

# Construction and Demolition Waste Management in

## FINLAND

V3 – December 2015



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# Screening factsheet

## 1. Summary

### Construction and Demolition Waste (CDW) management national performance

Table 1 Construction and Demolition Waste (CDW) generation

Waste category	Quantity generated in 2011 (million tonnes)	Quantity generated in 2012 (million tonnes)
<b>Non-hazardous CDW</b>	<b>18.1</b>	<b>15.9</b>
- CDW from buildings (estimated)	(1.7)	(1.5-2)
- Soil (estimated)	(appr. 16)	(appr. 14)
<b>Hazardous CDW</b>	<b>0.33</b>	<b>0.15</b>
<b>Total CDW</b>	<b>18.4</b>	<b>16.0</b>

Official statistics for Finland include soil waste that cannot be used on-site or recycled. Non-hazardous CDW from buildings, rehabilitation or demolition of buildings presented for 2011 and 2012 are estimated based on other sources than official statistics of Finland

In 2012, 16.0 million tonnes of construction and demolition waste (CDW) were officially reported as generated in Finland. The amount of CDW in 2012 represents a 13% decrease compared to 2011 (18.4 million tonnes) due to the recession in the construction sector. Most of the CDW has traditionally been soil, which was distinguished only in 2011 statistics from waste produced from buildings, rehabilitation or demolition of buildings. The amount of non-hazardous CDW, excluding soils was estimated based on other sources to be around 1.5-2 million tonnes in 2012. CDW specific data before 2011 are determined and estimated using administrative data from the register of buildings and dwellings and from material flow accounts. Data from 2011 onwards are based on the administrative register VAHTI.

A significant part of the CDW in Finland is wood waste due to the building typology. The amount of wood waste reported in Eurostat has, however, significantly decreased from 890 000 tonnes in 2010 to 238 000 tonnes in 2012.

Some key points raised by several stakeholders:

- Harmonization of waste statistics in Europe. The CDW data from different countries are not comparable. Finland includes soil from construction as CDW if not used on-site or as aggregate in roads.
- Current statistics coverage and accuracy:
  - Data collection based on the administrative register accounts only for wastes entering treatment facilities with environmental permits. Otherwise, estimations are used to complement the data.
  - Construction wastes from private households are not included in current statistics.
- CDW quality (securing zero or low content of hazardous substances and minimizing of disturbing fractions) is of high importance in recycling of CDW in high-grade applications.

### CDW management practices

Overall 1.7 million tonnes of waste (of a total of 2.2 million tonnes) generated in housing construction<sup>1</sup> was recovered or transported to pre-processing for recovery in 2011. The Government Decree on Waste (179/2012) requires organization of separate collection and recovery of waste generated in refurbishment, demolition and new construction, which has led to efficient recycling of separate waste streams. Concrete and other crushed mineral waste are used in earth construction, mainly in road

<sup>1</sup> The term 'house building wastes' accounts for waste produced in building, rehabilitating or demolishing buildings and does not account for land or mineral wastes [SYKE 2011].

structures. The mineral waste recycled amounted to 1.3 million tonnes and the separated metal waste to 100 000 tonnes. About 250 000 tonnes of CD wood waste was recovered as energy. There are, however, no reports about the treatment of wood wastes from construction in particular, only on the treatment of wood waste from all sectors. Around 250 000 tonnes of construction waste ended up at landfill sites. These figures do not include soil waste or dredging spoils generated in construction.

The landfilling costs and taxes promote recycling of CDW. This was already acknowledged in 1996 when one of the biggest construction companies started professional recycling of reclaimed concrete generated in selective demolition. Due to the introduction of taxes on landfilling of wastes, the recovery of processed reclaimed concrete waste was significantly encouraged and a new business area started. A Finnish SFS standard for quality control was prepared and technical manuals for the use of reclaimed concrete were published. Based on this, the Finnish Ministry of the Environment issued a decree on the use of specific waste streams in earth construction. The purpose of the decree is to promote, through simplification of the environmental permitting system, the use of selected wastes in earth construction which fulfils the requirements defined in the decree.

No illegal landfills have been acknowledged. In recent years, only a few cases have been reported where concrete waste has been used as backfilling in private sites without permission.

In recent years, several new activities to find new solutions on CDW have taken place. The need for quality management of waste streams has been acknowledged, and quality standards for recycled materials have been developed. Several legislative actions, industrial initiatives and R&D actions can be pointed out:

- Commitments between authorities, waste generators and end-users to promote sustainable use of CDW through a common action plan;
- Legislative simplification of regulations to promote the recycling of reclaimed concrete. Crushed demolition wastes have been successfully used for about 20 years in infra constructions to replace high-grade natural aggregates. Key issues in successful recycling are:
  - Use and development of adaptive legislative instruments enabling sustainable recycling;
  - Selective demolition and traceability of waste material flows;
  - Quality assurance (including limit values for environmental properties in compliance testing) and turning waste into product;
- Regulation for promoting recycling of asphalt on-site (asphalt not regarded as waste);
- Regulation for simplification of the permit system for recovered old asphalt granulates to be used directly in production of new asphalt. It implies that if the recovered asphalt granulate is free from metals, oil, tar and other contamination, it can be re-used after registration and no permit is required;
- Industrial initiatives to find new solutions for recycling of wood waste as new products;
- Many R&D programmes on recycled materials from CDW and the great support by the Finnish Funding Agency for Technology and Innovation and the Finnish Ministry of the Environment;
- Nordic initiatives by the Nordic Council of Ministers concerning the use of economic instruments to promote recycling and sustainable management of CDW for reaching the EU recycling target and development of tools for sustainability.

The effective CDW recycling is challenged by the fact that Finland is a very large country with a relatively small population. This means that CDW generation is dispersed and distances are long. Material recycling of wood waste is especially challenging. Although several projects are running to find new technologies for wood recycling, the degradation of wood during use and the treatment of wood limit its usability as material for new products.

### **Main obstacles to sustainable CDW management**

The following obstacles were identified during interviews:

- Adaptation and simplification of regulation together with reduction of bureaucracy would promote recycling further. The development of legislation for waste storage facilities is to be put forward.
- Product standards do not take into account special features of recycled material and therefore do not support recycling (e.g. no suitable standard for concrete recycling in new concrete is available).
- Consumers' and users' confidence in recycled products is still low.
- Environmental Product Declaration does not include recycling.
- Higher costs related to demolition/dismantling, sorting and treatment. Costs for quality control, assurance and auditing prior to demolition.
- The role of public procurement in promoting recycling remains quite low.
- Big data on site, qualities and quantities of construction materials are missing. Product data management and traceability are therefore non-existing.

## **Main drivers to sustainable CDW management**

It is clear, based on 20 years' experience of the regulation on reclaimed concrete recycling that successful recycling requires both professionalism throughout the entire recycling operations from the selective demolition to the quality check of the end-products and an adaptive regulation with clear requirements.

The following recommendations are given:

- Material-specific targets for recycling would promote sustainable recycling of CDW.
- Establishment of procedures within public procurement on how to take into account recycling and how to promote it.
- Branding and improving the market image of CDW-derived products. Public support for demonstrations and R&D.
- Developing the CE marking of products containing recycled materials, especially CE-marking of re-usable construction products (e.g. timber beams, steel).

## 2. Definitions concerning Construction and Demolition Waste (CDW) and Management

In this section the definitions of waste used in Finland are presented.

### 2.1. Definition of waste

The definition of waste in Finland is given in the Waste Act (646/2011, Chapter 1, Section 5) and is identical to the definition of the Waste Framework Directive 2008/98/EC.

### 2.2. Definition of Construction and Demolition Waste (CDW)

The definition of CDW in Finland is given in the Government Decree on Waste (179/2012) Chapter 1, Section 1 as follows: 'Construction and demolition waste' means waste from new construction and repairs and demolition of buildings or other fixed structures, civil engineering work or other corresponding construction.

There is not a clear distinction between construction and demolition wastes.

The Commission Decision on the list of waste (2014/955/EU) is implemented in the Government Decree on Waste as it is.

CDW is defined according to the LoW 17xxxx entries. Defined according to the economic activity, it contains both CDW and other waste from the economic activity NACE F, construction. In this case, the definition contains all waste from this NACE, i.e. also municipal solid waste from construction and building works operated by companies belonging to this economic activity.<sup>2</sup>

The Waste Act (646/2011) Section 121 § requires a shipping document for CDW. The shipping document is not required for packaging waste nor for municipal-like waste from construction activities. WEEE (Waste Electrical and Electronic Equipment) is not considered as CDW.

Generally, naturally occurring materials excavated in the course of construction activities that do not have a utilization plan are included in the total amount of CDW in the waste statistics. However, all excess soil cannot be defined as waste if there is a plan for its use; this applies to non-contaminated excess soil. For assessing the waste characteristics of soils excavated during construction activities, general considerations of the Waste Act are applied. If the excavated soil contains considerable amounts of other waste such as CDW (concrete, asphalt, bricks, insulation materials, plastics, stumps, etc.) or ashes and the soils cannot be separated from other waste, the whole batch of waste is to be classified as mixed CDW (waste category 17 09 04). The definition of 'considerable amount' depends on the characteristics and quantity of other waste. The treatability must be assessed case-by-case.<sup>3</sup>

Uncontaminated soils and other natural materials excavated during construction which are surely and relatively immediately recovered in construction, as such or as pre-treated (screening or similar), on the construction site or elsewhere, are generally not waste and fall under the product regulations. To be classified as non-waste, the material has to be subjected to multi-step assessment. The main requirements of the assessment are summarized below:<sup>4</sup>

- Soils have to be uncontaminated
- Use has to be certain (only short-term storage is allowed, generally < 1 year)
- Use has to be systematic (utilization plan required, including: need, technical prerequisites, estimated amounts and duration of operation)

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<sup>2</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

<sup>3</sup> -Ministry of the Environment 2014b. Interpretation guidelines for certain provisions of the Waste Act. Memorandum 19th December 2014.

<sup>4</sup> Ministry of the Environment 2014a. Utilization of soils – a guide for classification of soils as waste and assessing the compliance for utilization

- Soils must be used as such without modifications (mere sorting, screening, mixing or crushing is not considered modification; also improving technical properties by, e.g. stabilization is allowed)

### 2.3. End-of-Waste (EoW) status

There are no national EoW criteria set for any types of waste so far and at the moment there is no preparatory work ongoing.

### 2.4. Definitions of waste treatment operations

The Waste Act (646/2011, Chapter 1, Section 6) gives the following definitions for re-use, recycling and recovery in Finland:

- Re-use means re-using the product, or a component thereof, for the purpose for which it was originally conceived.
- Preparing for re-use means checking, cleaning or repairing recovery operations, by which products or components of products are prepared so that they can be re-used without further pre-processing.
- Recycling of waste means operations by which waste is reprocessed into a product, material or substance, either for the original or some other purpose; recycling of waste does not include recovery of waste as energy or the reprocessing of waste into fuel or material to be used for backfilling.
- Recovery of waste means any operation whose principal result is waste serving a useful purpose in a production facility or elsewhere in the economy, so that it replaces other materials or objects which would otherwise have been used to fulfil a particular function, including waste being prepared to fulfil that function.

The categorization of recovery operations (R1 to R14) in Finland is given in Annex I of the Waste Act (646/2011), and this is identical to the categorization of Annex II of the WFD.

Official waste statistics are prepared by Statistics Finland (StatFin) according to the WStat regulation; definitions of this regulation are followed. When environmental authorities use data from StatFin for reporting under the Directorate-General for the Environment (DG Env) requirements, definitions according to WFD are used.<sup>5</sup>

There is no legislative definition for backfilling in Finland, nor any official classification code for backfilling. The environmental register data utilized in preparing waste statistics do not separate backfilling from other material recovery operations. For the time being, waste statistics are compiled according to the R and D codes defined in WFD and the slightly more detailed national subclasses of the R and D codes. Unofficial discussions have been arranged between statistical and environmental authorities in order to have a separate treatment class called backfilling to be added to the environmental authorities' register data, where they have annual data from waste generating and treating facilities. This has not yet been done. However, the need for including such a data category in the reporting forms of the annual waste treatment data collection has been informed by the statistical authorities to the administrative register data keepers.<sup>6</sup>

## 3. Legal Framework – Waste Management Plans and Strategies

In this section the legal framework governing CDW management in Finland is presented.

