

Supported by:



on the basis of a decision
by the German Bundestag

CURE+

CENTRES FOR URBAN RESOURCES,
REUSE AND REMANUFACTURE

Baseline study

City of Kavala, Greece

Sara Rueda Raya, Frazen Tolentino-Zondervan, Patricia van Hemert, Willem van Winden

Table of Contents

Contents	1
Lists of Abbreviations.....	2
1. Introduction.....	3
1.1. City of Kavala	3
1.2 EUKI Funding.....	3
1.3 Problem Statement and justification for selecting this city.....	4
2. Methodology	6
3. Construction and Demolition Waste (CDW) Management practices	7
3.1 Legislation concerning CDW in Greece	7
3.2 Waste Management Plans and Strategies	8
3.3 CDW Management/Alternative Management.....	9
3.4 CDW stream analysis.....	10
4. Towards more circular CDW management.....	12
4.1 Current city vision and strategies	12
4.2 Current Innovative Practices and Experiments	14
4.3 Barriers and Enablers	15
5. Recommendations.....	24
References	25
Appendix A: Objectives OF THE ECDW strategic plan 2020-2030	26

Lists of Abbreviations

AWM	Alternative Waste Management
CDW	Construction and Demolition Waste
CE	Circular Economy
CURE+	Centres for Urban Resources, Reuse, and Remanufacture
ECDW	Excavation, Construction and Demolition Waste
EPR	Extended Producer Responsibility
EUKI	European Climate Initiative
EU WFD	European Union Waste Framework Directive
NECP	National Energy and Climate Plan
NWMP	National Waste Management Plan
PROs	Producer Responsible Organizations
RWMP	Regional Waste Management Plan
URC	Urban Resource Centre
WPP	Waste Prevention Plan
YPEN	Hellenic Ministry of Environment & Energy

1. Introduction

1.1. City of Kavala

Kavala is a coastal municipality in the North Aegean Sea and sits in the Eastern Macedonia and Thrace region of Greece. Being the capital of the prefecture with a total of 125,000 residents, Kavala city has a population of approximately 56,000 inhabitants (Municipality of Kavala, 2023). Its economy is run by large service industries, mostly related to tourism and public sectors such as agriculture, fishing, and quarrying. The other industries in the city include agrifood, oil, and chemical sectors. Based on the General Urban Plan, the municipality has a total area of 722.75 ha, and is expected to expand further by 240 ha (Chatzivatyriti et al., 2022).

Kavala has airport and ports rich in history and antiquity. Its city is accessible through different means, such as by sea via the port of Kavala, by road through the Egnatia Motorway and by air, through the Kavala Airport. The airport alone serves international flights on certain months – from May to September, and domestic flights year round. There are around 350,000 total passengers annually (Chatzivatyriti et al., 2022).

The Municipality of Kavala is active in taking part in several initiatives that integrate circular economy in its policies. In terms of the construction and demolition waste (CDW), the interest is mainly related to the significant number of buildings that are currently in bad condition and require demolition, and to several small-scale renovations to provide short-term accommodation to tourists, as a result of booming tourism industry (Samourkasidou et al. 2022; Chatzivatyriti et al., 2022). The significant quantities of bulky waste, as well as CDW, are a major challenge for the municipality. Based on a 2016 city report, there are approximately 530 buildings classified as ready for renovation, with 23% of them located in the wider city centre.

1.2 EUKI Funding

CDW is the most significant waste stream in the European Union (EU) in terms of mass. Around 340 million tons of CDW were generated between 2010 and 2018 in the EU (EEA, 2020). Therefore, the EU Circular Economy (CE) Action Plan (EC, 2015) has identified CDW as a priority waste stream. The Waste Framework Directive sets a 70% recovery target for CDW by 2020. Most member states achieved this target on time. However, the recovery rate was mainly based on backfilling or downcycling, which hampers the implementation of CE objectives (Galvez-Martos et al., 2018). Currently, most material streams from demolition and renovation works are unavailable for reuse or upcycling activities (EEA, 2020). Thus, the recovery potential of CDW in the EU is still under-exploited, with current CDW streams unsuitable for reuse or closed-loop recycling (EEA, 2020).

The Centres for Urban Resources, Reuse, and Remanufacture project, also known as the CURE+, aims to support the CE Action plan by promoting and designing urban CE practices to track, trace, reduce, reuse, repair, remanufacture, and upcycle household-related CDW.

This will be done by learning from the best practices elsewhere and mapping the current waste management practices in four participating European cities, namely Riga (Latvia), Tartu (Estonia), Kavala (Greece), and Barcelona (Spain), to develop locally tailored solutions for each city. Developing tailored-made solutions requires working with local stakeholders from cities/municipalities, private businesses, and universities while putting citizens at the forefront of this initiative. This report will focus on the city of Kavala.

The CURE+ project is funded by the European Climate Initiative (EUKI). EUKI is an initiative launched in 2017 by the German Federal Ministry for Economic Affairs and Climate Action to improve collaboration among the member states on climate action. EUKI supports organizations within the EU to implement plans related to contributing to the expansion of renewable energy, improving energy efficiency, and reducing CO₂ emissions. Furthermore, EUKI-funded projects aim "to strengthen technological advances and political dialogue, social justice in climate action as well as climate education and sustainable economy" (EUKI, 2017).

1.3 Problem Statement and justification for selecting this city

The EU's transition to a CE will reduce the pressure on natural resources while creating sustainable growth and jobs (EMF, 2015). Achieving the EU's 2050 climate neutrality targets is also a prerequisite. In order to contribute to this goal, the CURE+ will specifically address the following issues:

- Lack of knowledge of current CDW flows, their composition, and their characteristics to identify them as recoverable. In each partner city, there is a lack of reliable and available data and classification systems.
- Different understanding and varied accounting systems of EU-member states for waste recovery operations; as a result, there is a lack of comparable (baseline) data on how much of CDW is currently recovered, and it is difficult to measure improvements over time.
- A habit of giving preference to raw materials over secondary materials (originated from waste) for two reasons: 1.) They are cheaper; and 2.) Warranties and standards assure their quality, giving consumers and companies a limited incentive to use recovered materials.
- Lack of knowledge and resources to rethink value chains and business models, product design, and the overall economic systems to achieve the lowest environmental impact.
- Communicating and promoting long-term benefits from implementing circular actions in the building sector.

In sum, a common understanding, exchange, transfer of knowledge, and capacity building are crucial for the CURE+ partner municipalities to achieve the EU climate goals.

