Circular Economy Thinking for Construction Waste Management in island Regions

PROJECT TYPE: Other
(RIS Ideation)

State of Construction Demolition Waste management in Cyprus

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1. Introduction

The growing world population puts an enormous stress on the environment and natural resources. The intense activities of the construction sector in Europe have been generating huge amounts of construction and demolition waste (CDW). Our myopic focus on producing and consuming as cheaply as possible has created a linear economy in which objects are briefly used and then discarded as waste. Nowadays CDW is considered one of the heaviest and most voluminous waste streams generated in the EU. It accounts for approximately 25% - 30% of all waste generated in the EU [1]. It is thus not surprising that CDW was identified as a priority waste stream by the European Union, pinpointing that recycling and re-using of construction and demolition waste is a key issue at the core of European strategies such as the Circular Economy Package, the Resource Efficiency Opportunities in the Building Sector and the Construction 2020 strategy (EU 2015, EU COM 2014, EU COM 2012) due to the high potential for reuse and recycling embodied in these materials. The Commission introduced recently the "EU Construction & Demolition Waste Management Protocol" (EU 2016), non-binding guidelines as a proposal to the industry [2].

The CDW, generated in the EU include a wide range of materials. These are mostly inert such as: road construction and maintenance materials, wood, glass, but also can contain hazardous waste types such as asbestos, etc. which can be present in significant proportions when buildings are demolished or renovated. The Waste Statistic Regulation (2150/2002/EC) [3] provides information on the generation and composition of CDW for several countries. Across the EU volumes vary significantly depending on factors such as population growth, city or regional planning, state of the construction industry as well as landfill fees. Moreover, other factors include economic reasons (the quantities generated are highly dependent on the rate of new construction projects, which is related to the economic growth of the country), the types of materials used in construction shows great regional variation due to economic, cultural or technical reasons (for example in some regions brick is the main construction material, in other concrete represents the majority; wood is a major construction material in northern countries). Additionally, discrepancies on the Recovery rate of CDW could be due to unequal levels of control and reporting inconsistencies. Cyprus showed a 57% recovery in 2016 [4].

It should be noted though that the Statistical Service of Cyprus have the aforementioned amounts in combination with the excavation waste.

The lack of sufficient data, statistics and measurements related to CDW, the fragmentation of existing data, the general difficulty that exists in the organization and monitoring of a recording system lacking a central receiver, uncertainties not well defined or clarified of the various definitions in the Waste Framework Directive (WFD) [5] and a non-proper transposing of the WFD into the Cypriot law Regulations etc, makes CDW management in Cyprus difficult.

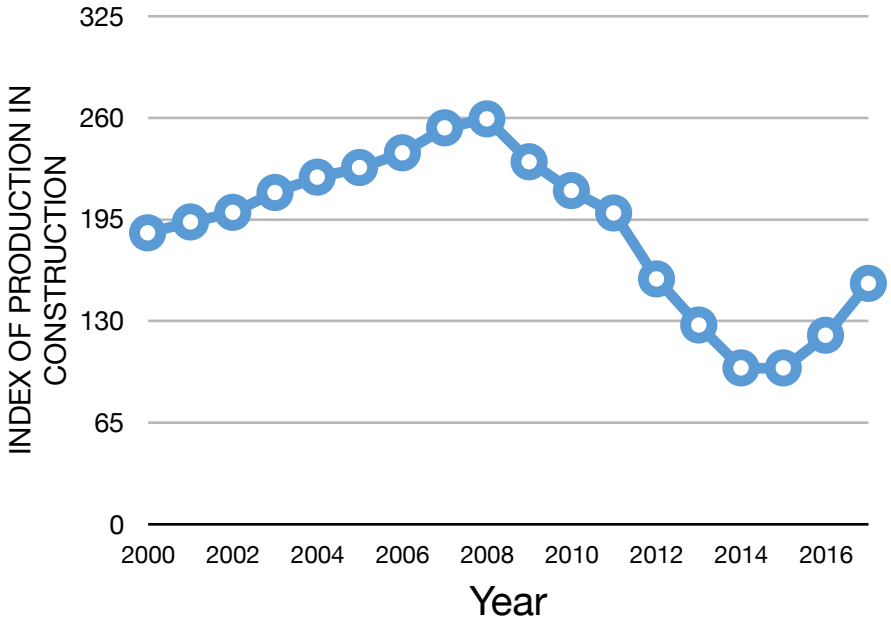
For these reasons, the current report aims to map the current state of affairs in CDW management in Cyprus, highlighting the consequences of non proper management and new important developments that have been incorporated in the international and European legislative agenda.