### 3.1. Legislation concerning CDW in Finland

The legislative framework concerning CDW in Finland is established in the following acts and decrees:

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<sup>5</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

<sup>6</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

- Waste Act 646/2011,
- Government Decree on Waste 179/2012,
- Land use and building Act 132/1999,
- Land use and building Decree 895/1999,
- Environmental protection Act 527/2014,
- Environmental protection Decree 713/2014,
- Government Decree concerning the recovery of certain wastes in earth construction 591/2006

The Land Use and Building Decree 895/1999 (section 55) gives general guidelines on the ecological considerations in building as follows: “When a building is designed, the environmental load caused by building materials and supplies during the building’s life cycle shall be investigated as required. Special attention shall be paid to the reparability and replaceability of building elements and technical systems. Permit applications and notifications concerning the construction or demolition of a building or part of a building shall include an account of the amount and type of construction waste and how it will be sorted, unless the amount of waste is minor. Applications and notifications shall report separately any construction and demolition waste that is harmful to health or the environment, and how it will be disposed of. The planned service life of a building and of construction elements shall be taken into account in the use and maintenance instructions drawn up for the building.”

During construction projects, the premises and structures required for the waste management of a property must be provided already in the construction phase. Waste management must be organized so that no harm is caused to health or the environment (132/1999, Section 157)

The Land Use and Building Act 132/1999 (section 127) gives guidelines on the occasions when a permit is required to demolish a building or part thereof. Section 139 explains how the waste management is to be dealt with in the demolition permit application: “The permit application must explain how the demolition work will be organized and the capacity to handle resulting building waste and to reuse any usable building components.” Furthermore, Section 154 of the same act states that “The demolition of a building or part thereof must be organized so as to make it possible to recycle usable parts of the building and process any building waste.”

The Government Decree on Waste (179/2012, Section 15) gives further requirements on reducing the amount and harmfulness of CDW: “A party engaged in a building project must ensure that the project is planned and implemented so that (...) all usable items and substances are reclaimed and re-used and that the activity generates as little CDW as possible, and that this waste is as harmless as possible.” Section 16 of the same decree defines the CDW fractions for which (minimum requirement) separate collection and recovery have to be organized:

- 1) concrete, brick, mineral tile and ceramic waste;
- 2) gypsum-based waste;
- 3) non-impregnated wood waste;
- 4) metal waste;
- 5) glass waste;
- 6) plastic waste;
- 7) paper and cardboard waste;
- 8) soil and waste rock material.

The waste holder must ensure that asbestos waste is collected and transported, separately from other waste, for treatment without delay. Tightly closed durable packaging must be used for the storage and transport of asbestos waste, and package labelling must indicate that the packages contain asbestos. To prevent breakage, the containers must be handled cautiously and carefully. (Government Decree on Waste, 179/2012, Section 19)

Producer responsibility for packaging wastes is defined in Chapter 6 of the Waste Act. Provisions on keeping hazardous waste separate and a ban on the mixing of hazardous waste are laid down in Section 17 of the Waste Act.

For the utilization of CDW, the Environmental Protection Act 527/2014 gives general requirements of environmental protection and it applies also to waste treatment activities. The Environmental Protection Decree 713/2014 defines professional or facility-based treatment of wastes as one of the operations where an environmental permit from the municipal environmental authority is required.

The Government Decree (591/2006) concerning the recovery of certain wastes in earth construction promotes the use of certain waste types. The decree defines certain recovery activities that do not require



an environmental permit, provided that the waste fulfils the requirements given in the decree and notification is given to a regional environment centre. For CDW, the decree is relevant for crushed concrete. The earth construction projects in the scope of the decree include, e.g. public roads, pavements, parking areas, sports grounds, tracks in parks and recreational areas, railway yards and industrial storage areas. The decree does not apply to operations in areas of important aquifers. Currently the decree is being revised and the aim is to extend the application area to include new materials, to check notification procedure and to tighten the quality control requirements. In addition, there is a new decree in preparation aiming at improved recovery of soils from construction.

Additional details are given in the Government Decree on Waste (amendment 332/2013) where limit values are defined for organic content of municipal and CDW (and wastes from the processing of the abovementioned) used in backfilling operations. The maximum allowed share of biodegradable and other organic matter measured as TOC (total organic carbon) or as LOI (loss of ignition) is 10%. This limit value does not apply to soil and stones.

The Government Decree on landfills (331/2013) gives limit values for the organic content of waste disposed on landfills (maximum TOC or LOI content 10%). For CDW this limit will be fully implemented on 1<sup>st</sup> January, 2020. Up to this date, the organic content of CDW as TOC or LOI must not exceed 15%. This limit is not applied to contaminated soils or dredging spoils or asbestos waste if they are disposed of separately. CDW containing asbestos can be disposed of on regular landfills if the specific regulations given in Section 31 of the decree are followed.

Asphalt crush processed from waste asphalt is usually waste according to the Waste Act (waste code 17 03 02). However, according to the interpretation guidelines for the Waste Act prepared by the Ministry of the Environment, asphalt immediately reused as such in a new asphalt layer on-site is not waste.<sup>7</sup> A recently approved regulation (Ordinance 846/2012) simplifies the permit system for recovered old asphalt granulates to be used directly in the production of new asphalt. It implies that if the recovered asphalt granulate is free from metals, oil, tar and other contamination, it can be re-used after registration and no permit is required.

According to waste legislation (Waste Act 646/2011, Government Decree on Waste 179/2012), hazardous waste must be separately collected and managed. The sorting obligation applies to all wastes classified as hazardous. As part of waste management, waste of different types and quality shall be collected and kept separate to the extent necessary to prevent hazard or harm being posed to human health or the environment. In addition, there is ban on the mixing of hazardous waste. Hazardous waste shall not be diluted, or in other ways mixed with waste different in type or quality, or with other substances. This ban on mixing can be derogated from if mixing is necessary to facilitate the treatment of waste, and the activity has been granted an environmental permit under the Environmental Protection Act. Waste must be separated if hazardous waste has been mixed contrary to the ban and if separation is necessary in order to prevent a hazard or harm to human health or the environment, and if such separation is technically feasible without undue cost.<sup>8</sup>

The requirement on shipping documentation applies to the transportation of hazardous wastes and CDW as well. The waste holder shall draw up a shipping document on hazardous waste, sludge in cesspools and septic tanks, sludge in sand and grease interceptors, contaminated soil and construction and demolition waste other than uncontaminated soil that is shipped and delivered to a consignee. The shipping document shall contain the information necessary for monitoring and supervision, on the type, quality, quantity, origin, delivery site and date, and waste carrier. The waste holder shall ensure that the shipping document accompanies the waste during shipment, and that it is submitted to the waste consignee after shipment. The consignee shall confirm the receipt of the waste by signing the shipping document or by other reliable means.<sup>9</sup>

The current landfill tax in Finland is EUR 55 /t (as of 1<sup>st</sup> January) (Waste Tax Act 1126/2010). The CDW fractions covered by the tax are 17 01 (concrete, bricks, tiles and ceramics), 17 02 (wood, glass and plastics), 17 03 (bituminous mixtures, coal tar and tarred products) 17 04 (metals and their alloys), 17 09 (other construction and demolition wastes) as well as soils excavated from contaminated areas.

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<sup>7</sup> Ministry of the Environment 2014b. Interpretation guidelines for certain provisions of the Waste Act. Memorandum 19th December 2014.

<sup>8</sup> Email contact with Hanna Salmenperä, Finnish Environment Institute (SYKE), April 2015

<sup>9</sup> Email contact with Hanna Salmenperä, Finnish Environment Institute (SYKE), April 2015

For mixed construction and demolition waste, typical gate fees for landfills range from EUR 100 to 170 /t. For sorted waste, such as wood, glass or concrete waste the fees are lower, e.g. EUR 20 to 90 /t.

### **3.2. Waste Management Plans (WMP) and strategies**

There is a national waste management plan in place until 2016 in Finland<sup>10</sup>. There is no sectoral division in the plan, but the recycling targets related to CDW are mainly described in target 2.1: Increasing the demand for recycled materials and target 2.2: Increasing recycling of industrial and construction wastes. An update to the waste management plan is currently being prepared. The work will be carried out mainly during 2015 and early 2016, and the new WMP is expected to be ready by the end of 2016.

The national waste prevention plan is incorporated in the national WMP. Some specific targets are given for CDW, especially within target 1.3: Prolonging the service life of building stock.

In 2012, the Ministry of the Environment appointed a working group to highlight the perspective of material efficiency in the field of real estate and construction and to create the framework for the realization of the objectives outlined in the EU Waste Framework Directive. The working group included representatives from the authorities, research institutes and industrial associations. The working group's efforts focused on measures related to the efficient use of construction material, reducing the amount of waste generated and promoting recycling. The working group finished its work in autumn 2013 when the final report was submitted to the Ministry of the Environment.<sup>11</sup> The working group suggested the following measures for improving the material efficiency of construction:

- The life cycle flexibility and material efficiency of new construction should be improved;
- Systematic property maintenance, economical renovation and the recycling of construction waste in renovation should be promoted;
- The material efficiency expertise of the real estate and construction sector should be improved;
- Waste management guidance, reporting and statistics on construction projects should be developed;
- The regional availability of construction waste management and utilization services should be ensured;
- The prerequisites for the reuse and recycling of construction materials, especially wood, should be improved;
- Technology related to the sorting and recycling of construction materials and waste should be promoted.

The target year for the realization of the programme is 2020 and realization will be monitored annually.

Since the adoption of the programme, the Ministry of the Environment has launched several projects to improve the material efficiency in the construction sector (e.g. projects to improve recycling of wood waste, update information on CDW management at building sites and also on the Internet web site).

### **3.3. Legal framework for sustainable management of CDW**

This section aims at identifying specific legislation that would create good conditions for a sustainable management of CDW.

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<sup>10</sup> National waste plan until 2016. Towards a recycling society. September 2008.

<sup>11</sup> Ministry of the Environment 2014c. Action plan for the promotion of material efficiency in construction. Final report of the Ramate working group.

Table 2 Legal framework

Description	Level of occurrence (Yes/No) Key Scope/Exemptions	Year established and policy reference	Further details, information source, related web-site
<p><i>National/regional obligation for selective demolition?</i></p>	<p>Yes, supported by</p> <ul style="list-style-type: none"> <li>- Land Use and Building Act 132/1999 ,</li> <li>- Land Use and Building Decree 895/1999</li> <li>- Waste Decree 179/2012</li> </ul> <p>Land Use and Building Act 132/1999, Section 154: “The demolition of a building or part thereof must be organized so as to make it possible to recycle usable parts of the building and process any building waste.”</p> <p>Land Use and Building Decree 895/1999 Section 55 on ecological considerations in building : When the requirements set for a building are applied, the finished building’s environmental impact shall be taken into account to ensure that its ecological properties will be sustainable when it is used for its intended purpose. When a building is designed, the environmental load caused by building materials and supplies during the building’s life cycle shall be investigated as required. Special attention shall be paid to the reparability and replaceability of building elements and technical systems.</p> <p>Permit applications and notifications concerning the construction or demolition of a building or part of a building shall include an account of the amount and type of construction waste and how it will be sorted, unless the amount of waste is minor. Applications and notifications shall report separately any construction and demolition waste that is harmful to health or the environment, and how it will be disposed of.</p> <p>The planned service life of a building and of construction elements shall be taken into account in the use and maintenance instructions drawn up for the building.</p> <p>Waste Decree 179/2012, Section 15: “A party engaged in a building project must ensure that the project is planned and implemented so that (...) all usable items and substances are reclaimed and re-used and that the activity generates as little CDW as possible, and that this waste is as harmless as possible.” Section 16 of the same decree defines the CDW fractions for which (minimum requirement) separate collection and recovery has to be organized</p>	<p>1999</p>	<ul style="list-style-type: none"> <li>• <a href="http://www.ym.fi/en-US/Land_use_and_building/Legislation_and_instructions/The_Land_Use_and_Building_Act">http://www.ym.fi/en-US/Land_use_and_building/Legislation_and_instructions/The_Land_Use_and_Building_Act</a></li> <li>• Land Use and Building Act (132/1999, Finlex)</li> <li>• Land Use and Building Decree (895/1999, Finlex)</li> </ul>