Kavala is an important city of study for CDW for three main reasons. First, the National Circular Economy Strategy of Greece has included circular economy activities for CDW. Second, there are a number of important old buildings in Kavala city that demonstrate artistic

beauty, but at the same time require renovation. However, due to their architectural value, they cannot be demolished since they are under the Service of Modern Monuments and Technical Works of Central Macedonia. Along with this, Kavala city would like to handle the increasing demand for tourism due to its enormous potential to boost the economy, but the lack of opportunity for major hotel developments led to some of the older, privately owned properties to be renovated for short leasing. This resulted to a huge volume of CDWs as well as bulky waste, and therefore needs to be managed (Samourkasidou et al. 2022). Third, Kavala has the organizational and institutional capacity to raise funds from various regional, national and European programmes as demonstrated by its participation in several initiatives, to develop local strategies, and document plans to enhance circularity in the building sector (Chatzivatyriti et al., 2022).

1.4 Aim of Article

The CURE+ project aims to contribute to a transition towards CE processes related to CDW in four EU municipalities (Riga, Tartu, Kavala and Barcelona). This involves engaging local stakeholders in waste prevention, upcycling wastes, and decreasing reliance on virgin raw materials. Local authorities play a crucial role in climate change mitigation through the development and execution of CE policies at the local level. Therefore, they must be provided with the necessary knowledge and tools to promote and evaluate such initiatives effectively.

Comprehensive studies have been conducted in each CURE+ municipality to support this goal. This report is focused explicitly on the city of Kavala (Greece). The aim of this report is twofold:

- First, it highlights the unique aspects of Kavala, including its CDW management approaches, legal and policy frameworks, city visions and strategies, innovative practices, and enablers and barriers for CDW management.
- Second, recommendations on organising URCs as an innovative approach for CDW management are formulated using the baseline insights obtained from this city.

1.5 Article Roadmap

The sections of this report are structured as follows. Chapter 1 introduces the city of Kavala, the funding body behind this project, the problem statement, and justifications for selecting this city, followed by the aim of this article. Chapter 2 presents the sources of information in this article, which include interviews and reports. Chapter 3 provides an overview of the CDW management practices, based on national and local level policies and regulations and CDW stream analysis. Chapter 4 discusses the current city vision and strategies, innovative practices and experiments, and the barriers and enablers to more circular CDW management. Chapter 5 recommends how an Urban Resource Centre (URC), as an innovative experiment, can be organized to manage CDWs in Kavala better.

2. Methodology

This report uses qualitative research using a case study method. It obtained information from desk research, documents from municipality of Kavala, in-depth interviews, and a validation workshop. The documents from municipality of Kavala include national and city documents on Legislation for Waste, Waste Management Plans (WMPs) of Greece, and project reports in which Kavala city participates in. Some of these reports were written in Greek and were translated into English. The desk research was supplemented by interviews, which were conducted in May 2023. The interviews were conducted among stakeholders comprise of public authorities, academics, citizens, and businesses. The summary of their profiles is presented in Table 1. All interviews were conducted in person and were recorded via MS Teams. The transcripts of interviews were generated using the same platform and were analyzed by coding relevant answers to the themes of this report. The information obtained from the reports and interviews was validated and supplemented through a workshop held among city stakeholders in Barcelona in October 2023. The representatives of Kavala city were also included in Table 1 as part of the sources of information in this report.

Table 1 Profile of the interviewees in Kavala City

Interviewees	Type of stakeholders	Profile
1	Academia	Assistant Professor, AUTH Department of Engineering
2	Academia	Associate Professor, AUTH lab of Mechanical Engineering
3	Public authorities	Deputy Mayor and head of quality of life Stavridis
4	Industry	Medusa waste management company
5	Citizen Civil society	Representative of Neapolis Neighbourhood Association
7	NGO	President of NGO Pnoi
8	Public authority	President Technical Chamber East Macedonia
9	Industry	Technical consultant of the state
10	Industry	Supervisor of unit (Vougioukli SA recycling company)
11	Public authorities	Representative Municipality of Kavala
12	Public authorities	Consultant for Municipality of Kavala

3. Construction and Demolition Waste (CDW) Management practices

This section identifies the different policies or regulation frameworks in the city of Kavala and Greece, and the CDW stream analysis.

3.1 Legislation concerning CDW in Greece

The National legislation for waste (Law 4819/2021) of the Greek government follows directly from the EU Waste Framework Directive or WFD (2008/98/EC) framework. The Hellenic Ministry of Environment & Energy (YPEN) is responsible for setting the national policy related to waste management, sketching the draft legal framework for waste management, and presenting the National Waste Management Plan (NWMP). The NWMP together with the 13 Regional Waste Management Plans (RWMPs) present several action points and measures that will contribute to meeting the EU targets, while at the same time achieving the maximum environmental, social and economic sustainability benefits. The various laws that are delivered, and the following that are discussed below, are directly linked to the management of CDWs.

- *National legislation for waste (Law 4042/2012)* – Under this law, all provisions in the EU WFD (2008/98/EC) in relation to CDW are valid for Greece and serves as the legal basis for the management of CDW in the country.
- *Joint Ministerial Decision 36259/1757/E103 of 2010* – This law is related to the alternative management of excavation, construction and demolition waste (ECDW). All actors involved in the management of CDW have obligations to enhance the re-use and recovery of CDW based on the waste hierarchy.
- *Law 2939 of 2001* – This law formulates the principles of alternative waste management of the CDW and requires systems for organizing and managing CDWs. In addition, this law also includes the fines and other administrative and legal sanctions for non-compliance with the regulation.
- *Law 4030 of 2011* – This law is related to the ‘New way of issuing building permits and control of construction’. Article 40 describes permit issuing for CDW.
- *Law 4067 of 2012* – This ‘New Building Regulation’, where Article 17 specifies that for the construction of any building, alternative management of waste from ECDW should be applied.
- *Law 4495/2017 (GGD 167A/3-11-2017)* – This law pertains to the “Control and protection of the Building Environment and other provisions”. It focuses on the mechanisms and methods of quality control of the building environment, regulates the framework of construction, the control of the implementation of spatial planning, the issues related to public areas, and the environmental balance.
- *Circular No. Pr. 129043/4345/8-7-2011* – Also known as the “Implementation of legislation for the management of non-hazardous solid waste”. This law aids in the implementation of current legislation related to the management of solid (non-

hazardous) wastes that include CDW. It specifically explains the legal framework for collection and transportation of CDW.