2. The Cyprus Context

Cyprus, is the third largest island in the Mediterranean Sea, after Sardinia and Sicily with a land area of 9,251 km^2. The recent history of Cyprus is marked by the 1974 military invasion of the island by Turkey and the continued occupation of its northern part until present. The Republic of Cyprus is recognized as the sole legitimate state, while the north is under the *de facto* administration of the self-declared Turkish Republic of Northern Cyprus, which is guarded by Turkish Armed Forces. The population of the Republic of Cyprus is approximately 864,236 while the entire island's population is estimated to be 1,187,575 [6]. The economic sectors composing the countries' GDP are 2.3% agriculture, industry 11% and services 86.8%. Industry includes activities such as mining, manufacturing, energy production, and construction.

2.1. Economic Growth and Construction Boom

The Cyprus economy has been accelerating rapidly, marking a growth rate of 3.9% in real GDP in 2017, the highest growth rate since the 2013 bank sector crisis, making Cyprus one of the fastest growing economies in the EU [7]. It is predicted that growth will continue into 2019, investment being its the main driver. The rapid growth of investment has been heavily influenced by the boom in tourism which reached record highs in 2018. As a result, the demand for accommodation and other tourism infrastructure has increased.



The construction industry in Cyprus, which has been heavily hit by the banking crisis in 2013, is recovering at a steady pace as indicated in Figures 1 and 2 by the index of production in construction and the building permits issued. Latest reports from the Statistical Service of the Republic of Cyprus show a recovery of local demand for housing and a reinvigoration in the

Figure 1: Index of Production in Construction in Cyprus 2000-2017 [8]

construction of dwellings for local and international investors. During the period from January to July 2018, 3699 building permits were issued compared to 3362 in the corresponding period of the previous year. The total value of these permits increased by 21,5%, the total area by 25,5% and the number of dwelling units recorded an increase of 23,7% [8]. Furthermore, several large-scale projects focused on tourism infrastructure, carried out by international consortia, have either been completed (Limassol Marina) or are under construction (Ayia Napa Marina, City of Dreams

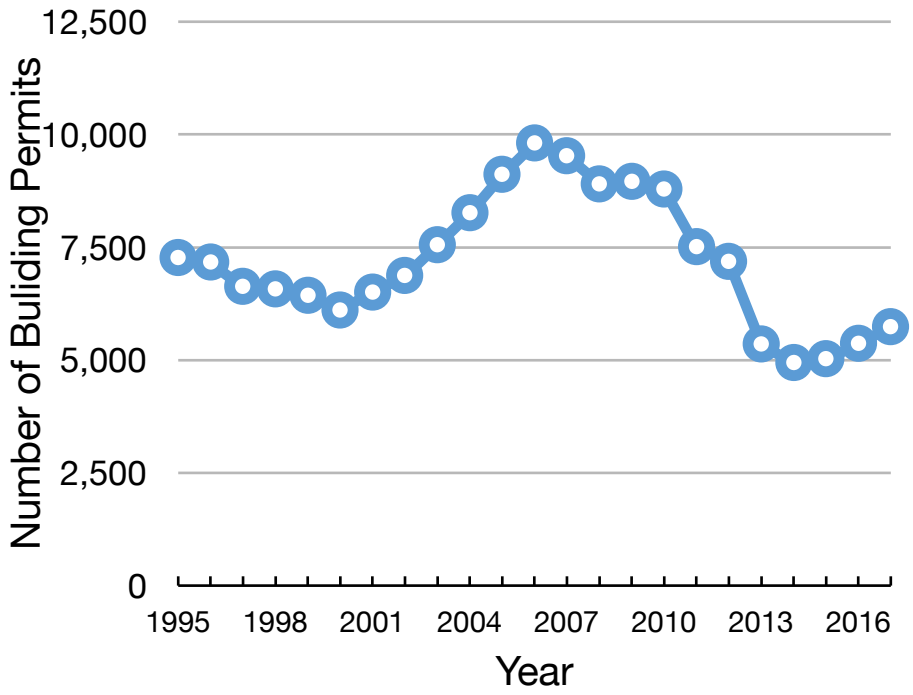


Figure 2: Number of Building Permits in Cyprus, 1995-2017 [9]

casino & resort). Recent data on demolition waste are not available but it is estimated based on past data that there are 200 demolitions per year on average [10].