Description	Level of occurrence (Yes/No) Key Scope/Exemptions	Year established and policy reference	Further details, information source, related web-site
<i>National/regional sorting obligation (on-site or in sorting facility)?</i>	Land Use and Building Decree 895/1999 (Section 55) Permit applications and notifications concerning the construction or demolition of a building or part of a building shall include an account of the amount and type of construction waste and how it will be sorted, unless the amount of waste is minor. Applications and notifications shall report separately any construction and demolition waste that is harmful to health or the environment, and how it will be disposed of. In waste legislation, there is no lower limit for the CDW to be sorted, thus all waste is to be sorted according to 179/2012	1999, 2012	See above
<i>National/regional separate collection obligation for different materials (iron and steel, plastic, glass, etc.)?</i>	Yes, Government Decree on Waste (179/2012)	2012	See above
<i>Landfill tax</i>	Landfill taxes have demonstrated to be an efficient instrument to divert waste from landfill and to increase recycling rates	1996	Reforming landfill taxation, Ministry of Finance publications 18/2009 <sup>12</sup>
<i>Obligation for separate collection and management of hazardous waste from construction and demolition operations?</i>	According to waste legislation (Waste Act 646/2011, Government Decree on Waste 179/2012), hazardous waste must be separately collected and managed. The sorting obligation applies to all wastes classified as hazardous (e.g. asbestos, PCB; also solvents, paints, oils).	2011, 2012	
<i>Related green public procurement requirements</i>	Finland has established a National Action Plan for Green Public Procurement (GPP) guidance and criteria for 14 procurement areas have been developed, many of which are directly relevant for buildings.	2013: Government decision-in-principle on the promotion of sustainable Environmental and energy solutions (Cleantech solutions) in	Ministry of Employment and the Economy 2013 <a href="http://www.tem.fi/files/37754/GOVERNMENT_DECISION-IN-PRINCIPLE_ON_THE_PROMOTION_OF_SUSTAINABLE_ENVIRONMENTAL_AND_ENERGY_SOLUTIONS_(CLEANTECH_SOLUTIONS)_IN_PUBLIC_PR">http://www.tem.fi/files/37754/GOVERNMENT_DECISION-IN-PRINCIPLE_ON_THE_PROMOTION_OF_SUSTAINABLE_ENVIRONMENTAL_AND_ENERGY_SOLUTIONS_(CLEANTECH_SOLUTIONS)_IN_PUBLIC_PR</a>

<sup>12</sup>

[http://www.2014.vm.fi/vm/fi/04\\_julkaisut\\_ja\\_asiakirjat/01\\_julkaisut/075\\_verotus/20090410.Jaeteve/Jaeteveromuistio\\_taitto\\_%2B\\_kan\\_net.pdf](http://www.2014.vm.fi/vm/fi/04_julkaisut_ja_asiakirjat/01_julkaisut/075_verotus/20090410.Jaeteve/Jaeteveromuistio_taitto_%2B_kan_net.pdf)

Description	Level of occurrence (Yes/No) Key Scope/Exemptions	Year established and policy reference	Further details, information source, related web-site
		public Procurement	<a href="#">OCUREMENT.pdf</a>  Motiva 2015. <a href="http://www.motivanhankintapalvelu.fi/tietopankki">http://www.motivanhankintapalvelu.fi/tietopankki</a>

### 3.4. Targets

The Government Decree on Waste (179/2012) sets the recycling target of 70% for CDW by 2020, identical to WFD. There are no national/regional targets concerning recycling of selected materials from CDW.

In the Nordic ENCORT report<sup>13</sup> financed by the Nordic Council of Ministers, the following recommendations are given regarding the EU recovery target:

- Transform the general weight-based target into waste-specific targets. This would favour recycling of CDW in general and not only for high weight materials.
- Rank the recovery operations in the calculation method for reporting progress. Backfilling should not be regarded as equal to other operations for recovery.

## 4. Non-legislative Instruments

In this section, other instruments addressing the question of CDW management in Finland are highlighted.

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<sup>13</sup> Arm et al. 2014. ENCORT-CDW – Evaluation of the European recovery target for construction and demolition waste.

**Table 3 Non legislative instruments**

Description	Level of occurrence (Yes/No) Key Scope/Exemptions	Year established and policy reference	Further details, information source, related web-site
<p><i>Sustainability standards that cover CDW (e.g. BREEAM)</i></p>	<p>The most used sustainability assessment schemes include PromisE (developed in Finland), BREEAM and LEED. In addition to these comprehensive schemes, there are assessment tools focusing on certain areas of building such as indoor air classification and condition certificate for housing associations.</p> <p>By the end of 2013 there were 14 BREEAM certified construction projects and 5 pre-certified construction projects in Finland. LEED certificate has been granted to 46 projects.</p>	<ul style="list-style-type: none"> <li>- BREEAM : 1990</li> <li>- LEED : 1998</li> </ul>	
<p><i>Extended producer responsibility scheme in operation?</i></p>	<p>No</p>		

Table 4 Key CDW management requirements and standards

Description	Occurrence (Yes/No) Mandatory (Yes/No) Scope & exemptions	Year established	National or regional (specify if regional)	Details of Public sector and Industry enforcement/ involvement/ collaboration	Levels of performance e.g. tonnes recycled,% coverage	Further information/ web-site
Requirement for pre-demolition audits	Yes For certain categories of buildings a diagnosis related to CDW is mandatory before any demolition work.		National		Unknown	- Guide RT 20-11159 "Identification of hazardous substances. Guide for customer" (2014) <a href="https://www.rakennustieto.fi/kortistot/rt/kortit/11159">https://www.rakennustieto.fi/kortistot/rt/kortit/11159</a>  -Guide RT 20-11160 "Identification of hazardous substances. Construction products and constructions" (2014) <a href="https://www.rakennustietokauppa.fi/haitta-ainetutkimus.-rakennustuotteet-ja-rakenteet/108799/dp">https://www.rakennustietokauppa.fi/haitta-ainetutkimus.-rakennustuotteet-ja-rakenteet/108799/dp</a>
Standards for recycled CDW	SFS-EN 15359. Solid recovered fuels. Specifications and classes	2012	European			
Selective demolition/ plan for large demolition sites/demolition standard	Land Use and Building Act 132/1999, Section 154 Waste Decree 179/2012, Section 15	1999	National			<a href="http://www.ym.fi/en-US/The_environment/Legislation_and_instructions/Waste_legislation">http://www.ym.fi/en-US/The_environment/Legislation_and_instructions/Waste_legislation</a> ( <a href="http://www.ym.fi/fi/Ymparisto/Lainsaadanto_ ja_ohjeet/Jatelaainsaadanto">http://www.ym.fi/fi/Ymparisto/Lainsaadanto_ ja_ohjeet/Jatelaainsaadanto</a> )  <a href="http://www.ym.fi/en-US/Land_use_and_building/Legislation_and_instructions/The_Land_Use_and_Building_Act">http://www.ym.fi/en-US/Land_use_and_building/Legislation_and_instructions/The_Land_Use_and_Building_Act</a> • Land Use and Building Act (132/1999, Finlex) • Land Use and Building Decree (895/1999, Finlex)

Description	Occurrence (Yes/No) Mandatory (Yes/No) Scope & exemptions	Year established	National or regional (specify if regional)	Details of Public sector and Industry enforcement/ involvement/ collaboration	Levels of performance e.g. tonnes recycled,% coverage	Further information/ web-site
UUMA-programme	Assessment of acceptability of waste materials in earth construction (UUMA-materials) and turning waste materials into products (legal framework)	2011	National	Public sector	Unknown	<a href="http://www.ym.fi/fi-FI/Ajankohtaista/Julkaisut/Raportteja_RA/YMra112011_Maarakentamisen_uusiomateriaa%284371%29">http://www.ym.fi/fi-FI/Ajankohtaista/Julkaisut/Raportteja_RA/YMra112011_Maarakentamisen_uusiomateriaa%284371%29</a>

**Table 5 Key CDW management guidance and tools**

Description of guidance/ tool	Scope	Year established/ produced	National or regional (specify if regional)	Public sector and/or Industry lead organization	Levels of use (high/ medium/low) or specify	Further information/ web-site
RT files	Construction waste: RT 69-11183 "Waste management during construction" (2015)  Asbestos, asbestos mapping and related measures: RT 08-10521 (1993)	2015  1993	National	The Building Information Foundation RTS is a private, non-profit-making foundation whose task is to foster both good planning and building methods and good property management practices. The Foundation and its activities are directed by a Board and an Assembly that represents the entire building and construction industry through 52 associations and organizations.	Unknown	The RT file of CDW published by the Building Information Foundation RTS



Description of guidance/ tool	Scope	Year established/ produced	National or regional (specify if regional)	Public sector and/or Industry lead organization	Levels of use (high/ medium/low) or specify	Further information/ web-site
The Ratu (Building Productivity) Files	<p>General guidelines on demolition procedures : Ratu 82-0379 (2011)</p> <p>Ratu S-1225 "Dust prevention in construction works" (2009)</p> <p>Guidelines on the demolition of constructions containing hazardous waste :  1. Ratu 82-0347 (asbestos, 2009)  2. Ratu 82-0381 (coal tar, 2011)  3. Ratu 82-0382 (PCB, 2011)</p> <p>Construction waste plan: RatuTT 13-00120 (2000)</p>	<p>2011</p> <p>2009, 2011</p> <p>2000</p>	National	As above	Unknown	See above
Guidance on life cycle management of constructions and buildings - RIL - Finnish Association of Civil Engineers	Covers sustainability aspects, process, tools and methods, demolition, reuse and recycling	2013	National		Unknown	<p>Web-page of RIL - Finnish Association of Civil Engineers</p> <p><a href="http://www.ril.fi/en/main-page.html">http://www.ril.fi/en/main-page.html</a></p>
Web-pages established by municipalities (Helsinki metropolitan area, Tampere, Turku, Lohja etc.)	Information for households about waste sorting and management		National		Unknown	<p>Web-pages for households created by several municipalities. For example, the Helsinki Region Environmental Services gives information on sorting and CDW management:</p> <p><a href="https://www.hsy.fi/fi/asukkaalle/lajittelujakierattys/lajitteluohteet/rakennusjate/Sivut/default.aspx">https://www.hsy.fi/fi/asukkaalle/lajittelujakierattys/lajitteluohteet/rakennusjate/Sivut/default.aspx</a></p>

Description of guidance/ tool	Scope	Year established/ produced	National or regional (specify if regional)	Public sector and/or Industry lead organization	Levels of use (high/ medium/low) or specify	Further information/ web-site
Web-page containing information on waste management facilities	Information on CDW management is included		National			<a href="http://www.kierratys.info/">http://www.kierratys.info/</a>
Web guide; good practice in recycling of household construction & demolition waste from refurbishment	Information of construction materials/products suitable for recycling or reuse (target group: households)	2015	National	Public lead (Finnish ministry of the Environment)	Unknown	To be published in Autumn 2015

**Table 6 Technical guidelines/standards/ Codes of Practice for use of CDW in construction application**

Description of guidance/ tool	Scope	Year established/ produced	National or regional (specify if regional)	Public sector and/or Industry lead organization	Levels of use (high/ medium/low) or specify	Further information/ web-site
UUMA2 programme	Demonstrations on productization of wastes for use in earth constructions	2013-	National	Both	Unknown	Web-page of UUMA2 for promotion of the use of recovered materials in groundworks (through projects, development of planning and acquisitions  <a href="http://www.uusiomaarake.ntaminen.fi/">http://www.uusiomaarake.ntaminen.fi/</a>
Building Performance Indicators	A calculation tool for measuring the environmental and energy efficiency of buildings, their life-cycle costs, and also occupant well-being. The results can easily be presented in the Building Passport, either for the pre-design or occupancy phase.	2010	National	Consortium of several stakeholders, project coordinated by Green Building Council Finland.	Unknown	web-page of Green Building Council Finland informing about the calculation guides for the Building Performance Indicators  <a href="http://figbc.fi/en/building-performance-indicators/">http://figbc.fi/en/building-performance-indicators/</a>
Report on use in earth construction financed by Finnish Transport Agency	Procedures /tools for technical and environmental assessment of waste in earth constructions	2014	National	Public	Unknown	Valkeisenmäki, A., Nousiainen, A., Leskelä E., Mäkelä E., Wahlström M., Laine-Ylijoki, J. and Mroueh, M. 2014. Finnish Transport Agency, Guidelines for waste materials in earth construction (UUMA-materials).