3.2 Waste Management Plans and Strategies

This section discusses the different levels of Waste Management (WMP) plan in Greece, starting from national, regional, and local levels.

National Waste Management Plan (NWMP)

The Greek WMP, which was delivered in 2015, states that all waste streams are analysed and specific measures are proposed for the environmentally sound management of each waste stream following the Waste Prevention Plan (WPP) and waste hierarchy of EU for efficient use of waste. The WPP provides specific measures on four priority waste streams, namely the food waste, paper waste, packaging waste and Waste Electrical and Electronic Equipment. A specific section of WPP also provides measures for waste prevention in CDW, which are mostly limited to promoting information and education about waste prevention and engaging business, while there are no binding prevention targets attached to this waste stream.

By the end of 2019, the number of waste processing units for CDW amounted to approximately 100. These units cover 63% of the Greek territory.

The targets of the WMP (2015-2020) have changed throughout the years. Overall, the targets are increasing as specified below:

- By January 1st, **2012**, reuse, recycling and recovery of CDW should reach at least **30%** relative to the total weight of the produced CDW.
- By January 1st, **2015**, reuse, recycling and recovery of CDW should reach at least **50%** relative to the total weight of the produced CDW.
- By January 1st, **2020**, reuse, recycling and recovery of CDW should reach at least **70%** relative to the total weight of the produced CDW.

The revised WMP (2020-2030) is built upon the previous one. According to the WMP 2020-30 the evolution of the CDW until 2030 is like what is described in Table 2.

Table 2 Evolution of the CDW until 2030

CDW	2018	2020	2025	2030
demolition and construction	1,500,000	1,436,790	1,578,909	1,651,251
excavations	3,443,092	3,298,000	3,624,220	3,790,272
Total CDW (t)	4,943,092	4,734,790	5,203,130	5,441,523

The new objectives until 2030 will be:

- Institutionalization of the obligation for alternative management of the generated CDW in public and private works, with the adaptation of the relevant legislation or the process where required.
- Rationalization of the operation of AWMs (Alternative Waste Management) and restructuring of financial contributions.
- Development of markets for the secondary materials resulting from the processing of CDW.
- Separate collection for excavation waste, which is excluded from the CDW targets, as well as for the excess concrete generated during construction works.

Regional Waste Management Plan (RWMP)

The RWMP is made in alignment with the NWMP. This plan includes the condition for establishing a system for monitoring the production and management of CDW, as well as for using recycled or secondary materials in the construction sector (Samourkasidou et al., 2022). The Kavala Regional Unit is expected to produce 265,000 tons in CDW in 2020. The RWMP in Eastern Macedonia and Thrace, also known as RWMP-EMT, was delivered in 2016. The RWMP-EMT does not specifically cover CDW, apart from generally adopting the goals of the relevant NWMP. However, it should be noted that the RWMP is in general outdated and is currently under revision (Enviterra, 2020).

Local Waste Management Plan

At municipal level, the Local Waste Management Plan for the Municipality of Kavala has been released in 2021. The CDW is out of the scope of the municipality's waste collection service, therefore no special provisions are currently made regarding CDW. However, local authorities are obliged to collect CDW that come from various public activities such as constructions, repairs, renovations, demolition, excavation, asphalt removal, etc., and from abandoned CDW by private construction projects often at small scale. The alternative management of CDW is organized either by each Municipality itself as Individual System or in collaboration with a PRO (usually the latter) (Municipality of Kavala, 2023).

3.3 CDW Management/Alternative Management

The "Alternative Management" as defined by the National Legislation, is: "the collection, transport, temporary storage, reuse, processing and recovery of CDW, so that by reusing or recovering them they return to the current market or be promoted to other uses" (Enviterra, 2020).

The Alternative Management System is grounded on the principle of Extended Producer Responsibility (EPR), which is based on economic rewards for producers for designing environmental friendly products and making them responsible for the cost of managing the

product at the end of their life cycle. A range of waste streams including clear quantitative targets for recycling and recovery in European legislation has been included in the institutional framework of Alternative Management in Greece. However, the inclusion of these waste streams are not necessarily in the context of extended producer responsibility, such as ECDW (Excavation, Construction and Demolition Waste). Thus, the *JMD 36259/1757/E103/2010* (refer back to Section 3.1), which contains the terms and conditions for the alternative waste management for ECDW, has been issued (Enviterra, 2020).

Under the Alternative Management Systems, all producers/ holders, manufacturers, traders, importers, are obliged to either organize or participate in alternative waste management. The Hellenic Recycling Agency (HRA), which is under YPEN, has been established in order to ensure the implementation of the alternative waste management in Greece. Specifically, HRA supervises all operations in relation to reuse, recycling, and recovery of all waste streams (Enviterra, 2020).

3.4 CDW stream analysis

The processes and the stakeholders that are involved in the management of the household CDW stream in Kavala Greece are illustrated in Figure 1. It begins with a customer doing a household renovation or project. The customer will contact a civil engineer, who will present a CDW management plan based on quality, quantities, and weight of wastes. The engineer charges around 200-300 euros for the service. After the material is weighed, the civil engineer makes a draft bill of quantities that goes to ANAKEM or ANABE¹, two collective systems for alternative management of excavation and CDWs. The ANAKEM or ANABE will prepare a collective system for alternative management, in which a contract of 1 or 2 days will be delivered to the customer. The customer pays ANAKEM, while the ANAKEM goes to the CDW management facility to give them the job to monitor the CDWs. The CDW management facility receives 70% of the total money and the 30% goes to ANAKEM.

The producer of waste (household or company) either brings the waste themselves or via the waste collector or transporter, which are truck companies or individual truck owners that have the license to transport the wastes. The waste collector costs on average approximately 50-100 euros and a maximum of 150 euros if the waste is too mixed. Afterwards, the waste will go to the recycling companies, and depending on the types, the waste will undergo either sorting or separation. Under sorting, the waste could either (1) go straight to downcycling and upcycling, or (2) treated. For downcycling, some (not so good quality) materials, such as bricks, are squashed to be delivered readily for customers, such as for agricultural roads and for embankments. Good quality materials, on the other hand, consist of around 60-70% stones. These customers of upcycled materials are the construction companies, municipalities, and individuals. For the waste that is separated by hand, 70% are downcycled

¹ ANAKEM and ANABE are both used for prefecture of Kavala, while ANABE is for Kavala municipality.

through crushing or shredding while 30% which includes metal, paper, plastic and carton are upcycled.

