waste is merely reported as a sum in the waste balance. Approximately 6% of the hazardous waste in 2014 was generated by the industrial and construction sectors. 67% of this waste could be utilized [107].

10.3.2 CDW treatment data

Reliable figures for CDW generation and treatment were taken from a report that the Federal Statistic Office published in 2014, with figures dating back to 2006. The overall amount of CDW totals to 197 million tonnes, whereof 89% of waste has been exploited and 88% has been recycled [108].

10.3.3 CDW exports/imports data

The Federal Ministry for Environment provides figures with regards to for the trans-national transport of waste for Germany (Figure 7, Figure 8 and Figure 9). The published data show that the shipment is mainly carried out between neighbouring countries, in particular from the border areas. The average transport distance between the place where the waste were generated and the disposal is less than 500 km (average) [109].

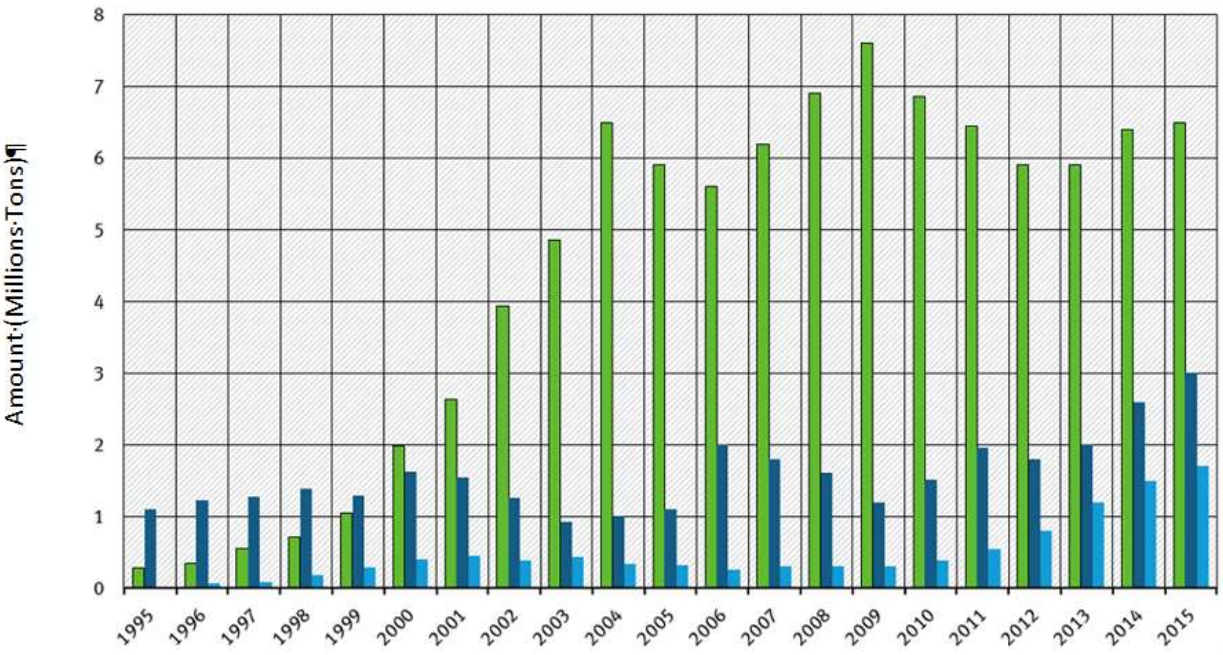

Figure 7. Amount of waste Import – Export in Germany in MIO Tons, source UBA [109]

Grenzüberschreitende Verbringung von zustimmungspflichtigen Abfällen
Zeitreihe Import nach Staaten - Mengen in 1000 t

Staatengruppe	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
EU-Staaten	6227	5689	5307	5889	6431	7157	6379	5806	5099	5127	5 671	5807
EFTA-Staaten	245	257	303	323	394	446	447	598	737	715	709	668
Andere OECD-Staaten	10	6	4	9	15	16	23	29	29	32	29	19
Nicht-OECD-Staaten	10	13	14	19	14	8	11	20	15	12	17	25
Summe	6492	5965	5628	6240	6854	7627	6861	6452	5881	5886	6426	6519

Staatengruppe	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
EU-Staaten	64	61	52	194	247	428	567	916	1808	2427	3692	4587
EFTA-Staaten	12	28	46	82	91	115	129	120	165	193	229	250
Andere OECD-Staaten	0	0	1	3	5	3	3	3	3	4	4	8
Nicht-OECD-Staaten	0	0	0	1	4	2	2	5	8	7	10	9
Summe	76	89	100	281	347	548	701	1044	1985	2630	3934	4854

Quelle: Umweltbundesamt

Daten für 1994 ab Inkrafttreten der EG-Abfallverbringungsverordnung im Mai 1994
Zuordnung der Staaten gemäß Status von 2015