2.2. Virgin Construction Materials

Cyprus is considered self-sufficient with respect to raw materials for buildings, roads, harbours, dams and other constructional works. There are about 1343 quarries that produce various rocks and industrial minerals. From these quarries, about 22 are in the final stages of operation or the reclamation phase following the end of production [11]. For inland use, the following quantities of raw materials are produced: crushed limestone (Havaras), used for embankments and roads sub-base, aggregates mainly from limestone and diabase for the needs of the building industry and other infrastructure (roads etc), limestone, clay and gypsum as raw material for the production of cement, limestone for the production of lime, clay for bricks and tiles, gypsum for the production of plasters and sandstone for the production of armour and building stone [12].

Table 1 summarizes the mean annual production of quarry materials.

TABLE 1: Mean annual production of quarry materials [12]

Quarry Materials	Quantities (tonnes)
Aggegates	10,500,000
Havara	2,000,000
Limestone for cement	2,600,000
Clay for cement	400,000
Clay for bricks and tiles	350,000
Building stone	50,000
Armour stone	30,000
Bentonite	170,000
Umber and ochre	6,000
Marble	2,000
Lime	12,000
Gypsum	300,000

In May 2004, a study titled “Strategy for Sustainable Quarrying and Mining Development of Cyprus 2001 - 2025” was executed [13]. This study, underlined the importance of protecting the the various quarry material reserves of strategic importance, which are used for the building industry and exports from other developments with the creation of Quarry Zones. The sustainability report findings were not available to us, however the reuse/recycle of CDWs is expected to create an alternative source of construction materials which will relieve the natural resources of the country.

3. CDW in Cyprus

3.1. CDW Management Model

Legally, CDW in the Republic of Cyprus follows two main routes: CDW are either collected and transported to licensed processing plants, or alternatively are processed on site. For the collection/transport network CDW there are currently 479 carriers [14], who are licensed to accept and handle construction waste and whose license is applicable for only a single waste code as specified in the European List of Waste [15]. Several of these carriers are equipped with mobile crushers and sieves for processing of CDWs on site.

It should be noted that Cyprus legislation considers any material leaving the site as waste and as such, on site processed residual materials should be used within the premises of the construction site.

There are currently six (6) licensed processing plants for CDW operating in Cyprus [16]. These units are equipped with CDW reception stations for weight control of the dump trucks and recording and initial inspection of the CDW's. Furthermore they have temporary storage areas and presorting areas. They have the technical capabilities for smashing, crushing, manual and/or magnetic separation and sieving. They also have storage areas for recycled aggregates/final products. In addition they operate sanitary landfills for any remain solid waste resulting from the operations. The recycled end products from the plant operations are sold back to authorized sellers of construction materials. To ensure compliance with legislation, producers of CDW (contractors etc) are required to register or maintain CDW Management Systems. There are currently (3) Collective and four (4) Single CDW Management Systems in Cyprus [17].

3.2. CDW Data

According to data from the annual reports of licensed construction waste management systems assembled by the Ministry of Interior of Cyprus, the total quantities of CDW collected/produced in 2011-2013 in Cyprus are estimated to be 505,478 tonnes in 2011, 1,144,954 tonnes in 2012 and 83,798 tonnes in 2013. These waste quantities are further broken down in Table 2 by their corresponding waste codes the European List of Waste [15] and Annex III to Directive 2008/98/EC [18]:

Table 2 – Composition of CDW in Cyprus for the years 2011-2013 [19]

Waste Code	Economic activity	Total Quantity produced (tonnes)		
		2011	2012	2013
17 01 01	Concrete	8,619	2,345	520
17 01 02	Bricks	-	1,071	-
17 01 03	Tiles and ceramics	-	539	-
17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	-	2,503	125
17 02 01	Wood	-	1,275	41
17 02 02	Glass	-	18	-