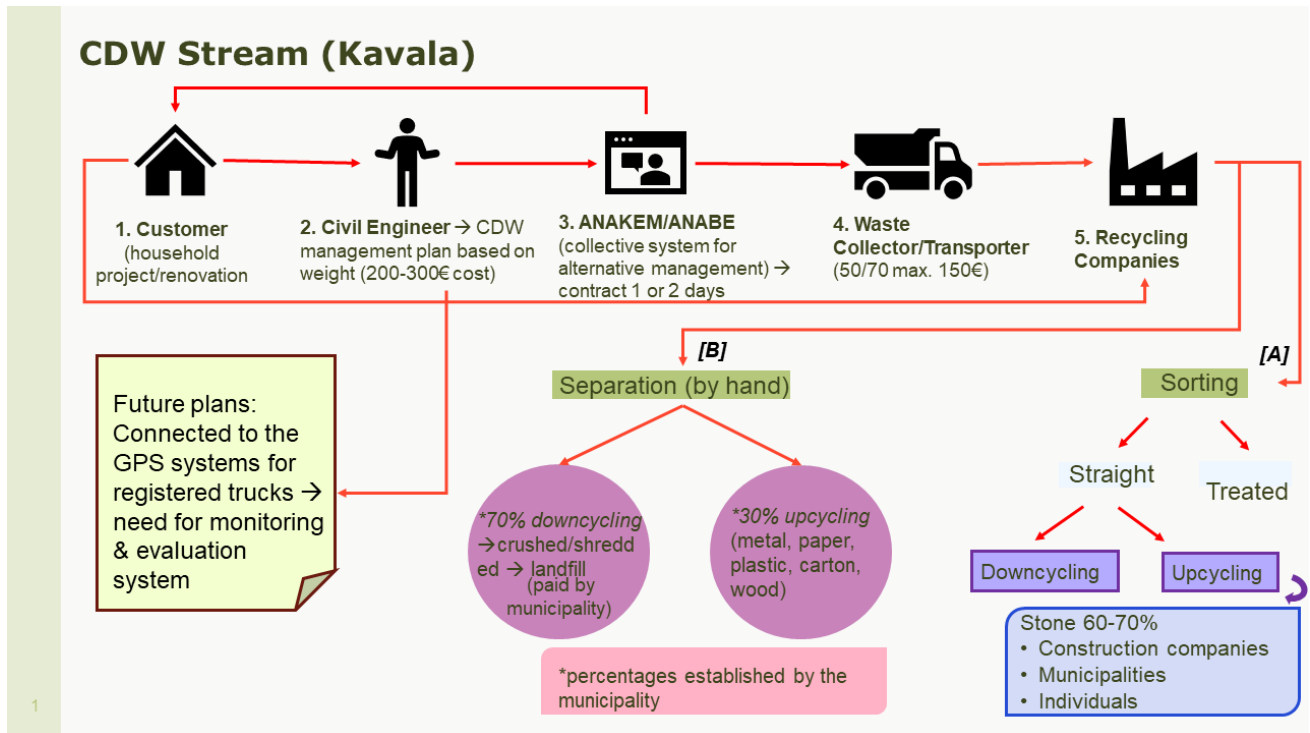


Figure 1 The processes and stakeholders involved in the management of CDWs in Kavala Greece (Sources: Interviews 2023 and Reports).

4. Towards more circular CDW management

This section focuses on three topics: the current city vision and strategies, the current innovative practices and experiments, and the barriers and enablers in managing CDW in Kavala Greece.

4.1 Current city vision and strategies

The city of Kavala adopts several frameworks in alignment with its circularity ambitions. For CDWs, there are initiatives and programs at European, national, and city levels. Figure 2 shows how these programs are translated from broad to specific city strategies and are discussed below.



Figure 2 The vision and strategies on management of CDWs that are translated to the case of Kavala city. From left to right (European, National, and City strategies).

European Level Strategy

The European level strategies in relation to CE management of CDWs consist of the EU Waste Framework Directive (EU-WFD) for CDW. The EU WFD has two goals: (1) To manage the CDW in an environmentally sound way, and (2) To reap the full potential of CDW by transitioning to CE. For the 2020 target, seventy percent (70%) of CDW by weight must be recovered through reuse, recycling, and preparation of other material recovery of non-hazardous CDW (European Commission, 2008).

National Level Strategies

1. Greek Waste Management Plan (Greek WMP)

The Greek WMP translates the EU WFD into its national strategy. In addition to this, strengthening circular activities are also part of these targets. The goals of Greek WMP are summarized as follows:

1. The target of 70% by weight of produced CDW should be prepared for reuse, recycled or recovered by the end of 2020 (Note: The lack of reliable data until 2023 makes it unclear whether this target has been achieved or not).
2. The geographical coverage of Alternative Management Systems (Extended Producer's Responsibility Schemes) will be increased.
3. Mandatory obligation for the alternative management of CDW in public and private works, by revision of relevant legislation and/ or procedures.
4. Providing justification for implementation of Alternative Management Systems and adjusting contribution fees.
5. Separation and collection of excavation waste that are not included in the management targets calculation, as well as for excess concrete that may arise during construction works.
6. Market development for secondary/ recovered materials from CDW processing.

2. National Circular Economy Strategy

The National Circular Economy Strategy identify measures that will promote use of recycled CDW aggregates whether in public or private construction (e.g., household or individual) projects. The appropriate framework of specifications, standards and certification of secondary materials will be created, as well as public procurement.

3. National Energy and Climate Plan (NECP)

The NECP is the Greek government's strategic plan related to climate and energy. The 2030 road map on climate and energy objectives include the sound management of CDWs and full adoption of Circular Economy principles.

City Strategy

The integrated management strategy on CDW of the municipality of Kavala can be considered as a key component of a circular economy policy that will in turn be used as a tool for the sustainable development of the city. If proven successful, Kavala can serve as a pilot for other Greek cities. The main strategy related to CDWs is the Integrated Action Plan (IAP).

Integrated Action Plan (IAP) city of Kavala

The IAP of the city of Kavala was delivered via the URBACT III URGE Project. This project is based on four interconnected pillars, such as (1) Human Resources, (2) Methods and Infrastructures, (3) Governance, and (4) Materials and Natural Resources. These pillars

guide cities toward successful governance of transitioning to a circular city in the construction sector. By operationalizing these pillars, the city of Kavala was able to formulate action points as part of the vision and strategies of cities in terms of enhancing circularity in CDW management. These action points, which are enumerated below based on the four pillars, will lead to specific results, and ultimately the vision of the city (Samourkasidou et al., 2022; Chatzivatyriti et al., 2022).