Description of guidance/ tool	Scope	Year established/ produced	National or regional (specify if regional)	Public sector and/or Industry lead organization	Levels of use (high/ medium/low) or specify	Further information/ web-site
Promoting of wood recycling	Development of new recycling concepts and new products from wood waste	2015	National	Finnish Ministry of the Environment and industry	Unknown	Seminar arranged by the Finnish Ministry of the Environment :  <a href="http://www.ym.fi/fi-FI/Ajankohtaista/Tapahtuma_Puujatteet_kierratyks_een_semin%2833145%29">http://www.ym.fi/fi-FI/Ajankohtaista/Tapahtuma_Puujatteet_kierratyks_een_semin%2833145%29</a>
Guide on utilization of crushed concrete in Helsinki region (issued by cities of Helsinki, Espoo and Vantaa)	Design, building and maintenance of infra structures utilizing crushed concrete; construction product industry, contractors. Comprehensive guidance for design, building and maintenance of infra structures utilizing crushed concrete instead of virgin raw materials.	2015	Cities of Helsinki, Espoo and Vantaa	Public sector		Guidance entitled "Ohje betonimurskeen hyödyntäminen infrarakentamisessa pääkaupunkiseudulla"  <a href="http://www.hel.fi/static/hkr/julkaisut/ohjeet/betonimurske.pdf">http://www.hel.fi/static/hkr/julkaisut/ohjeet/betonimurske.pdf</a>

**Table 7 Other CDW initiatives**

Description of initiative	Scope	Year established	National, regional, local (specify which local area/region)	Public sector and/or Industry lead organization	Levels of performance e.g. tonnes recycled	Further information/ web-site
TemaNord 2013:533. Proposals for targets and indicators for waste prevention in four waste streams	Providing first proposals for targets and indicators that can be used in the Nordic countries' waste prevention programmes	2013	Nordic	Nordic Council of ministers	Unknown	Report published by the Nordic Council of Ministers  Report link : <a href="http://dx.doi.org/10.6027/TN2013-533">http://dx.doi.org/10.6027/TN2013-533</a>

Description of initiative	Scope	Year established	National, regional, local (specify which local area/region)	Public sector and/or Industry lead organization	Levels of performance e.g. tonnes recycled	Further information/ web-site
Ramate programme	Efficient utilization of construction material, reducing the amount of waste generated and promoting recycling.	2013	National	Finnish Ministry of the Environment	Unknown	Report entitled: "Rakentamisen materiaalitehokkuuden edistämisohjelma", Ympäristöministeriön raportteja 17/2014  <a href="http://www.ym.fi/fi-FI/Ymparisto/Rakennusjatteesta_arvokkaaksi_resurssiksi%2829942%29">http://www.ym.fi/fi-FI/Ymparisto/Rakennusjatteesta_arvokkaaksi_resurssiksi%2829942%29</a>
Green Building Council Finland	Brings together knowledge and expertise in sustainable development and also represents its members in the field both domestically and internationally.  Promotes new and innovative solutions and offers impartial information and studies  Provides its members with training in sustainability, information services, and development.  Brings a national perspective on how to adapt international environmental certifications, such as LEED and BREEAM, to Finnish real estate.	2010	The association is Finland's connection to the international Green Building Council network.	Non-profit, non-governmental organization. Professional real estate owners, developers, occupants, providers of facilities and user services, planners, designers, contractors, and commercial and industrial enterprises can apply for membership in Green Building Council Finland.	Unknown	web-page by Green Building Council Finland  <a href="http://figbc.fi/en/gbc-finland/">http://figbc.fi/en/gbc-finland/</a>

## 5. CDW Management Performance – CDW Data

In this section, the performance of CDW management in Finland is explored. This section particularly seeks to gather all available data and information about CDW generation and treatment, exports/imports, and treatment facilities in Finland.

### **Summary - CDW generation and recovery official statistics**

**Table 8 Summary of CDW generation and recovery based on official statistics.**

Year	2008	2009	2010	2011	2012	2013
Generated CDW (tonnes)	24 979 000	18 779 000	24 636 000	18 425 000	16 027 000	n/a
Recycled CDW (tonnes)	n/a	n/a	n/a	n/a	n/a	n/a
Backfilled CDW (tonnes)	n/a	n/a	n/a	n/a	n/a	n/a
Landfilled CDW (tonnes)	n/a	n/a	n/a	n/a	n/a	n/a
Energy recovery (tonnes)	n/a	n/a	n/a	n/a	n/a	n/a

The above table was compiled using:

- Figures of 2012 survey on waste production and treatment in Finland<sup>14</sup> published in May 2014 conducted by Statistics Finland
- Figures of 2011 survey on waste production and treatment in Finland<sup>15</sup> published in May 2013 conducted by Statistics Finland
- Figures of 2010 survey on waste production and treatment in Finland<sup>16</sup> published in May 2012 conducted by Statistics Finland
- Figures of 2009 survey on waste production and treatment in Finland<sup>17</sup> published in May 2011 conducted by Statistics Finland
- Figures of 2008 survey on waste production and treatment in Finland<sup>18</sup> published in May 2010 conducted by Statistics Finland

CDW specific figures before 2011 are determined and estimated from administrative data from the register of buildings and dwellings and from material flow accounts. Figures for 2011 onwards are based on the administrative register VAHTI. The figures for 2013 were published in May-June of 2015.

These figures correspond to the ones sent to Eurostat.

These figures include hazardous CDW and naturally occurring materials.

Official published statistics figures on waste treatment do not segregate the economic activity where the waste is produced. Thus, it has not been possible to isolate recovery data for CDW recovery data.

<sup>14</sup>[http://www.stat.fi/til/jate/2012/jate\\_2012\\_2014-05-15\\_tau\\_002\\_fi.html](http://www.stat.fi/til/jate/2012/jate_2012_2014-05-15_tau_002_fi.html)

<sup>15</sup>[http://www.stat.fi/til/jate/2011/jate\\_2011\\_2013-05-17\\_tau\\_002\\_fi.html](http://www.stat.fi/til/jate/2011/jate_2011_2013-05-17_tau_002_fi.html)

<sup>16</sup>[http://www.stat.fi/til/jate/2010/jate\\_2010\\_2012-05-16\\_tau\\_002\\_fi.html](http://www.stat.fi/til/jate/2010/jate_2010_2012-05-16_tau_002_fi.html)

<sup>17</sup>[http://www.stat.fi/til/jate/2009/jate\\_2009\\_2011-05-20\\_tau\\_002\\_fi.html](http://www.stat.fi/til/jate/2009/jate_2009_2011-05-20_tau_002_fi.html)

<sup>18</sup>[http://www.stat.fi/til/jate/2008/jate\\_2008\\_2010-05-26\\_tau\\_002\\_fi.html](http://www.stat.fi/til/jate/2008/jate_2008_2010-05-26_tau_002_fi.html)

## 5.1. CDW generation data

Data on CDW generation is collected on a yearly basis. The methodology for data collection is similar for even and uneven years. Currently the most important data source is the administrative VAHTI register (Compliance Monitoring Data System). VAHTI is a tool for the 15 Centres for Economic Development, Transport and the Environment for processing and monitoring environmental permits. Environmental permits are needed for all activities that may lead to pollution. Such permits are required by law for, among others, waste treatment and disposal facilities. VAHTI collects data on waste amounts treated. For CDW generation, VAHTI data is complemented by mineral waste generation, which is estimated based on the usage of mineral materials in construction activities.<sup>19</sup>

In the following table, the generation of hazardous and non-hazardous CDW is presented based on the data published<sup>20</sup> by the Statistics Finland.

**Table 9 The generation of hazardous and non-hazardous CDW in Finland**

Year	2006	2007	2008	2009	2010	2011	2012
Generated hazardous CDW (tonnes)	409 100	402 600	303 000	289 000	14 000	334 000	150 000
Generated non-hazardous CDW (tonnes)	22 736 600	25 075 800	24 676 000	18 490 000	24 622 000	18 091 000	15 877 000
Total (tonnes)	23 145 700	25 478 400	24 979 000	18 779 000	24 636 000	18 425 000	16 027 000

CDW specific figures before 2011 are determined and estimated from administrative data from the register of buildings and dwellings and from material flow accounts. Figures for 2011 onwards are based on the administrative VAHTI register (Compliance Monitoring Data System), which is now the most important data source for both generated and treated waste.<sup>21</sup> It should be noted that the VAHTI register contains only data from treatment sites possessing an environmental permit.

The figures presented in Table 9 correspond to the ones sent to Eurostat.

As was described in Section 2.2.-, CDW is defined according to LoW 17xxxx entries. This relates to CDW as a waste type. Defined according to the economic activity, it contains both CDW and other waste from the economic activity NACE F, construction. In this case, the definition contains all waste from this NACE, i.e. also municipal solid waste from construction and building works operated by companies belonging to this economic activity.<sup>22</sup>

As for excavated soils, they are included in waste group 12.1 (Mineral waste from construction and demolition) only when no use is found due to the composition, location, or the stumps and other building waste it contains.<sup>23</sup>

CDW from households is included in municipal waste data where CDW is collected as mixed to LoW code 200301, mixed municipal waste or other municipal waste codes. LoW 17xxxx entries or any possible other separately collected CDW entries are not included in the municipal waste counts.<sup>24</sup> CDW generation data are not broken down to new build, refurbishment, demolition or DIY.<sup>25</sup>

### Data from other sources

In a recent master's thesis from Lappeenranta University of Technology, a rather extensive study on the composition and amount of CDW in Finland was carried out. The amounts of CDW in 2006-2012 have varied

<sup>19</sup> Interview and several email contacts with J. Espo & S. Vahvelainen, 2015

<sup>20</sup> <http://www.stat.fi/til/jate/tau.html>

<sup>21</sup> Interview and several email contacts with J. Espo & S. Vahvelainen, 2015

<sup>22</sup> Interview and several email contacts with J. Espo & S. Vahvelainen, 2015

<sup>23</sup> Interview and several email contacts with J. Espo & S. Vahvelainen, 2015

<sup>24</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

<sup>25</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

between 1.6 and 2.2 million tonnes according to different sources. In the following table,<sup>26</sup> has estimated the composition of generated waste from different types of construction activity.<sup>27</sup>

**Table 10 Materials distribution of different sources of CDW.**

Economic activity	New building			Refurbishment	
	Housing block	Office	Industry/warehouse	Housing block	Office
Concrete and bricks	14%	25%	26%	16%	21%
Wood	30%	28%	27%	3%	17%
Metals	1%	4%	3%	1%	5%
Stones and soils	1%	0%	0%	1%	0%
Energy fraction	1%	1%	1%	0%	0%
Mixed CDW	51%	40%	42%	79%	56%
Other	2%	1%	0%	0%	1%
Sum	10.4 kg/m <sup>3</sup>	9.0 kg/m <sup>3</sup>	2.6 kg/m <sup>3</sup>	23.7 kg/m <sup>3</sup>	10.0 kg/m <sup>3</sup>

## 5.2. CDW treatment data

Data on waste treatment are collected on a yearly basis. The methodology for data collection is similar for even and uneven years. The most important data source is the administrative VAHTI register (Compliance Monitoring Data System), which collects data on waste amounts treated.<sup>28</sup>

Official published figures on the treatment of waste do not distinguish the economic activity where the waste is produced. However, Statistics Finland released in 2013 a snap shot notice<sup>29</sup> on the treatment of wastes from housing construction in 2011. Overall 1.7 million tonnes of waste generated in housing construction were used or transported to pre-processing for utilization in 2011. The mineral waste used or treated for utilization amounted to 1.3 million tonnes and metal waste to 100 000 tonnes. Energy production used 250 000 tonnes of wood waste from construction. Around 250 000 tonnes of construction waste ended up at landfill sites. In 2011, the total amount of construction waste was 2.2 million tonnes. The figures do not include soil waste or dredging spoils generated in construction.