17 02 03	Plastic	-	62	-
17 03 02	Bituminous mixtures other than those mentioned in 17 03 01	290	4,105	4,642
17 04 01	Copper, Bronze, Brass	-	2	-
17 04 02	Aluminium	-	6	-
17 04 05	Iron and steel	-	35	-
17 04 07	Mixed metals	120	-	-
17 05 04	Soil and stones other than those mentioned in 17 05 03	198,384	132,258	3,984
17 05 06	Dredging spoil other than those mentioned in 17 05 05	282,518	163,194	64,286
17 06 04	Insulation materials other than those mentioned in 1706 01 and 17 06 03	-	5	-
17 08 02	Gypsum-based construction materials other than those mentioned in 17 08 01	-	224	-
17 09 04	Mixed construction and demolition waste other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	15,547	837,313	10,200
	Total CDW	**505,478**	**1,144,954**	**83,798**

This limited data, indicates that the top three construction waste products in the years 2011-2013 is mixed construction and demolition wastes, dredging spoil, soil and stones. Following the data from Table 1, the total 1,734,230.24 tonnes of CDW generated in years 2011-2013 were distributed as follows: 74,4739 tonnes were received by CDW processing plants, 308,184 tonnes were received by private individuals or the public sector, 58,640 tonnes were received by quarries, 43.24 were received by metal scrap yards and 622,624 tonnes were landfilled [19]. Chart 1 shows the relative percentages of the distributed quantities.

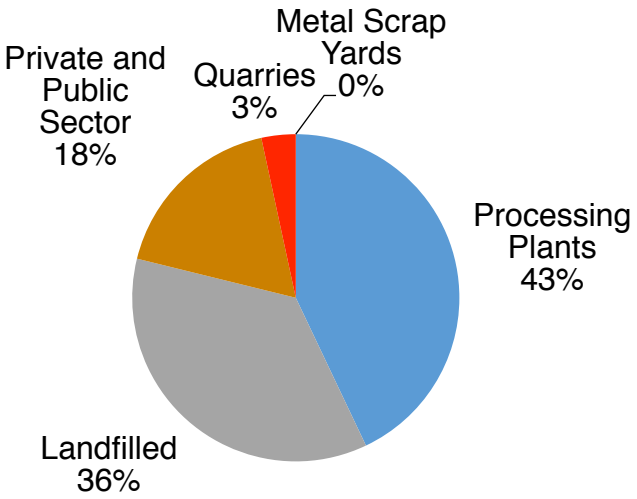


Figure 3 - Relative distribution of total CDW produced in

From the limited data available, we see that 36%, a significant percentage, of the CDW was landfilled, while 43% is being processed by licensed processing plants. The qualitative composition of the landfilled CDWs was not available to us and the source and whether it was

Table 3: CDW managed by registered members of two Collective Management Systems [19, 22]

	Produced by members (tonnes)	Reused/Recycled on site (tonnes)	Transported to Processing Plants (tonnes)
Cyprus Recycling Organization			
2016	182,220.00	173,930.00	8,290.00
2014	219,057.11	201.569,13	Not specified
KODA			
2015	58,474,14	57,636,64	Not specified

legally deposited.

A slightly more accurate reflection of reality comes from data collected from the annual reports of the two major collective management systems, the Cyprus Recycling Organization and KODA and is presented in Table 2. [20, 21, 22].

While interpreting the data in Table 3 it is important to bear in mind that there are currently 2033 registered contractors in Cyprus, according to the records of the Council for Registration and Control of Building and Civil Engineering Contractors of Cyprus [23]. Currently, there are 202 contracting companies registered with the Cyprus Recycling Organization and 187 with KODA. The data in Table 2 reflects only the production/reuse/recycle of CDW from the registered members which are about 20% of all professional contractors. Given this low registration rate, there is a significant percentage of CDW production **which remains unaccounted for**. Furthermore, it raises serious concerns about these CDWs' handling and disposition. It is encouraging, however, to see that the registered members are in high compliance with current legislation and that the collective systems are providing useful statistics.

Data from the major processing plants, presented in Table 4, indicate a high degree of reuse and recycling of the CDW received. Regarding the qualitative composition of CDW, although the sample of them arriving at the CDW processing units is small, it is however considered a reliable source of data.