- (1) *Methods and Infrastructure/ Governance/ Materials and Natural Resources* – Elaboration of guidelines for reusing recovered CDWs products as raw materials (e.g. as raw materials for municipal projects);
- (2) *Human Resources* – Achieve stakeholder engagement and enhance knowledge on circularity, particularly on construction and demolition materials;
- (3) *Human Resources/Materials & Natural Resources* – Demonstration project on selective demolition and source separation;
- (4) *Human Resources* – Pilot CE standardization of recovered materials from municipal projects
- (5) *Materials & Natural Resources* – Integrated bulky waste management system;
- (6) Application of green procurement tendering guidelines in municipal projects.

4.2 Current Innovative Practices and Experiments

Downcycling of CDW materials is a practice in Kavala city. For example, recycled aggregates from the construction waste are used as backfilling for sub-pavement of roads (Interviewee 1, May 2023). Table 3 summarizes the current practices and experiments in the city of Kavala.

Table 3 Innovative practices and experiments in CDW management in Kavala city

Circular Activities	Local practices and experiments in Kavala
1. Recycling	<ul style="list-style-type: none"> - Mainly asphalt and soil and stones are produced as secondary materials. For example, many good quality stones that come from Kavala are crushed and produce very quality sub-based materials for mixtures, concrete, or asphalt mixtures (Interviewee 10, May 2023). - Recycled materials are given to Municipalities or other Public Authorities, for low scale public works.
2. Reuse	<ul style="list-style-type: none"> - Some of the PROs claim that all the materials entering the RUs are used entirely for backfilling activities, including restoration of quarries. - The existing CDW treatment facilities in Greece treat mainly the mineral fraction of CDW. - Some smaller parts of the stones, woods, and other materials are being reused. These are usually utilized in the road industry and regenerating

	<p>material (Interviewee 2, May 2023).</p> <p>- Another state of the art example is Imaret, a historical building in the Old Town of Kavala. This building is planned to be renovated re-using the exact same materials of the building (Interviewees 8 and 9, May 2023).</p>
3. Selective demolitions	<p>- Before demolishing, contractors have an obligation to make and to see if there are things in buildings that should be treated in another way. (Interviewee 2, May 2023). The selective demolition allows to separate the material during the demolition and therefore save some of the valuable structural materials to renovate other buildings of the same era in the same region, and that may not lose the traditional materials which are very scarce and very difficult to find (Interviewee 8, May 2023).</p>
4. Upcycling	<p>- The product of cement produces a lot of CO₂. Therefore, there was an experimentation phase for a project tries to find a more sustainable material to replace as much cement as possible. After 20 years of research, the burned coal produces dust, which is now being used to replace cement (Interviewee 1, May 2023). Another dust that the company produces, called “slag” is another material during fabrication process that is used for “green concrete” and replaced cement as material for concrete (Interviewee 1, May 2023).</p>

Source: Interviews, May 2023 & Reports

4.3 Barriers and Enablers

Several barriers and enablers were identified from the interviews and reports. Tables 4 and 3 summarize the collection of interview quotes including the sources of information, and categorize them together as part of barriers and enablers for circular management of CDW in Kavala city.

Table 4 Lists of barriers for a more circular management of CDW in Kavala city

Barriers (Factors)	Examples according to interviews
1. Legislative framework for managing CDW is either partial or lacking, and is not properly translated from national to local situations.	<p><i>“In the last 5 years, it is prescribed in the Greek legislation that there should be ‘green points’. But there is no Green points so far in Greece.”</i> (Interviewee 2)</p> <p><i>Partial or complete lack of implementation of the existing legal framework [in CDW management].</i> (Interviewee 10)</p> <p><i>“The legislation is always imposed on a national level, so there are not many degrees of freedom, let's say on the local level..., so when the legislation comes from the national government, they usually do</i></p>

	<p><i>not have the local knowledge necessary to differentiate between the cases and the markets” (Interviewee 10)</i></p> <p><i>“The Ministry for the development, I think, is for the past three years preparing some guidelines and standards for reusing construction, demolition, waste recovered materials in other projects...Unfortunately, these guidelines have not been delivered yet and they are not formal, so every municipality, including ours as well, we do not have a clear path or guidelines or instructions or whatever in order to include and integrate these processes in our projects” (Interviewee 3)</i></p> <p><i>“Civil servants and policymakers working in the field are hesitating to take a step forward and be innovative and recycle or upcycle because there is no legislative framework supporting them. So there is risk of having, let's say implications, even in actually paying out what they design, or even worse being prosecuted for that.” (Interviewee 3)</i></p> <p><i>“There's a high bureaucratic cost to issue the relevant permits [for processing, separating, managing wastes] and follow the environmental permit regulations in order to operate.” (Interviewee 4)</i></p> <p><i>“During our discussions with the municipality and with the mayor, we had suggested as a neighbourhood -and they liked it as an idea-, that there should be a specific date, only one day before which date the citizens could take out all their bulky waste and a car would come by to collect it all... but there was no actual thought in implementing it because they don't have the necessary equipment and personnel to do it, they can't schedule a truck that would pass by at least twice a month”. (Interviewee 5)</i></p> <p><i>“There is no legislative requirement for end of life and things like that, so every designer and contractor wants to minimize the cost.” (Interviewee 9)</i></p>
<p>2. Weak enforcement of regulations or systems for managing CDWs.</p>	<p><i>“Random private construction contractors would come to dump their construction waste [for free] so the one bin turned into two and there was a lot of waste because the municipality couldn't come in time to collect it all.” (Interviewee 5)</i></p> <p><i>“Despite the fact that there was the bin, because of Greek people's tendency to choose comfort/ease and because of the lack of monitoring and lack of fines, they would dump anything and everything and still next to the bin”. (Interviewee 5)</i></p>
<p>3. The market for CDW is either lacking or does not incentivize circular activities in CDWs.</p>	<p><i>- “In EU, recycled materials costs more. The quality is not good as the new material though, so people prefer the primary or original over recycled ones” (Interviewee 10)</i></p>