In terms of on-site recovery, it is mostly taken as internal recycling and not reported according to the WStatRegulation. Only on-site incineration is reported as disposal or energy recovery if existing.<sup>30</sup>

When the waste is received at a treatment facility, the origin of the waste is determined on a rough activity level. Wastes from construction activities are classified in their own category. As a result there is no problem in the traceability of CDW in Finland.<sup>31</sup>

There is no information on temporary storage, but this is not so significant because temporarily stored material is recorded as soon as it reaches a treatment facility.<sup>32</sup>

In most areas the following construction and demolition wastes are collected separately and treated: wood waste, metal, gypsum, mixed waste, brick and concrete, soil and gravel.<sup>33</sup>

## 5.3. CDW exports/imports data

Only small amounts of mixed construction and demolition waste are exported to Estonia for sorting and recycling. A very small amount of PCB-containing demolition waste is imported to Finland for disposal.<sup>34</sup>

<sup>26</sup> Peittilä, M. 2014. The Amount, Composition and Regional Division of Construction Waste – Present State and the Future. Master's Thesis

<sup>27</sup> Peittilä, M. 2014. The Amount, Composition and Regional Division of Construction Waste – Present State and the Future. Master's Thesis

<sup>28</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

<sup>29</sup> [http://www.stat.fi/til/jate/2011/jate\\_2011\\_2013-05-17\\_en.pdf](http://www.stat.fi/til/jate/2011/jate_2011_2013-05-17_en.pdf)

<sup>30</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

<sup>31</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

<sup>32</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

<sup>33</sup> Email contact with Hanna Salmenperä, Finnish Environment Institute (SYKE), April 2015

<sup>34</sup> Email contact with Hanna Salmenperä, Finnish Environment Institute (SYKE), April 2015



## 5.4. CDW treatment facilities data

Several different sized treatment facilities are geographically located rather extensively all over Finland. These facilities treat mixed CDW that contains i.a. concrete, plastics, bricks, wood and metals. The combined capacity of eight large-scale facilities based on their environmental permits is around 680 000 tonnes. In addition, these facilities also treat other types of wastes. Together with pre-treatment even larger quantities are possible to treat. In these cases, the waste is pre-treated (pre-sorting) with an excavator to separate materials that may be harmful for the actual processing before sending the waste to the treatment facility.<sup>35</sup> In addition to the mixed CDW treatment facilities, Finland has a number of other recycling facilities operated both by private companies and by some municipalities that can treat also source separated waste fractions such as mineral waste (e.g. over 100 000 tonnes). However, more detailed information of their capacity regarding source separated CDW has not been compiled in available reports.

Considering the amount of CDW generated, there is sufficient treatment capacity in place in Finland.<sup>36, 37</sup>

Specific inert CDW landfills are not reported. As for general inert landfills, 4 landfills with a capacity of 496 000 tonnes are operating in Finland. All inert landfills are compliant with EU legislation, although some landfills for hazardous and non-hazardous waste are not.<sup>38</sup>

**Table 11 Total landfill distribution in Finland. (Finnish Environment Institute, Directive reporting)**

	Landfill for hazardous waste	Landfill for non-hazardous waste	Landfill for inert waste
Total number of existing landfills	22	90	4
Number of these landfills complying with the directive	20	88	4
Number of landfills closed (no more depositing) between January 2010 and 31 December 2012	3	10	0
Number of landfills re-equipped		11	
Rest capacity (tonnes)	18 060 728	48 667 821	496 000

In some cases, the requirements have been reduced or adjusted. The requirements concerning the landfill base and sides have been reduced at 11 landfills for non-hazardous waste and one landfill for hazardous waste. The requirements concerning the leachate collection and surface sealing system have been reduced at 71 landfills (2 hazardous waste, 69 non-hazardous waste).<sup>39</sup>

The reasons for the reductions were based on the minor environmental effects of the landfills in question. In addition, the hydrogeological conditions and other environmental effects of the landfill areas have been considered, as well as the quality of the deposited waste. On one landfill area, the natural geological conditions were closely equal to the requirements of the Landfill Directive for the bottom structures. On several landfills alternative structures have been used: on the surface sealing the impermeable mineral layer has been replaced by a bentonite mat and the drainage layer has been replaced by a drainage mat.<sup>40</sup>

## 5.5. Future projections of CDW generation and treatment

No satisfactory information could be retrieved on future projections of CDW generation and treatment.

<sup>35</sup> Peittilä, M. 2014. The Amount, Composition and Regional Division of Construction Waste – Present State and the Future. Master's Thesis

<sup>36</sup> Interview with Pekka Vuorinen, Confederation of Finnish Construction Industries, April 2015

<sup>37</sup> Interview with Katja Lehtonen, Rudus Ltd, June 2015

<sup>38</sup> Email contact with Hanna Salmenperä, Finnish Environment Institute (SYKE), April 2015

<sup>39</sup> Email contact with Hanna Salmenperä, Finnish Environment Institute (SYKE), April 2015

<sup>40</sup> Email contact with Hanna Salmenperä, Finnish Environment Institute (SYKE), April 2015

## 5.6. Methodology for CDW statistics

The methodology used for gathering data on CDW generation and treatment follows Eurostat guidelines, when reporting is under WStat regulation requirements.<sup>41</sup>

## 6. CDW Management in Practice

In this section the CDW management “on the ground” in Finland is explored. The section indicates specific CDW obligations, initiatives, voluntary agreements and other management practices.

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<sup>41</sup> Interviews/contacts with J. Espo & S. Vahvelainen, 2015

## 6.1. CDW management initiatives

Table 12 Projects or specific initiatives showing how the legal and non-legal framework is applied

Description of initiative	Scope	Year established	National, regional, local (specify which local area/region)	Public sector and/or Industry lead organization	Levels of performance e.g. tonnes recycled	Further information/ web-site
ReUse-project financed by the Finnish Ministry of the Environment	Reuse of structural elements: obstacles and opportunities	2014	National	Finnish Ministry of the Environment		Final report entitled "Re-Use of structural elements – Environmentally efficient recovery of building components" (2014)  <a href="http://www.vtt.fi/sites/reuse/en">http://www.vtt.fi/sites/reuse/en</a>
<b>Raahe</b> : deconstruction of apartment block in Raahe city (project only partly fulfilled)	Lowering flooring in a block house from the 1960´s and reuse of panels in new construction	2010	National	Raahe		Described in Diploma thesis on reuse of construction elements/Satu Huuhka (in Finnish) <a href="http://www.tut.fi/ark/tiedostot/pdfs/D-huuhka.pdf">http://www.tut.fi/ark/tiedostot/pdfs/D-huuhka.pdf</a>
<b>Rudus/Betoroc</b>	Recycling of reclaimed concrete in earth construction.	1996	National	Industry lead organization	Significant proportion of concrete waste generated in Finland in selective demolition	Web-page by Rudus Ltd on recycling solutions for reclaimed concrete  <a href="http://www.rudus.fi/ratkaisut/kierratys">http://www.rudus.fi/ratkaisut/kierratys</a>
Rudus/Mixtures of concrete & bricks	Recycling in earth construction		National	Industry lead organization		see above <a href="http://www.rudus.fi/ratkaisut/kierratys">http://www.rudus.fi/ratkaisut/kierratys</a>

Description of initiative	Scope	Year established	National, regional, local (specify which local area/region)	Public sector and/or Industry lead organization	Levels of performance e.g. tonnes recycled	Further information/ web-site
<b>Zenrobotics Recyclers (Finnish SME)</b>	Development of robotic recycling system (ZRR) which picks raw materials (wood, plastics, metal, stone, concrete etc) from construction and demolition waste. Waste material spread on a conveyor belt and the ZRR system will autonomously sort the waste.	2007 established 2009 all development focus on waste sorting 2014 commercial version ready.	National/international company	Industrial		Internet link with information on ZenRobotics installing Robotic CDW-Sorting System in Finland : <a href="http://zenrobotics.com/">http://zenrobotics.com/</a> YouTube presentation : <a href="https://www.youtube.com/watch?v=X_1sOPqM_VA">https://www.youtube.com/watch?v=X_1sOPqM_VA</a>
DEMOWOOD "Optimization of material recycling and energy recovery from waste and demolition wood in different value chains"	Potential of construction and demolition wood material for pulp production, particle board production and energy use	2011	EU project	EU project	Unknown	Homepage of EU project « Material recycling and energy recovery from waste and demolition wood » <a href="http://www.demowood.eu">www.demowood.eu</a>
<b>Destamatic:</b> product development	Use of wood waste in new products : The recycled fibre used in the wood stone is the first in Europe to replace as much as 20-25 weight per cent of the stone's volume compared to traditional concrete stones.	2014	National	Industry lead organization	Unknown	Information by Destamatic on Destamatic's wood stone <a href="http://www.destamatic.fi/files/DestaClean_woodStones_info_Oct2014.pdf">http://www.destamatic.fi/files/DestaClean_woodStones_info_Oct2014.pdf</a>
Eracobuild-project financed by Nordic innovation, Finnish and Swedish companies	Tools for the assessment of environmental sustainability of construction products and identification of current and future substances of concern with regard to recycling and reuse of construction products and renovation wastes	2014	Nordic	Both	Unknown	Project report entitled "Environmentally Sustainable Construction Products and Materials – Assessment of release" (2014) <a href="http://www.nordicinnovation.org/Global/Publications/Reports/2014/Environmentally%20Sustainable%20Construction%20Products%20and%20Materials_Final_report.pdf">http://www.nordicinnovation.org/Global/Publications/Reports/2014/Environmentally%20Sustainable%20Construction%20Products%20and%20Materials_Final_report.pdf</a>

Description of initiative	Scope	Year established	National, regional, local (specify which local area/region)	Public sector and/or Industry lead organization	Levels of performance e.g. tonnes recycled	Further information/ web-site
Report on Advanced recycling of complex and new materials	Analysis of five waste value chains (MSW, CDW, C+I, WEEE, ELV) for bottlenecks, material and energy value, current and future development needs. The aim of the project has been to create an understanding of the future development needs of waste recycling and management.	2012	National	Both	Unknown	Project report entitled "Directions of future developments in waste recycling" (2012) <a href="http://www.vtt.fi/inf/pdf/technology/2012/T60.pdf">http://www.vtt.fi/inf/pdf/technology/2012/T60.pdf</a>
Report on requirements from construction products regulation	Procedures related to CE marking of recycled waste	2010	Nordic innovation	Nordic		Project report entitled "Handbook : Environmental assessment of construction products – an introduction to test methods and other procedures related to CE-marking" (2009) <a href="http://www.nordtest.info/index.php/technical-reports/item/handbook-environmental-assessment-of-construction-products-an-introduction-to-test-methods-and-other-procedures-related-to-ce-marking-nt-tr-618.html?category_id=3">http://www.nordtest.info/index.php/technical-reports/item/handbook-environmental-assessment-of-construction-products-an-introduction-to-test-methods-and-other-procedures-related-to-ce-marking-nt-tr-618.html?category_id=3</a>
ENCORT project financed by the Nordic Council of Ministers	Environmental Consequences of the EC Recovery Target for Construction and Demolition Waste.	2014	Nordic Council of Ministers	Nordic	Unknown	Project report entitled "Evaluation of the European recovery target for construction and demolition waste" (2014) <a href="http://dx.doi.org/10.6027/NA2014-916">http://dx.doi.org/10.6027/NA2014-916</a> , NA 2014:916. ISSN 2311 – 0562

Description of initiative	Scope	Year established	National, regional, local (specify which local area/region)	Public sector and/or Industry lead organization	Levels of performance e.g. tonnes recycled	Further information/ web-site
Standardization tools	Validation of methods developed by CEN/TC351/WG1 to assess release from construction products to soil, surface- and groundwater	2013	CEN	EU	Unknown	Robustness report entitled "Robustness validation of TS-2 and TS-3 developed by CEN/TC351/WG1 to assess release from products to soil, surface water and groundwater" (2012)
Rakmat project (Removing the barriers to material efficiency in housing construction)	The aim of the project was to analyse the obstacles to waste prevention and improved material efficiency in this sector and to disseminate good practices from the field. Additionally the aim was to present proposals and recommendations for removing the obstacles and for achieving the recycling targets defined in the European Union Waste Directive and in Finland's Waste Plan.	2011	National	Ministry of the Environment	Unknown	Project report entitled "Talonrakentamisen materiaalitehokkuuden edistäminen" (2011)  <a href="http://www.ym.fi/download/noname/%7BF23DDA2A-1E58-4771-ACA8-90D06AB4FBE6%7D/32103">http://www.ym.fi/download/noname/%7BF23DDA2A-1E58-4771-ACA8-90D06AB4FBE6%7D/32103</a>
End-of-waste concept	End-of-Waste criteria for construction and demolition waste	2013	Nordic	Nordic Council of Ministers	Unknown	To be published
Project SUSPROC (Sustainable Building Processes)	Procurement guidelines for sustainable refurbishment.  The research project Sustainable Building Processes aimed at adopting new processes for eco-efficient building and sustainable built environment.	2009–2010	National		Unknown	Homepage of the project "Sustainable Building Processes – SUSPROC" :  <a href="http://virtual.vtt.fi/virtual/environ/susproc_e.html">http://virtual.vtt.fi/virtual/environ/susproc_e.html</a>