3.3. CDW Management Parties and Responsibilities

The management of CDW in Cyprus involves a wide range of parties from the public and private sectors. All the CDW activity in Cyprus is overseen by the Ministry of Agriculture, Rural Development and Environment. In this section we describe the main actors involved in the management of CDW in Cyprus and their responsibilities:

Owner's responsibility

The project owner (construction and demolition) has the full responsibility for managing the produced CDW [Reg 5, Annex. (1)] and needs prior to the start of any project, to prepare and maintain a comprehensive management plan within the construction site [Reg. 7, Ann. (1α)], which it must include: a) The name and address of the owner of the project, b) project description, timetables and a copy of the title deed/lease of land within which will run the project, c) quantification per item that falls within the category 17 [15] volume or weight of CDW estimated to be produced during the implementation of the technical work or construction, d) management methods to be applied for CDW, e) contracts with waste managers and f)to lodge a bank guarantee to the competent authority to ensure fulfillment of obligations.

No work can start unless an integrated management plan to perform the project cannot start before the preparation of the integrated management plan or the authorization of the management form of CDW in the case where the total mixed compressed material CDW by volume (by volume) is up to 25 cubic meters [reg. 5, Ann. (1 c)].

Table 4: CDW Received and managed by two CW Processing Plants [19, 22]

CDW Received by Processing Plants	2012 (tonnes)	2013 (tonnes)	2014 (tonnes)
M.S. Skyra Vassas Ltd	48,523.65	47,668.07	26,863.38
Skyra Lima Ltd	20,477.31	18,135.650	31,634.08
Total CDW Received	69,000.96	65,803.72	58,497.46
Reused	12,000	14,210.84	1,280.58
Recycled/Processed	25,000	56,038.37	62,753.01
Deposited in Sanitary Landfills	3,000	11,663.75	9,070.09

The Owner may transfer by contract to the CDW producer (Contractor) the liability of managing the CDW as it is arising from the provisions of Regulation 5. The Owner is dismissed of the above obligations and the Contractor is fully obliged in Managing the CDW.

CDW Contractor's Responsibility

According to legislation, producers of CDW in the construction sector (construction works contractors, demolishers, etc.) are obliged to either be a member of a collective CDW Management Systems (organization with many participants) or to maintain and operate a licensed CDW Management System (single entity organization).

Contractors obligations in more detail are as follows: Prepare an Integrated Management Plan for CDW [Reg. 7, Annex (1a), CDW management costs, quantities, storage period, the collection and transfer of CDW to a licensed trustee, the rationale behind the management of CDW and management method , in order to achieve a high level of material recovery, recycling and reuse; and to achieve a high degree of co-operation between all actors involved in the management of CDW). Additionally, they are obliged to either be a member of an authorized collective CDW Management Systems (organization with many participants) or to maintain and operate an individual licensed CDW Management System (single entity organization) [Reg. 7, Annex. (2a and 2b)]. Payment of the guarantee to ensure fulfillment of its obligations is done through the system. The CDW individual or collective management system operator must prepare and submit a detailed annual report comprising a technical and financial party by 30 April of each year for the previous year. The Secretary keeps a register of CDW producers.

CDW Management Systems

The CDW Management Systems are non-for-profit private entities owned by one or more contractors. CDW management systems are responsible to [24]:

(i) ensure the compliance of their members with the current Legislation
(ii) collect and maintain data records regarding CDW quantities, their collection, transport, disposal and recycling of waste and report to the Competent Authority
(iii) promote waste hierarchy and achievement of recycling objectives
(iv) rational management of CDW
(v) achievement of: high-level recovery materials, their recycling and reuse
(vi) achievement high degree cooperation of all of the involved stakeholders

Currently, there are three (3) Collective and four (4) Single CDW Management Systems in Cyprus. It is noted that contractors that are members of CDW managements systems in Cyprus amount to approximately 20% of the total licensed contractors. [20]

We should stress here that the individual & collective systems do not issue licenses for Management or Collection and Transport of CDW. Rather, it is a commitment of the contractors to achieve the rate of recycling (e.g 70%) which they themselves report to the Competent Authority to secure approval (not a permit) of an individual or collective management system of CDW.