Figure 8. Amount of waste Import – Export in Germany in MIO Tons, source UBA [109] – Update

Grenzüberschreitende Verbringung von zustimmungspflichtigen Abfällen
Zeitreihe Export nach Staaten - Mengen in 1000 t

Staatengruppe	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
EU-Staaten	929	836	1476	1423	1192	869	1145	1526	1428	1734	2346	2716
EFTA-Staaten	63	198	384	284	256	199	189	242	249	238	251	295
Andere OECD-Staaten	5	2	2	1	3	3	3	3	7	2	3	2
Nicht-OECD-Staaten	0	0	3	0	0	0	0	3	4	2	1	3
Abfälle nach Artkel 37 und 63 VVA	39	68	101	118	111	131	177	177	120	14	11	10
Summe	1036	1103	1966	1827	1561	1201	1514	1950	1809	1990	2613	3027

Staatengruppe	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
EU-Staaten	797	1050	936	821	936	974	1114	1088	1371	1399	1150	823
EFTA-Staaten	0	35	9	42	39	57	63	70	53	64	67	54
Andere OECD-Staaten	0	0	0	24	35	17	4	3	1	1	2	2
Nicht-OECD-Staaten	0	0	0	3	1	0	0	0	0	0	0	0
Abfälle nach Artkel 37 und 63 VVA	0	0	0	208	210	230	204	126	203	76	45	28
Summe	798	1085	945	1099	1220	1278	1385	1288	1628	1540	1263	907

Quelle: Umweltbundesamt

Figure 9. Amount of waste Import – Export in Germany in MIO Tons, source UBA [109] - Update

10.3.4 CDW treatment facilities data

No data found.

10.3.5 Future projections of CDW generation and treatment

No data found.

10.3.6 Methodology for CDW statistics

Waste figures are based on the Environmental Statistics Act [110]. The figures are reported by the treatment plants directly to the individual statistical offices of the Federal States, which then provide the data to the Federal Statistical Office. In addition, the initiative Circular Economy Construction is monitoring the utilisation of CDW and provides waste figures in their annual reports [111].

10.4 C&D waste management in practice

10.4.1 CDW management initiatives

The German government is encouraging the construction industry to establish and follow the principals of the circular economy. The aim is understand existing buildings as urban mining and minimise the extraction of raw materials. The total amount of anthropogenic stock in Germany, including rocks, metals, wood and plastics, can be estimated with 51.7 billion tons of material. This corresponds roughly to the sum of all raw materials obtained worldwide in 2000. The Federal Environment Agency has initiated projects to generate

reliable data on the available secondary raw materials in order to develop an urban mining strategy. In this way, not only valuable natural resources can be protected in the future, but also the import dependency for numerous raw materials can be mitigated. [112].
In addition, in 2012 the non-profit organisation Cradle to Cradle was founded in Germany with the aim to establish a different handling of resources and to establish continuous material cycles, which are healthy for humans and the environment. The concept is not limited to construction, but covers all resources and substances.

10.4.2 Drivers / barriers to increase CDW recycling

Recycling of CDW is an important step towards a reduction of resource extraction and the associated environmental impacts. Especially in Germany, where access to raw materials is limited, CDW offers a huge potential of high quality raw materials, which can be efficiently recovered and processed to feature a similar quality of other high quality starting materials.

The increased use of plastic-based building materials, such as windows, doors or insulation materials as well as the increasing importance of composites and the generally increasing variety of materials used in the construction sector will lead to ever higher demands with regards to appropriate processing and recycling procedures.

In many cases, economic considerations are the main barriers to CDW reuse and recycling as waste disposal as well as access to raw materials is much cheaper than an appropriate reuse or recycling of CDW. However, increasing prices for raw materials could lead to a turn around.

10.5 CDW sector characterization

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

Product description and applications

The potential applications of several building materials are reported in Table 38.

Table 38. CDW materials and applications.

CDW material	Application
CONCRETE	Concrete waste in Germany is mainly used as filling material for roadworks. In addition, the first architectural projects are finalised using RE concrete (Neubau von Forschungs- und Laborgebäude Lebenswissenschaften Humboldt-Universität). Due to limited access to sand and other aggregates necessary for concrete the use of RE concrete in Switzerland is very common.
BRICKS	Bricks are reused in smaller applications, where full bricks could be dismantled from the building.
WOOD	Due to a surplus of wood in Germany, recycled materials are mainly used for energy generation. In addition, in buildings constructed after world war II, wooden elements were often treated, which implies that material cannot be reused inside buildings.

GYPSUM	In Germany plasterboards offer a high potential for recycling, whereas gypsum plaster boards are rarely generated from CDW.

Quantitative analysis

No data found.

Recovery techniques

No data found.

Environmental and economic impacts of CDW waste management

No data found.

Drivers / barriers to increase recycling

Provided in section 10.4.2

10.5.2 Recycled materials from CDW

No data found.

10.5.3 Market conditions / costs and benefits

No data found.