Description of initiative	Scope	Year established	National, regional, local (specify which local area/region)	Public sector and/or Industry lead organization	Levels of performance e.g. tonnes recycled	Further information/ web-site
LifePlan	Database on service life of construction production	2010	National	Public	Unknown	Homepage of project with database on construction products : <a href="http://ce.vtt.fi/lifeplan_iw/">http://ce.vtt.fi/lifeplan_iw/</a>
BUILD UPON	A two-year project, aimed at helping European countries design and implement strong, long-term national strategies for the renovation of their existing buildings. BUILD UPON will guide a critical mass of key stakeholders across 13 countries through a structured process, working as a powerful collaborative community to design and implement the v2.0 national renovation strategies due to be in place by April 2017.	2014-15	EU Horizon 2020	Finnish partner : Green Building Council Finland		Project presentation on web-page: <a href="http://www.worldgbc.org/files/1514/2652/7002/150310_BUILD_UPON_Project_Summary_WGBC.pdf">http://www.worldgbc.org/files/1514/2652/7002/150310_BUILD_UPON_Project_Summary_WGBC.pdf</a>
Nordic Guide to Sustainable Materials	The project aims at making a guide, relevant for both refurbishments and new buildings that will define sustainable functional criteria for building materials common within the Nordic countries, and offer product data reflecting Nordic practice (legislation, market drivers, procurements and production methods). The project will also result in closer cooperation within this field among Nordic organizations.	2014-15	Nordic	Finnish partner : Green Building Council Finland		Project homepage with links : <a href="http://www.nordicinnovation.org/nordicbuilt/funding-opportunities/funded-projects-through-nordic-built-in-2013/nordic-guide-to-sustainable-materials/">http://www.nordicinnovation.org/nordicbuilt/funding-opportunities/funded-projects-through-nordic-built-in-2013/nordic-guide-to-sustainable-materials/</a>

Description of initiative	Scope	Year established	National, regional, local (specify which local area/region)	Public sector and/or Industry lead organization	Levels of performance e.g. tonnes recycled	Further information/ web-site
HISER-project "Holistic Innovative Solutions for an Efficient Recycling and Recovery of Valuable Raw Materials from Complex Construction and Demolition Waste" (2015-2019)	HISER's main goal is to develop and demonstrate novel cost-effective technological and non-technological holistic solutions for a higher recovery of raw materials from ever more complex construction and demolition waste due to the variety of materials used. The solutions obtained will be validated in demolition work and five case studies throughout Europe. The environmental and economic impact of the solutions obtained in the HISER project will be quantified from a life cycle perspective (LCA/LCC). Recommendations will also be put forward to define new European policies and standardization standards to implement the best solutions in the construction sector.	2015	EU project under Horizon 2020	EU project involving both public & industry organizations	Waste materials specific targets given	Project homepage : <a href="http://www.hiserproject.eu">www.hiserproject.eu</a>
Project on wood recycling financed by the Finnish Ministry of the Environment	Development of new recycling concepts and new products from wood waste	2013-15	National	Public/private		<a href="http://www.ym.fi/fi-FI/Ymparisto/Jatteet/Kehitys_ia_kokeiluhan_kkeet">http://www.ym.fi/fi-FI/Ymparisto/Jatteet/Kehitys_ia_kokeiluhan_kkeet</a>
Puukuitu project financed by the Finnish Ministry of the Environment	Fibre material for new product from wood waste	2014	National	Public		Research report (in Finnish) <a href="http://www.vtt.fi/inf/julkaisut/muut/2014/VTT-R-06095-14.pdf">http://www.vtt.fi/inf/julkaisut/muut/2014/VTT-R-06095-14.pdf</a>
European Regional Development Fund project on recycling of gypsum and felt roof waste	Study on collection systems and treatment processes of gypsum and felt roof waste – analysis of barriers & economics	2014-15	National	Public		Final report (in Finnish) <a href="http://www.phj.fi/images/KIHU_loppuraportti_pienennetty.pdf">http://www.phj.fi/images/KIHU_loppuraportti_pienennetty.pdf</a>



## 6.2. Stakeholders' engagement

This subsection is addressed to all contacted parties during the stakeholder consultation of the screening phase in order to incorporate their views, insights and hands-on experience of CDW management initiatives already in place in Finland. All the gathered initiatives were highlighted in the previous sections.

Within these initiatives, the following could be selected as interesting case studies for task 2:

- Rudus: Betoroc: Use of reclaimed concrete in earth construction. Development of concept covering selective demolition, processing and quality control. Initiative for Finnish decree on simplification of permitting system to promote recycling.
- Raahen city (old steel company): Reusing reclaimed prefabricated concrete elements and other second-hand structural components when building deconstructed.
- Destamatic: use of wood waste in new products: The recycled fibre used in the wood stone is the first in Europe to replace as much as 20-25 weight per cent of the stone's volume compared to traditional concrete stones.
- Zenrobotics: Development of robotic waste sorting system suitable for sorting construction and demolition waste, 4 000 picks per hour using two robot arms. Systems now installed in Finland, Holland and Switzerland. Deliveries in Japan are on-going

## 6.3. Waste legislation enforcement

### Supervision responsibilities

The Land Use and Building Act (139 §) requires that, in the demolition permit application, the organization of the demolition work must be explained as well as the handling of resulting building waste and reuse of any usable building components. The Land Use and Building Decree (55.2 §) requires that the permit application and notifications concerning the construction or demolition of a building or part of a building shall include an account of the amount and type of construction waste and how it will be sorted, unless the amount of waste is minor. Applications and notifications shall report separately any construction and demolition waste that is harmful to health or the environment, and how it will be disposed of. The applications and notifications are handled by the supervisory construction authority of the relevant municipality. The notification is used as a tool for the municipal authority to monitor the treatment and utilization of CDW at construction and demolition sites according to regulations.<sup>42</sup>

Demolition work may be such an on-off activity mentioned in the Environmental Protection Act (527/2014, 120 §) which requires special measures in waste management and which requires a notification to the environmental protection authority of the municipality. According to the Waste Act (12 §), the waste holder must be aware of the amount, quality, type, origin, properties relevant to waste management as well as any health and environmental effects of the waste. The supervisory authority has the right to obtain sufficient information from the waste holder or other waste management body in order to carry out monitoring duties.<sup>43</sup>

The waste management regulations of municipalities also include regulations on CDW and their sorting. For instance, in the metropolitan area the regulations demand that non-impregnated wood waste and metal scrap from construction activities are sorted and recovered.<sup>44</sup>

The pre-sorting replacing or complementing source separation of CDW and professional, facility-based treatment of CDW requires an environmental permit. The competent permit and supervisory authority is the environmental protection authority of the municipality when the amount treated yearly is below 20 000 tonnes. For capacities above 20 000 tonnes p.a. the competent authority is the state (AVI/ELY). For non-contaminated soils, concrete, brick, asphalt or other stable waste the threshold for state authority permitting is 50 000 tonnes p.a. Utilization of some waste types is possible in land construction by notification procedure (591/2006), see paragraph 3.1.

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<sup>42</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>43</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>44</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

### Administrative tools

The environmental permit violations or defaults should only be assessed reflecting the requirements set in the environmental permit. If the requirements are violated the supervisory activities are taken irrespective of the reason for violation. In principle, the supervisory authority should not at this stage assess the appropriateness of the law environmental permit or the disadvantages or costs caused to the actor by the fulfilment of permit requirements.<sup>45</sup>

The aim is to use administrative tools in an efficient manner. The behest can include a saying of the possibility to use administrative compulsion and related hearing. This way the administrative compulsion can be used immediately if the behest is not followed. When needed a request for investigation is handled by the police.<sup>46</sup>

### Resources and monitoring realization

The resources for monitoring at ELY centres and co-operative authorities (including municipalities) are scant but under the circumstances the monitoring duties have been managed well. The prioritizing of tasks has been made based on their impact on environmental protection. The monitoring is carried out according a yearly plan. The realization of monitoring is followed-up and a yearly report is prepared. The guidelines from the ministry of the environment are followed in the monitoring activities.

In practice, the focus of inspections is on activities controlled by waste permits and not on activities operating without permits.

### Environmental soundness and waste hierarchy

The environmental permits of facilities pre-treating CDW imposes the delivery of any waste fractions to appropriate treatment to be recovered either as material or energy according to waste hierarchy. Only waste fractions not suitable for recovery may be delivered to landfill disposal according to their classification or to a facility having a permit to treat the waste type in question.<sup>47</sup>

The treatment and recovery of CDW according to waste hierarchy has been monitored in ELY centres (Centre for Economic Development, Transport and the Environment) as a part of follow-up work of regional waste plans. The data available from the administrative register VAHTI are based on waste amounts reported by the facilities with environmental permits and supervised by the ELY centres.<sup>48</sup>

In the first midterm review of the waste plan for southern and western Finland carried out in 2014, the material efficiency of building construction was evaluated. The identified challenge with regard to meeting the set targets is the insufficient sorting of waste generated at construction sites, the underlying reasons being, e.g. poor attitudes or common waste management practices. In addition, the economic benefit of waste utilization or recycling is minor, which diminishes sorting at construction sites. The properties of waste are variable according to activity - new construction, refurbishment and demolition. This is also a factor influencing the efficiency in source separation.<sup>49</sup>

The CDW statistics on waste generation and recovery rate are on a rough level and the classification does not always correspond to the one defined by the Government Decree on Waste. The development of statistics would require uniform accounting of CDW amounts.<sup>50</sup>

### CDW shipments

The professional waste transporting and supplying companies must apply for approval to the waste management register mentioned in the Waste Act (142 §). The decision on the approval for the register is made by the ELY centre. The registered waste transporters and suppliers are not necessarily monitored by inspections due to a shortage in resources.<sup>51</sup>

A shipment document according to the Waste Act (121 §) must be prepared for CDW. The document or a copy of it must be stored for a minimum of three years. The shipment documents can be inspected as spot

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<sup>45</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>46</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>47</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>48</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>49</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>50</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>51</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

checks in pursuance of monitoring visits to waste treatment facilities. The shipment documents can be used to track the route of individual waste batches to the permitted recipient.<sup>52</sup>

The competent authority in the exports and imports of waste is the Finnish Environment Institute.

#### Illegal dumpings of CDW

Waste lots abandoned in the countryside are typically revealed by notifications from the public.

There are only a few cases handled by Finnish courts of illegal dumping per year. For example in 2013, one case has been reported on dumping concrete waste from a plant producing precast concrete elements without a permit. The employers responsible were sentenced to a fine of 50 days by the Court of Appeal of Turku.<sup>53</sup>

Illegal dumpings of CDW lead to market distortion and are not easily detectable due to the characteristics of the sector. Only a few cases are brought into court and the penalties are often rather mild in comparison to the economic benefit from illegal dumping.

### **6.4. Drivers / barriers to increase CDW recycling**

The main drivers and barriers that affect (directly/indirectly) the recycling efforts and boost/impede CDW recycling rates and overall performance in Finland are listed in Table 13.