Licensing of CDW Processing Plants - Registration of Collectors / Carriers in the Waste Management Record

It is forbidden to treat or dispose of any waste without a waste management license issued. Managing of the inert waste that it is generated on site requires the contractor to secure a registration certificate from the Waste Management Record. Additionally, the produced CDW cannot be processed in situ for reuse or land treatment from which there is a resulting benefit for agriculture or ecological improvement (R10) since they are considered waste and have to be transported to Licensed Units for Processing/Recycling exclusively by collectors-carriers, registered under the Waste Management Record for Collection-Transport (Identification and Monitoring Form).

The gate fee for CDW (mixed debris) at the processing plants in Cyprus exceeds the €30/tonne. The prices of the treated aggregates depending on the screening and the quality may fluctuate from €2-5/tonne [25]. The detailed description of the life-cycle of waste from excavation, construction and demolition waste (CD&E) in Cyprus, the appropriate environmental management of such waste, takes place in only a small proportion of the total CD&E wastes produced.

4. Legal Framework

All member States of the EU and of the EEA are constrained by the principles and targets introduced by EU waste legislation. In 2008, the community voted the Directive 2008/98/EC on waste (Waste Framework Directive) [5] defining the framework and the hierarchy in waste management as follows:

a) prevention,
b) b) preparing for re-use,
c) recycling,
d) other recovery, e.g. energy recovery, and finally
e) disposal.

Figure 4: Hierarchy in Waste Management [26]

The Directive requires that the Member States should adopt waste management plans and waste prevention programmes. In Cyprus, The Dept. of Environment is responsible for enforcement for the management of CDW (licensing and inspection). Hence, in accordance with Article 28 of Directive 2008/98 / EC (Article 35, L.185 (I) / 2011) on waste, Cyprus back in 2015, has prepared a Waste Management Strategy and within the aforementioned framework, the Department of the Environment has drafted a waste Management Plans for the remaining waste streams 2016-2022 in order for the Republic of Cyprus to comply fully with the article. Furthermore, the Cypriot environmental legislation is under continuous development and harmonization with EU legislation. The legislative framework for waste management in Cyprus is defined by the ***Waste Law of 2011 (N. 185(I)/2011) and its amendments of 6(I)/2012, 185(I)/2011, 32(I)/2014, 55(I)/2014, 31 (I)/2015, 3(I)/2016 και 120(I)/2016, which transposes the EU Waste Framework Directive (2008/98/EC) into Cypriot law and The Solid and Hazardous Waste (Management of Excavation, Construction and Demolition Waste) Regulations of 2011 (RAA 159/2011 and 220/2013).*** All provisions in the WFD related to CDW form the legal basis for the management of CDW in the country. It should be stated that there is no specific EU legislation for the CDW in addition to the WFD.

The regulations apply to the owners and legitimate contractors of projects and make mandatory the carriage and handling of construction, demolition waste in suitable Processing Units. In particular, the provisions of these Regulations intend: a) on the prevention of waste and limiting the harmful effects of waste on the environment and on human health, b) in recycling, reuse and recovery CDW and to improve the environmental performance of all economic sectors involved in the general construction business and especially the stakeholders/operators directly involved in the management of such materials, c) on setting quantitative objectives and medium to long-term timeframes for their implementation, d) on defining requirements in terms of reusing CDW including recycling, e) separation of CDW to the source, f) to foresee measures in order for all actors involved in the management of the CDW to comply with the context of the "polluter pays" principle, and z) on the open source data for users and consumers.

It is important to mention that the WFD underlines that when a waste ceases to be a waste, it becomes a secondary raw material if it fulfills the end-of-waste criteria, and explains how to distinguish between waste and by-products. In addition, it requires that waste should be managed without endangering human health and harming the environment.That is, however, contradicting to the definition of CDW in Cyprus which is found in the Solid and Hazardous Waste (Management of Excavation, Construction and Demolition Waste) Regulations of 2011 (P.I. 159/2011), and is as follows:

'waste from excavation, construction and demolition means any material or object deriving from excavations, construction and demolition waste is considered as waste and is included in category 17 of the Order of Solid and Hazardous Waste (Waste Catalogue) of 2003 (RAA. 157/2003) [27].