	<p><i>“The market [for recycled or reused CDW] is not yet fully developed in Greece in general” (Interviewee 3)</i></p> <p><i>“Others are not interested in managing bulky [CDW] waste because of the cost of managing bulky waste and then the market values are not high enough to justify the operations.” (Interviewee 4)</i></p> <p><i>“There is no mentality of reuse there [in several Greek municipalities] yet and there is no such local demand [for CDWs], let's say for something like that, you have to create the need...” (Interviewee 7)</i></p> <p><i>“If you could give some idea on how to promote the use of recycled material, because the EU policy till today, it's only to subsidize the production of recycled materials, which is not a feasible idea. If you don't create the demand, the market, it is meaningless”. (Interviewee 8)</i></p>
<p>4. The costs of virgin raw materials is cheaper than producing recycled materials.</p>	<p><i>“Specific materials we're talking about, let's say recycling concrete, is much more expensive than to produce it [virgin materials]. (Interviewee 8)</i></p> <p><i>“There is no market for recycled CDW. No financial incentives. Raw natural materials are still cheaper and easier to access than recycled.” (Interviewee 10)</i></p>
<p>5. Lack of knowledge on selective demolition by construction companies.</p>	<p><i>“There's also a problem of lack of demolition indications, meaning that when a construction company goes at the demolition of a house, there's no knowledge enough for selective demolition, so even material that could be easily reused, because they are mixed with everything and it's not done selectively, it kind of nullifies also material that could easily be reused.” (Interviewee 10)</i></p> <p><i>“There are only four or five companies, contractors that have the experience to build these [recycling] plants... Knowledge [is] concentrated in very few actors and they are not willing to cooperate.” (Interviewee 3)</i></p>
<p>6. Low amount of CDWs at local level.</p>	<p><i>“The amount of aggregates are very low, in Greece it is around 4-5 tons per capita, while Kavala has 3 tons per capita.” (Interviewee 10)</i></p> <p><i>“After having a CDW facility for many years, we saw that there is not a wide range...there is no business initiative/possibility for expansion... There is not a big enough volume of material to be able to work (right/enough)” (Interviewee 4)</i></p>
<p>7. Issue of lack of awareness, knowledge, and commitment from citizens.</p>	<p><i>“In the streets you will find illegal dumping of construction and demolition wastes” (Interviewee 2)</i></p> <p><i>“Sometimes, [they dump] big quantities while the materials can still be useful” (Interviewee 10)</i></p>

	<p><i>“Illegal dumping – in other open big areas in Kavala it happens more because there is more space.” (Interviewee 10)</i></p> <p><i>“They [citizens] are not accustomed to trying to find reuse solutions or persons that might be interested in using this waste. Let’s say a piece of furniture or whatever.” (Interviewee 3)</i></p> <p><i>“The majority of citizens, when they do projects like that [renovation] they dispose of their bulky waste next to the bins... I also see in many areas in the mountains dumped waste from these projects” (Interviewee 5)</i></p> <p><i>“There was a boom of Airbnb’s, which of course initiated the huge wave of bulky waste from the apartments that were renovated to serve such purposes. And we found ourselves in the municipality handling immense amount of bulky waste daily, bulky waste that were disposed without letting us know.” (Interviewee 11)</i></p> <p><i>“They [citizens] do not repair. It is not part of culture. Time to change the mindset.” (Interviewee 11)</i></p>
<p>8. Lack of regulation in terms of assurance on the quality of material.</p>	<p><i>“There are no specific regulations on how we are going to classify the quality of these (waste) materials before we use it to a product, and then certify the product itself.” (Interviewee 1)</i></p> <p><i>“There are some materials that are not acceptable, sometimes considered illegals by regulations.” (Interviewee 1)</i></p> <p><i>“The first target would be to standardize and have quality inspections of the produced [recycled] material. That [standards] not even exists at national level.” (Interviewee 8)</i></p>
<p>9. Lack of data on materials (e.g. old buildings, waste streams).</p>	<p><i>“I find it quite challenging because when we’re talking about old buildings, there is no data about what is there, so then there will need to be some kind of really thorough analysis”. (Interviewee 1)</i></p> <p><i>“One other issue is the lack of data regarding the flows of materials... [but we try to collect data now so there is improvement]” (Interviewee 3)</i></p> <p><i>“One such thing that does not exist right now, but it would be very useful is to have a database, let’s say, of sites and the quantity and quality of materials in these sites. So if one wants to use materials of a certain quantity, can look through the database, find the site where he or she can find the relevant materials, and use it for his project.” (Interviewee 8)</i></p>
<p>10. Lack of facilities to support management of CDW.</p>	<p><i>“We lack a central waste recycling facility, so we try to compensate for this lack of facility through measures such as pilot projects, and things like that. It’s not an easy task and has no practical results right now.” (Interviewee 3)</i></p>

<p>11. The costs of waste separation is very high or not attractive.</p>	<p><i>“...because the separation [of waste] is happening manually, this increases a lot the cost of the process and therefore it leaves minimum income/profit” (Interviewee 4)</i></p> <p><i>“The quality of the recovered materials and their market value is very low to justify any kind of investments in to optimize the separation process or include some mechanical steps or whatever”.</i> (Interviewee 4)</p> <p><i>“Companies that are handling demolition material, let’s say have a business feasibility study due to subsidies... It’s not feasible [if financed by themselves].” (Interviewee 8)</i></p>
<p>12. The geographical feature of Kavala is part of challenge for managing CDWs.</p>	<p><i>“Kavala is a very difficult city in terms of narrow streets and uphill slopes. It’s not very easy to determine sectors within the city and schedule frequent collection trips [of waste] in these sectors”.</i> (Interviewee 5)</p>

Source: Interviews, May 2023.