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<sup>52</sup> Email contact with Mikko Kantokari, Centre for Economic Development, Transport and the Environment, May 2015

<sup>53</sup> [https://www.poliisi.fi/instancedata/prime\\_product\\_julkaisu/intermin/embeds/poliisiwwwstructure/15051\\_INTERPOL-rap2013.pdf?c9a33f604d2ad288](https://www.poliisi.fi/instancedata/prime_product_julkaisu/intermin/embeds/poliisiwwwstructure/15051_INTERPOL-rap2013.pdf?c9a33f604d2ad288)

**Table 13 Drivers and barriers of recycling**

Factor / characteristic / element in CDW recycling chain	Drivers	Barriers
Legislation	<p>Material specific recycling targets: 70 % of construction and demolition waste must be recycled as material by 2020.</p> <p>Government Decree 591/2006 promotes the utilization of crushed concrete.</p>	<p>Other overlapping (environmental) legislation ; health and safety issues</p> <p>Lack of EoW criteria for CDW.</p> <p>Current recycling targets do not take into account country-specific features such as climate, housing types, material availability and overall cultural issues.</p>
Statistics	<p>Reliable information on waste important for business development</p>	<p>Lack of harmonization of data collection in Europe. Data produced in different countries are not comparable.</p> <p>Data collection is based on the treatment phase in facilities with environmental permit; some CDW streams (e.g. CDW treated in facilities without permits, CDW from households, the CDW recycled on-site) generated fall out of data collection.</p>
Economics	<p>Landfilling costs, taxation</p>	<p>Lacking markets and real supply and demand.</p> <p>Good availability of virgin sand and aggregates limits the demand for recycled materials.</p>
Recycling process and techniques	<p>Benefit for the environment</p>	<p>Current waste management practices hinder the interest to utilize available information on sorting and recycling of construction waste.</p> <p>Immature market for CDW recycling. Lacking adaptation of relevant standards and best practices.</p>
Quality	<p>Use of efficient selective dismantling enables the separation of unwanted fractions from CDW and improves quality.</p>	<p>Variations of CDW quality hinder high quality recycling and lead to use of CDW in low-grade applications.</p> <p>Lack of EoW criteria for CDW.</p> <p>Quality of CDW, e.g. wood waste, may degrade during use.</p>
Content of hazardous compounds	<p>Ban on use of hazardous compounds in construction products, awareness of risks related to hazardous compounds in construction products promote the development of construction products.</p>	<p>Due to the long time span of constructions, hazardous substances (e.g. restricted substances today) can be found in CDW for a long time. Several contaminants can't be visually detected. Safe use of CDW sets needs for pre-auditing, sorting and analytical checks of CDW prior to recycling.</p> <p>Several stakeholders have also pointed out that many CDW are not recyclable if there is risk of presence of hazardous substances.</p>

Factor / characteristic / element in CDW recycling chain	Drivers	Barriers
Large share of wood used in building construction	High amounts of wood waste produced	Recycling of wood waste set high requirements on quality (high amount of demolition waste not recyclable due to material degradation).
Environmental Product Declaration (EPD)	Standardized way of reporting impacts from construction products	The benefit from a sustainable use of natural resources is not fully addressed in LCA. The current impact assessment on resource depletion is based on extraction and consumption of scarce elements and use of fossil energy. The current indicator on ADP (Abiotic Depletion Potential) in LCA (according to EN 15804) focuses on fossil fuel use or extraction of scarce elements, but not adequately taking into account the saving of other natural resources like renewables.
Construction Product Regulation CPR and its Basic Requirement of Construction Works (BRCW); CE marking	Quality control scheme in production; CPR/BRCW 7 Sustainable use of natural resource: The construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and in particular ensure the following: reuse or recyclability of the construction works, their materials and parts after demolition; durability of the construction works; use of environmentally compatible raw and secondary materials in the construction works.	Standards need to be adapted for applications suitable for recycled materials (e.g. lower requirement needs in some applications); implementation of BRCW 7 is not finalized (e.g. inclusion of the recycling stage is not mandatory in an EPD report according to EPD standard (EN 15804)  CE marking of certain recycled materials especially reusable construction products (steel and timber beams, columns, panels) needs development. Harmonized test standards for the determination of release of dangerous substances not yet adopted.
Others		General attitude concerning recycling  Lack of knowledge among several stakeholders about new recycling possibilities, especially among small companies (training/education needed).  Availability of virgin materials limits interest to recycling of CDW. Green (public) procurement to support demand on recycled material and new ways to build and demolish.

## 7. CDW Sector Characterization

In this section some specific characteristics of the CDW management sector in Finland are presented. The section describes the business environment of the CDW management.

### 7.1. Sector characteristics

Figure 1 illustrates the CDW chain for recycling. CDW is commonly collected and transported to treatment facilities directly from the construction site by the contractor. The quality of the waste is influenced by the performance/specifications/requirements of selective demolition. Further processing generally includes only

mechanical processing and further refining or utilization as material or as fuel in energy production. At all stages some rejects are generated.<sup>54</sup>

Demolition can be implemented as selective, partially selective or non-selective; partially selective demolition is used in Finland.<sup>55</sup>

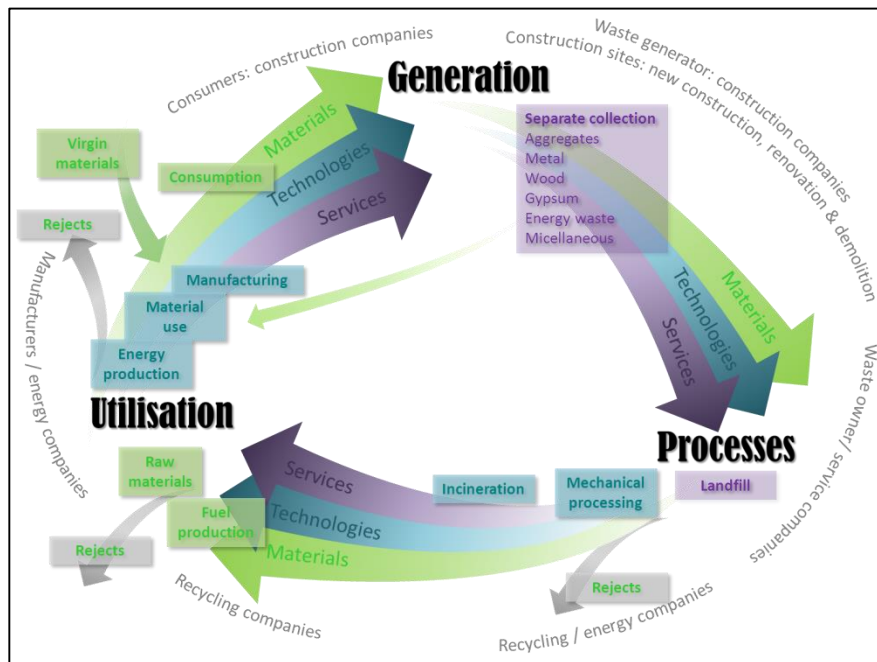


Figure 1 Schematic description of CDW-value chain in Finland.<sup>56</sup>

The following key actors within CDW management have been identified:<sup>57</sup>

- Waste generators: The CDW generators are mainly construction and demolition companies as small construction sites (private houses) are not covered by the CDW. These are the owners of waste and are obliged to provide for appropriate waste management according to the Finnish waste legislation. A priority is to reduce waste generation and reuse materials in order to generate as little waste as possible. Waste is usually sorted on-site and transported to treatment facilities, creating mass/volume dependent costs.
- Municipalities: The municipalities are to guide and govern the sorting and treatment of CDW. The municipality can give their own local regulations on waste management, based, of course, on national legislation. The most common regulations obliges the waste owner to provide sorting of the waste in order to separate recyclables and hazardous wastes from the mixed waste stream and consign the waste to a proper treatment facility. When granting permits for construction and/or demolition, the authorities similarly can give orders for the management of the waste.
- Private companies: The treatment and recycling plants are commonly private actors, which process the sorted waste into recovered raw material. In addition, actors that provide demolition/refurbishment services and logistics are commonly private companies of various sizes.

In the following table, utilization possibilities for CDW in Finland in 2010 are presented.<sup>58</sup>

<sup>54</sup> Meinander, M. & Mroueh, U.-M. (Eds). (2012). Directions of future developments in waste recycling.

<sup>55</sup> Meinander, M. & Mroueh, U.-M. (Eds). (2012). Directions of future developments in waste recycling.

<sup>56</sup> Meinander, M. & Mroueh, U.-M. (Eds). (2012). Directions of future developments in waste recycling.

<sup>57</sup> Meinander, M. (2011). CD market analysis.

<sup>58</sup> Kojo, R. and Lilja, R. 2011. Removing the barriers to material efficiency in housing construction

Table 14 Finnish CDW recovery routes in 2010.<sup>59</sup>

Waste fraction	Available recovery routes	Organization 2010
<b>Wood:</b> <ul style="list-style-type: none"> <li>- Used lumber, plywood, chipboard,</li> <li>- Fibre board and other wood based waste</li> </ul>	<ul style="list-style-type: none"> <li>- Chipboard production after removal of nails</li> <li>- Woodchip for composting</li> </ul>	<ul style="list-style-type: none"> <li>- Single chipboard manufacturers</li> <li>- Crushing is common:               <ul style="list-style-type: none"> <li>o Several facilities</li> <li>o Possible use of mobile equipment</li> <li>o Several actors</li> </ul> </li> </ul>
<b>Mineral waste:</b> <ul style="list-style-type: none"> <li>- Concrete, bricks, earth materials</li> </ul>	<ul style="list-style-type: none"> <li>- Cement production</li> <li>- Earthworks</li> <li>- Backfilling</li> <li>- Landfill construction</li> <li>- Land reclamation</li> </ul>	<ul style="list-style-type: none"> <li>- Several facilities</li> <li>- Utilization at onsite</li> <li>- Possible use of mobile equipment</li> <li>- Several actors</li> </ul>
<b>Plasterboards</b>	<ul style="list-style-type: none"> <li>- Plasterboard production</li> </ul>	<ul style="list-style-type: none"> <li>- Single manufacturers</li> </ul>
<b>Metals</b>	<ul style="list-style-type: none"> <li>- Metal recycling</li> </ul>	<ul style="list-style-type: none"> <li>- Developed commercial activity</li> </ul>
<b>Windows with frames</b>	<ul style="list-style-type: none"> <li>- Metal recycling</li> <li>- Glass wool</li> </ul>	<ul style="list-style-type: none"> <li>- Single manufacturers, more extensive activity starting in 2010</li> </ul>
<b>Insulation materials:</b> <ul style="list-style-type: none"> <li>- Mineral wool</li> <li>- Wood fibre and cotton</li> <li>- Polyurethane, polystyrene etc.</li> </ul>	<ul style="list-style-type: none"> <li>- Cotton, mineral and wood fibre can be reused as blowing wool</li> <li>- Styrox can be used as a frost insulation in infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>- Single actors</li> </ul>
<b>Plastics:</b> <ul style="list-style-type: none"> <li>- PE, HDPE, LDPE</li> <li>- PVC</li> <li>- Other plastics</li> </ul>	<ul style="list-style-type: none"> <li>- PE recycling as material</li> <li>- PVC recycling complicated due to the different additives</li> <li>- Mixed plastics can be recycled as composite products (plastic-wood; plastic-mineral)</li> </ul>	<ul style="list-style-type: none"> <li>- As for plastic pipes optional national organization</li> </ul>
<b>Packaging materials:</b> <ul style="list-style-type: none"> <li>- Cardboard</li> <li>- Plastic</li> <li>- Metals</li> <li>- Pallets</li> </ul>	<ul style="list-style-type: none"> <li>- Producer responsibility, recycling as material</li> </ul>	<ul style="list-style-type: none"> <li>- Legal based national action system</li> </ul>
<b>Waste electric and electronic waste (WEEE)</b>	<ul style="list-style-type: none"> <li>- Producer responsibility, recycling as material</li> </ul>	<ul style="list-style-type: none"> <li>- Legal based national action system</li> </ul>
<b>Mercury vapour lamp</b>	<ul style="list-style-type: none"> <li>- Reception sites and treatment capacity is available</li> </ul>	<ul style="list-style-type: none"> <li>- National reception</li> </ul>

<sup>59</sup> Kojo, R. and Lilja, R. 2011. Removing the barriers to material efficiency in housing construction

## 7.2. Exports / imports of CDW

Only small amounts of mixed construction and demolition waste are exported to Estonia for sorting and recycling. A very small amount of PCB-containing demolition waste is imported to Finland for disposal.<sup>60</sup>

## 7.3. CDW as landfill cover

Soils excavated during construction activities are used as construction material in the closure of landfills. Reclaimed concrete is mainly used as aggregate in earth construction.

## 7.4. Market conditions / costs and benefits

The landfill tax is currently EUR 55 /t; this also applies to CDW. Additionally, reception of non-sorted CDW costs more than sorted waste. For mixed CDW, typical gate fees for landfills range from EUR 100 to 170 /t. For sorted waste, such as wood, glass or concrete waste the fees are lower, e.g. EUR 20 to 90 /t.

Current waste management practices are highly driven by economy. Treatment costs of CDW depend on the targeted utilization specifications. Especially, on-site treatment of concrete with lower quality requirements and therefore lower treatment costs has been claimed to hinder the market development of higher-grade utilization. In several cases, treatment costs are avoided when concrete waste is crushed and used on-site.