All material mentioned above are considered to be waste and not recycled material or by-products. Additionally, there is a distinction between waste deriving from excavation, construction and demolition activities, but no distinct definitions are provided in the relevant legislation. Although soil and naturally occurring excavated materials during the course of construction are included in the definition of CDW, these are not considered in the definition of CDW for calculating the WFD target as presented in Commission Decision 2011/753/EU. The European List of Wastes (LoW) categories excluded in the latter definition are 17 05 04 and 17 05 06.

5. Standards

Since 1/5/2004 the responsibility for the control of construction products has been undertaken by the Ministry of the Interior on the basis of the Essential Requirements Regulations that wants these products, when they are available to market, to meet the specifications laid down in the relevant European Standards and to this end bear the "CE" conformity marking. This legislation is in line with the relevant European Union legislation.

According to the provisions of the Essential Requirements (Bulging Products) Regulations, the Minister of the Interior has determined the levels of the essential requirements concerning:

- aggregates for concrete, CYS EN 12620,
- aggregates for bituminous mixtures, CYS EN 13043,
- aggregates for mortar, CYS EN 13139, and

- aggregates for base and sub base of roads construction and filling materials, CYS EN 13242.

These specifications are covered in the harmonized European Standards.

The majority of buildings in Cyprus are built based on a reinforced concrete structure. Concrete is a composite construction material with coarse/fine aggregates and cement which binds them together through a hydration process. As such, concrete, as a CDW cannot be expected to separate back to its raw constituents. It may be crushed, down to a particular grain size, the resulting grain containing the original aggregate along with hardened cement paste forming a recycled concrete aggregate (RCA). Notwithstanding, the use of recycled aggregate remains low in Cyprus due to a lack of confidence and of national quality standards and regulations for recycled aggregates. At a European setting however, the use of recycled aggregate has been under investigation for at least 20 years. The European project, European Alternative Materials (ALT-MAT), for example, was established in 1998 to encourage the use of alternative materials in road construction and develop methods of evaluation for these materials [28]. National standards that specify use of RCA in the construction of road bases and sub-bases are in existence in European countries such as Finland, Sweden, Denmark, The Netherlands, Portugal and France [29].

Furthermore, several codes, regulations and guidelines dealing with the use of recycled aggregate in concrete applications around the world are available, out of which documents from the countries such as Japan, Hong Kong, Portugal, Brazil, European Union and recently Australia are most comprehensive [30].

6. Barriers to sustainable management of CDW in Cyprus

Even today, after the authorization of six processing units, the 4 individual and the 3 collective management systems, large quantities of CDW are being discarded in illegal and largely uncontrollable sites. Hence, it's difficult to be detected by environmental inspectors. Sometimes are being illegally managed and as a result none of the procedures takes place, and/or are being re-used on site for landscaping and other engineering purposes. Therefore, the amount of CDW re-used on site is not reported as CDW generated or treated and thus is not taken into account for the calculation of national/EU targets [31]. In this section we identify several barriers to a sustainable management of CDW in Cyprus. These are the following:

- The regulations for CDW are still in a transition phase.

- Not well defined and -clarified definitions in the WFD and non-proper transposing of the WFD into the Cypriot law /regulations. In particular, Article 11.2 stipulates that "*Member States shall take the necessary measures designed to achieve that by 2020 a minimum of 70% (by weight) of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the List of Wastes shall be prepared for re-use, recycled or undergo other material recovery*" (including backfilling operations using waste to substitute other materials). However, the definition of CDW in Cyprus which is found in the Solid and Hazardous Waste (Management of Excavation, Construction and Demolition Waste) Regulations of 2011 (RAA. 159/2011), defines as follows: *waste from excavation, construction and demolition means any material or object deriving from excavations, construction and demolition waste that is considered as waste and is included in category 17 of the Order of Solid and Hazardous Waste (Waste Catalogue) of 2003 (RAA. 157/2003),* without excluding naturally occurring material defined in category 17 05 04 and as it was expected for the purpose of verifying compliance with Article 11(2)(b)81, also the amount of waste used for backfilling operations in not reported separately from the amount of waste prepared for re-use or recycled [32].