Table 5 The lists of enablers for a more circular management of CDW in Kavala city

<p>Enablers</p>	<p>Examples according to interviews</p>
<p>1. There is involvement of local civil engineers, in circular activities and in waste management plans before demolition happens.</p>	<p><i>“We can create a platform of contemporary/current training, where any engineer could enter to educate themselves. Also to write down technical instructions for the management of CDW for engineers who deal with this topic.” (Interviewee 8)</i></p>
<p>2. There is on-going move towards systematic way of organizing transport of CDWs.</p>	<p><i>“The GPS system will be part of the legislative requirement and will become active from January, 2024, right now it is in the transition phase”.</i> (Interviewee 10)</p> <p><i>“We talk about the optimization of routes and trips for the bin collection trucks... Right now we’re [trucks from municipality] trying to do this exactly, we’re trying to schedule regular trips for the waste collection truck, at least for bulky waste.” (Interviewee 5)</i></p>
<p>3. Penalty systems/ strict fining (last 5 years).</p>	<p><i>“You are paying a fine (fee) as an owner that you want to demolish something to the municipality and you have to call a specific company that recycles construction materials. So there are regulations that they force you to demolish in a logical way in order to recycle.” (Interviewee 1)</i></p> <p><i>“There is a predefined fee for the people that will take out their construction demolition material and there is a fine for the ones</i></p>

	<p><i>that have not paid this fee and have illegally taken out the disposable material. This fee goes from €50 until €400 and the penalty goes likewise” (Interviewee 3)</i></p> <p><i>“I would like to add is the payers schemes... going to be made obligatory in 2027 or 2028. This mechanism is pay as you throw that can be applied in either in the household level or a building block level or a neighbourhood level”. (Interviewee 3)</i></p>
<p>4. Green point planning with smaller green points throughout city.</p>	<p><i>-There is a plan for a Green point project that will serve as place for citizens in bringing their wastes. (Interviewees 3)</i></p>
<p>5. Presence of initiatives that raise awareness and help people engage in recycling (bottom-up initiatives, trust and network).</p>	<p><i>-“The following [recycling] project is implemented in schools throughout the city and our main concern and goal is to engage the younger children, the next generation in the recycling mentality, in order to increase our recycling percentages” (Interviewee 3)</i></p> <p><i>“There was an active NGO of young people that did green initiatives, such as creating small pop up installations during festivals with recycled materials”. (Interviewee 3)</i></p> <p><i>“As a neighbourhood council that is pretty active, and in contact with more than 900 inhabitants of the neighbourhood, they have a Facebook page in which sometimes they even upload images of construction material being disposed next to the bins and giving them instructions on how they should recycle them and what’s the cost for this business and how it should be done.” (Interviewee 5)</i></p>
<p>6. Presence of digital platforms that raise awareness and allow citizens to manage CDWs.</p>	<p><i>“There is a waste registry, it’s a web platform that’s accessible to everyone and one can filter the codes, region, city and find the unit that can process their [citizens] waste”. (Interviewee 10)</i></p> <p><i>“This is a practice [people are able to upload, inspect, and take items/waste in a platform] that some NGOs already follow on Facebook pages like the “harizo”, “heri heri” etc.” (Interviewee 5)</i></p> <p><i>“There are three other NGOs, pages in the internet. They all operate Facebook webpages, they all have pages. They share the same posts with the furniture that are available and people who are responding to the post say they need this or I need the other. They have their phone so they call them and say I need this or they come and pick it up. So they don’t store it, they take it from the one that donates it.” (Interviewee 7)</i></p>
<p>7. Stakeholder active involvement, such as citizens.</p>	<p><i>“During our discussions with the municipality and with the mayor, we had suggested as a neighbourhood -and they liked it as an idea-, that there should be a specific date, only one day before which date the citizens could take out all their bulky</i></p>

	<i>waste and a car would come by to collect it all. This is what we discussed and what they liked, but there was no actual thought in implementing it because they don't have the necessary equipment and personnel to do it, they can't schedule a truck that would pass by at least twice a month.” (Interviewee 5)</i>
8. Prospect for selective demolition	<i>“The selective demolition for historic buildings that are collapsing due to mal restoration could be a solution. This is a practice that we have already worked with together with the Chamber, and we have included in European urban initiative project that Kavala has submitted over the last fall.” (Interviewee 8/9)</i>

Source: Interviews, May 2023.

In total, the barriers for the Municipality of Kavala, can be attributed to regulatory, market or business, and individual citizen factors. The regulatory factors include: (1) inadequate proper translation of national CDW management framework to local level, (2) weak enforcements of regulations for managing CDWs, (3) lack of regulation in terms of quality assurance of the materials, (4) lack of (regulation) related to data of the materials, and (5) lack of facilities to support CDW management. The market factors include: (1) lack of markets or demand for products made of CDW, (2) higher costs of recycling as compared to using virgin raw materials, (3) low amount of CDWs for processing, (4) lack of knowledge among companies in terms of selective demolition; and (5) high costs of separating CDWs for companies. At individual level, there is a lack of knowledge, awareness, and commitment among citizens as demonstrated by illegal dumping and not being oriented towards recycling and reusing 2nd hand materials.

The enabling factors are mostly driven by the regulation and citizen's engagement. Policies such as: (1) selective demolition and involving engineers to prepare a waste management plan before demolition, (2) providing systematic transport for collecting CDWs, (3) imposing penalty or fines, and (4) planning for green points throughout the city, aid in advancing CDW management in Kavala. The citizen's engagement include (1) grassroot initiatives that raise awareness and engagement of people on recycling (and reuse), (2) use of digital platforms by citizens to manage the flow of CDWs, and (3) citizens' active involvement on the dialogue with municipalities for ideas and suggestions on how to manage waste(s), including CDWs, in general.

4.4 Urban Resource Centre (URC) Initiative(s)

Design of the URC of Kavala City

The interviews with various stakeholders and the innovative practices discussed in Sections 4.2 and 4.3 provide input on what a possible **Urban Resource Centre (URC)** in Kavala city

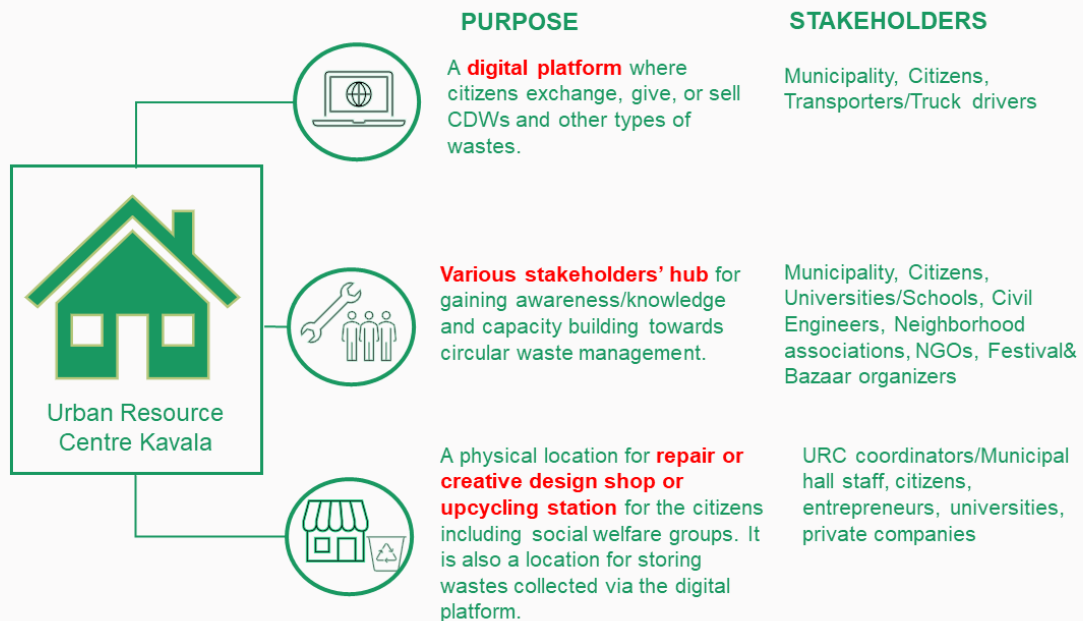
looks like. This idea is further developed and validated in the workshop that was conducted in Barcelona (Personal Communication, Interviewees 11 and 12, October 2023).