Obstacles and challenges for CDW recycling in Finland have been analyzed by Kojo and Lilja (report by the Ministry of the Environment, 2011)<sup>61</sup>. A key challenge in reaching the 70% recycling target in Finland is the large share of wood in the housing construction wastes which is currently to large extent used as energy source to replace fossil fuels. Other challenges/obstacles related to waste prevention, reuse and recycling are listed below:

- Wide implementation of more advanced practices (e.g. in selective demolition) is challenging due to large-scale differences of operators as well as sites; the revealed misconducts and offences have violated the reputation of the activity in the market
- Partly immature market for CDW recycling leads to lacking adaptation of relevant standards and best practices
- Higher price of prefabricated or tailor-made solutions which usually reduce material wastage
- Wastages due to over-dimensioning of material needs, insufficient packaging/protection of materials at construction sites and damages during transportation
- Low demand and price for used construction parts

In Finland, as well as in Sweden, a significant part of the CDW is wood due to the large share of wood in housing construction. Wood waste is recycled or reused if the recycling infrastructure and re-manufacturing is present. However, an efficient energy recovery replacing the use of fossil fuels, biomass and wood chips, is often the best economically and environmentally option also with the climatic conditions taken into account. During the use phase, the quality of wood may under certain condition deteriorate and the wood waste is not always suitable for recycling or reuse. Also the pretreatment of wood materials containing nails and paint is labour intensive. To a minor extent, timber structures (e.g. beams) and interiors (doors, windows) are reused today. Research is going on to develop new products (e.g. panels, wood-plastic composites) by using fibres from wood CDW and there are already products on the market. However, the recyclability of these products needs also to be assessed, especially if the wood fibres are mixed with other materials. In Central Europe the recycled wood scrap is used in manufacturing of particle board, but especially the long transport distances of waste wood to the particle board manufacturer (in Finland only one manufacturer), requirements and quality controls on the input materials (removal of impurities, waste sorting needs) and also logistics of the finished particle board to foreign customers due to the limited domestic use hamper the use in particle boards.<sup>62</sup>

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<sup>60</sup> Email contact with Hanna Salmenperä, Finnish Environment Institute (SYKE), April 2015

<sup>61</sup> Kojo, R. and Lilja, R. 2011. Removing the barriers to material efficiency in housing construction

<sup>62</sup> Interview/email contacts with Topi Helle, Finnish Wood Research Oy & Gunilla Beyer, Swedish Forest Industries Federation



labour intensive. Due to climatic conditions, the utilization of wood in energy production has so far been the primary option replacing the use of fossil fuels, biomass and wood chips. To a minor extent, timber structures (e.g. beams) and interiors (doors, windows) are reused today. Research is underway to develop new products (e.g. panels, wood-plastic composites) by using fibres from wood CDW, and there are already products on the market. However, the recyclability of these products also needs to be assessed, especially if the wood fibres are mixed with other materials. In Central Europe the recycled wood scrap is used in manufacturing of particle board, but especially the long transport distances of waste wood to the particle board manufacturer (in Finland only one manufacturer), requirements and quality controls on the input materials (removal of impurities, waste sorting needs) and also logistics of the finished particle board to foreign customers due to the limited domestic use hamper the use in particle boards.

## **7.5. Recycled materials from CDW**

There are no end-of-waste criteria in place for aggregates or other materials.

The Finnish Government Decree 591/2006 (rev. 403/2009) has significantly promoted the use of reclaimed concrete from selective demolition in earth constructions. The purpose of the decree is to promote, through simplification of the environmental permit system, the use of selected wastes in earth construction fulfilling the requirements defined in the decree. Limit values are given both on total content and on the release of metals and salts both for basic characterization and compliance testing (focusing only on key elements). The decree has increased confidence in the material quality among the end-users and also lightened the administrative works. The maximum grain size given in the decree also enhances processing of concrete wastes to high-quality products.

The European Standard EN 15359 for solid recovered fuel is used for the wood waste separated from CDW and replaces the national standard SFS 5875 previously used. The standard covers the requirements on waste properties and also requirements for CE marking of waste used as fuels.

The quality of CDW is crucial for high-grade recycling. This concerns especially mineral waste used as aggregate in earth construction. According to some stakeholders, the quality is often poor (waste includes impurities) in cases where the activity is not controlled by the authorities through permits or does not fulfil the requirements in the notification procedure according to the Government Decree.

## **7.6. Construction sector make-up**

The total value of the Finnish construction sector in 2014 was altogether EUR 28.5 billion of which 79% is accounted for by housing construction and 21% by infra construction (Confederation of Finnish Construction Industries RT, 2015). In 2013, the number of construction companies was about 42 500.<sup>63</sup> The total volume of construction is estimated to decrease in 2015. However, a slight increase is expected for 2016. In 2015 the estimated number of dwellings started is 23 500. The value of refurbishments (total EUR 11.9 billion in 2014) exceeds the volume of new construction. Employment in the construction sector in Finland is about 165 000. The following graphs extracted from the latest economic outlook report of the construction sector give further insight into the key economic figures and recent trends within the Finnish construction sector.<sup>64</sup>

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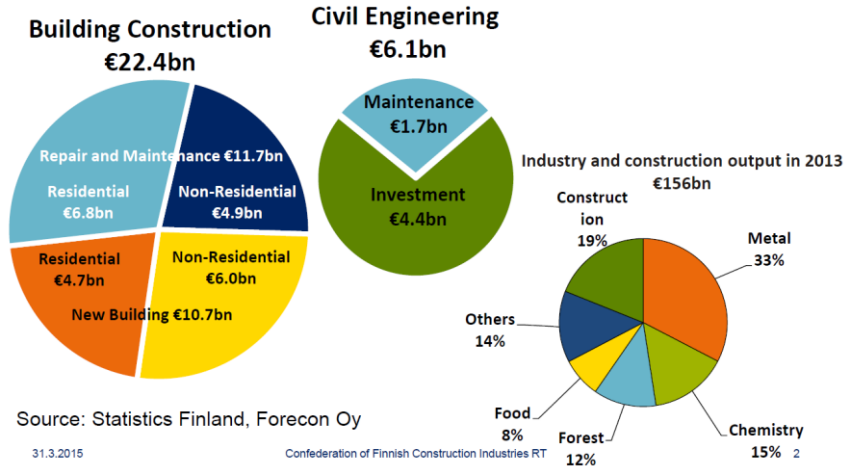
<sup>63</sup> -Statistics Finland, 2015. Companies by branch 2013- according to TOL 2008.

[http://193.166.171.75/database/StatFin/yri/yrti/yrti\\_fi.asp](http://193.166.171.75/database/StatFin/yri/yrti/yrti_fi.asp)

<sup>64</sup> -Confederation of Finnish Construction Industries RT, 2015. Economic Outlook, Spring 2015.

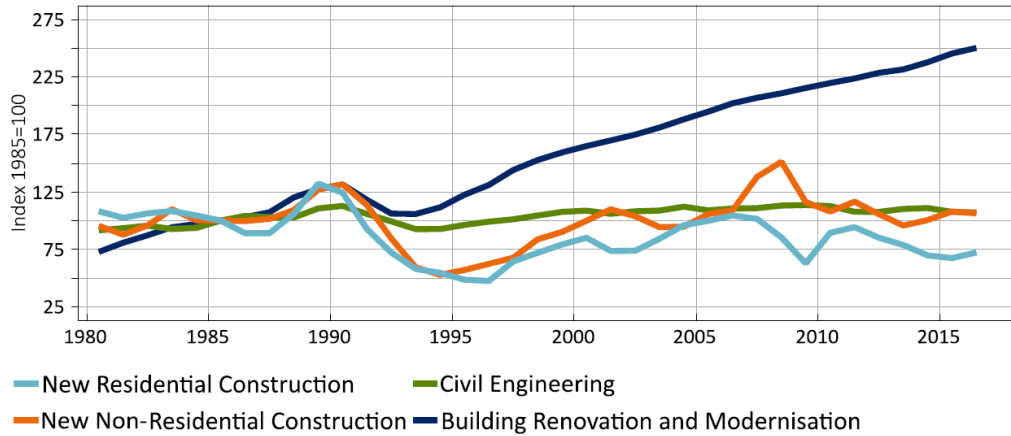
## Construction Sector Output 2014

Total €28.5bn



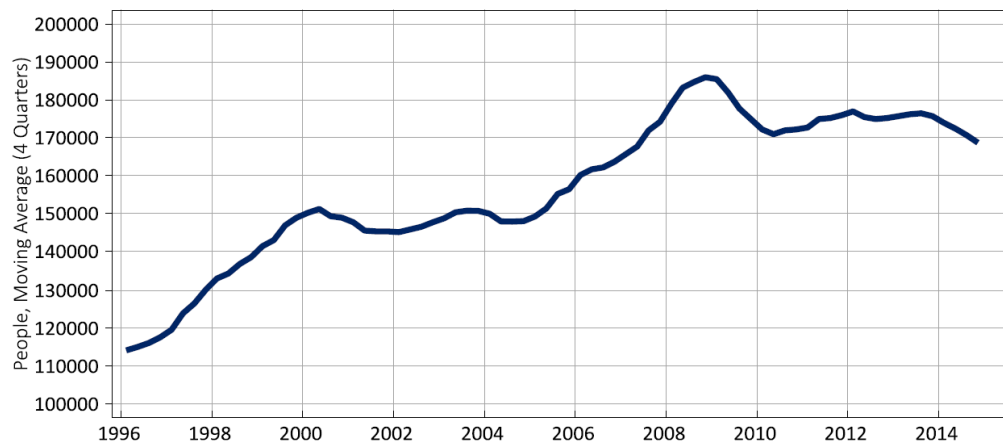
Source: Confederation of Finnish Construction Industries RT, 2015

## Construction volume



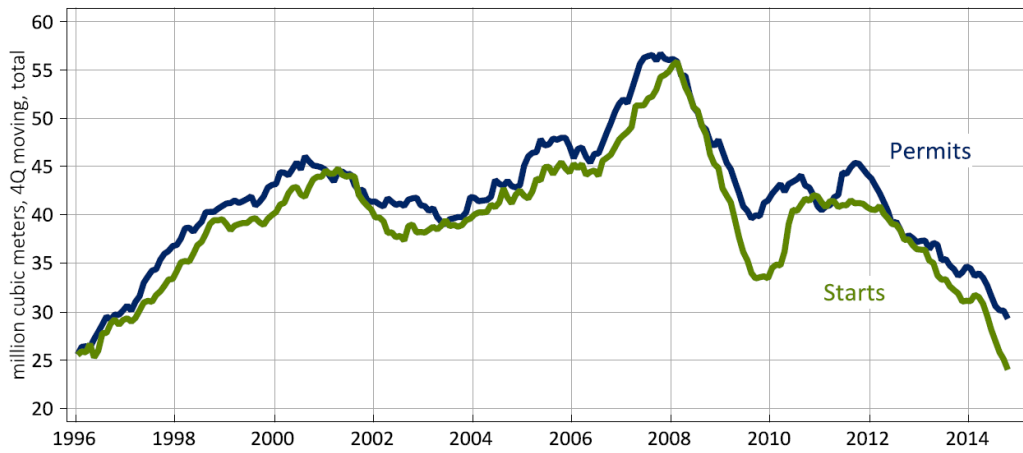
Source: Confederation of Finnish Construction Industries RT, 2015

## Employment in Construction



Source: Confederation of Finnish Construction Industries RT, 2015

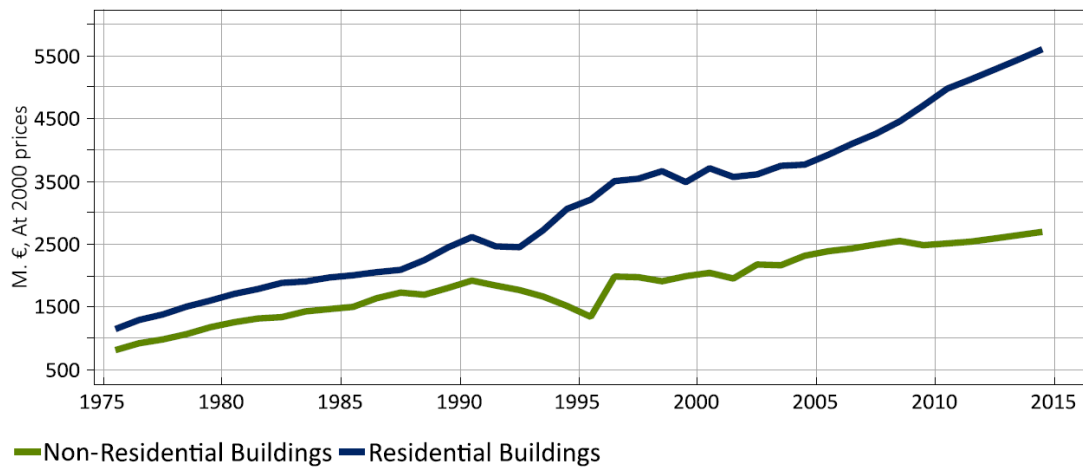
### Total New Building Construction



Source: Macrobond/Confederation of Finnish Construction Industries RT

Source: Confederation of Finnish Construction Industries RT, 2015

### Renovation and Modernisation of Building Construction



Source: Macrobond/Confederation of Finnish Construction Industries RT

Source: Confederation of Finnish Construction Industries RT, 2015

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