- There is no strict control and enforcement of Environmental policy on the precautionary principle, the polluter pays principle and the principle of co-operation thus involved (producers, distributors, consumers, disposal and recycling companies, as well as government offices)

- Manufacturers and distributors most likely are not designing their products in such a way as to minimize the amount of waste produced during manufacturing and, finally, to facilitate an ecological removal of those components of the waste which can no longer be reused.

- The absence of a policy requiring designers, builders and contractors to use an appropriate percentage of recycled CDW materials

- Underemployment of environmental inspectors/low organizational capacity for implementation and/or enforcement of the law. Delays in the administration of fines or non-conviction of CDW management rules violators

- The general mentality in the construction sector (and of the general public in Cyprus) is that CDW is not considered to be a waste stream that requires immediate attention and treatment. There is the misperception that CDW can be disposed somewhere and left there since its inert nature makes it harmless for human health and the environment

- Contractors/owners prefer to avoid the cost of CDW management so they either illegally discharge or reuse on site or prefer to pay the penalties for not complying with the directives and regulations that force them to manage their produced wastes which in most of the cases are much lower than the cost of managing their produced waste
- The high cost of transport and disposal in collection areas

- General lack of skills and knowledge to organise effective systems of CDW management

- Lack of knowledge and understanding by agents and all agents involved in the construction industry of the law on how to prevent CDW

- Lack of knowledge of the construction industry professionals regarding the implementation of the CDW legislation

- No market/no demand for recycled CDW, natural materials are always preferred over recycled materials in the construction works

- No pull effect from market conditions

- Lack of incentives for recycling

- According to legislation, actors in the construction sector (construction works contractors, demolishers, etc.) are not allowed to utilize the waste produced as a byproduct or resell it and move from linear to circular economy since at the moment they are only allowed to transfer their waste and pay the processing plants a gate fee preventing them from creating a revenue. In case they decide to have an on site processing system there no standards for recycled materials /standards on the quality of secondary materials from CDW.

- There is no implementation of secondary raw material regulation and standards in the Cyprus waste framework policy that would specify: the nature of the waste which could be used as a secondary raw material in construction and/or the minimum concentrations of heavy metals and aromatic hydrocarbon

- Actors in the construction sector are only allowed to use uncontaminated soil and other naturally occurring material excavated in the course of construction activities, where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated. However, the waste status of uncontaminated excavated soils and other naturally occurring material which are used on sites other than the one from which they were excavated should be considered in accordance with the definition of waste and the provisions on by-products or on the end of waste status under the WFD. which comes into **contradiction** with the mines and quarries *regulation (Law) 5 of 1965, 88(1)/1995, 132(1)/2001, 63(1)/2003, 76(I)/ 2009, 9(I)/2010, 12(I)/2010 and 35(I)/ 2011* which stipulates that even such wastes produced

(construction, demolition and excavation) are considered to be a waste under the WFD, some of the materials are also considered to be mine or quarry material and the constructor or owner must pay 1.25 fee per tonne.

- Lack of confidence in the quality of construction and demolition recycled materials. There is also uncertainty about the potential health risk for workers using recycled C&D materials. This lack of confidence reduces and restricts the demand for CD recycled materials, which inhibits the development of CDW management and recycling infrastructures in the EU. For this reason, the Construction and Demolition waste protocol includes good practices from across the EU that can be sources of inspiration for both policymakers and practitioners. It also includes an overview of definitions and a checklist for practitioners

- Misunderstanding and unfamiliarity with the EU Construction & Demolition Waste Management Protocol Ref. Ares(2016)6914779 - 12/12/2016
- Unfamiliarity with the Guidelines for the waste audits before demolition and renovation works of buildings Ref. Ares(2018)4724185 - 14/09/2018

- Cost of recovery activities is higher than the prices of the recycled end-product. Because of the low cost associated with this alternative, compared to the additional costs of proper waste treatment. The availability of cheap primary materials compared to the higher cost of recycled CDW

- Limited awareness on the issue Publicity - information - knowledge from users and consumers/Conservative determinations and clarifications on the responsibility of all those involved in product management, such as material suppliers, producers, importers, traders, distributors, public authorities, local authorities, institutes and institutions, etc

- There is no official way of estimating the volume of CDW re-used this way on site

- Owners/contractors might consider the gate fee for construction and demolition at the treatment units in Cyprus expensive

7. References

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