The idea of URC in Kavala has three main elements, as shown in Figure 3. First is the availability of a digital platform, which is currently being developed by the municipality of Kavala, as part of the CURE+ project. This platform will be linked to activities of the URC. Citizens will have their user ID on this platform. Once the platform is activated, citizens can upload CDWs and other types of wastes such as bulky waste, furniture, and clothes, that they generate and want to dispose, sell, or share freely with others. Citizens identify the items that they do not need anymore, and they will do the transport. If they are not willing to transport, the municipal transport will then be used. The wastes uploaded in the platform can be viewed, transferred or delivered, or picked up by the persons who are interested and want to use them for small- or large-scale projects.

The second element is the availability of physical location of the URC. This will serve as the collection and pick-up point for CDWs and other types of waste registered in the platform, as well as a venue for small repair shops and workshops that will educate people and schools for recycling and upcycling of wastes. The location will be close to the municipal warehouse located in the city center for accessibility purposes, or in a multi-story building where the basement will be used as the URC area. The space will be rented by the municipal hall.

The third element of the URC is the inclusion of various stakeholders and activities that will address raising awareness and knowledge and capacity building towards a more circular management of CDWs and wastes in general. These elements are parts of the action plan and thus the circular strategy of the city (Samourkasidou et al., 2022; Chatzivatyriti et al., 2022). The stakeholders that the URC will collaborate include: the (1) citizens who will be educated and will provide second hand materials as part of the management of wastes in the city; (2) university and engineers who could give lessons and workshops on the basics of CDWs, recycling, and creative designs and reuse of these wastes; (3) NGOs and neighbourhood association to raise awareness to citizens in terms of the existence of this URC and to engage in social projects such as craftsmanship workshops that target low income families, single mothers, or those in need of social welfare support; and private companies that are willing to share resources, knowledge, and become future partner for processing and managing the collected wastes in the city. Outside activities that the URC will take part include mentoring and education via student internships or lectures in schools, connecting with festivals and bazaars that are part of huge events during summer in Greece, recycling programs such as marathons or exhibitions.

How can an Urban Resource Centre look like?



11



Figure 3 Possible Design of URC in Kavala City.

Managing Operations of the URC

The future URC will be owned by the municipality of Kavala, but the organization will involve public-private partnerships since various stakeholders will be involved. The municipality will provide the location, platform, and will organize the stakeholders that will be involved in URC's operation.

In order for the URC to sustain its operation in the long-term, business model(s) that will show how each stakeholder can benefit from the operation of URC should be developed. The initial ideas for possible business model(s), which could be adapted or modified on the actual implementation, are as follows:

1. While being run voluntarily, the URC will collect small donations from its members or citizens who want to attend the organized workshops, creative sessions, or trainings.
2. The items that members make during the workshop could be sold for a price, for instance, in a store focusing on circularity or selling unique items.
3. The URC could also benefit from raising funds via "income generating activities" such as organizing bazaars (e.g. quarterly, bi-yearly, or yearly) and festivals.
4. Once the supply of the good quality, recycled CDWs are constantly flowing, the social aspect of the URC could be part of the storytelling when supplying to private businesses or companies selling hand-crafted items to tourists, locals, etc.

5. Recommendations

To make the idea of URC feasible, the following set of recommendations are formulated for capacity building of stakeholders as well as for policy makers. In terms of capacity building:

- First, a feasibility study is needed to analyze how this centre can function, the stakeholders that will be involved, and the possible business model(s) that could make the URC financially sustainable in the long term. The municipality could collaborate with universities to conduct this feasibility study.
- Second, site visits to successful URC's in Europe is needed to see what Kavala city can learn from them and if there are similarities (and differences), which could be implemented or adapted to the local situation (e.g. inclusion of social or environmental aspect in the operation of the URC).
- Third is to create awareness among citizens and other stakeholders on the existence and purpose of the URC. This could be done via involving neighbourhood associations, use of social media, word-of-mouth, and other means of communication to citizens.
- Fourth, selected stakeholders involved in the URC must either go through or provide trainings, depending on their role in the operation of URCs. For instance, the engineers, university researchers, or private companies will provide trainings and workshop that will educate citizens and URC's workers on the recycling and upcycling of waste. Creative designers or NGOs will provide workshops on repairing, doing innovative arts using CDWs, etc. Coordinators or staff of URCs will be assigned to manage the operation as well as the financial health of the URC.

For policymakers, the set of recommendations are as follows:

- First, being the owner of the URC, the municipality must provide the platform and the location necessary to operate the URC.
- Second, since the government of Kavala has been reliant on subsidies coming from national and European programmes to support its circularity vision, it needs to continuously engage in project proposals that will bring funds to further expand the operation of URCs (e.g. linking the collected CDWs of URCs on renovations of historical sites and AirBnBs).
- Third, the municipality needs to provide subsidies or financial support to stakeholders in the beginning of the project, e.g. the social groups or entrepreneurs who want to kick-start a business based on the creative designs that they made. Once proven to be financially healthy, this subsidy can be eliminated.
- Fourth, the municipality could further optimize the management of CDWs in the city via its URCs, by planning routes and collection days based on collected data.
- Fifth, the municipality could source URC's cleaned and sorted waste in its city procurement, which involve using recycled materials for creative public projects such as parks, bus stations, and exhibitions.

6. References

- Chatzivatyriti, I., Kitis, K., Gkiouzepas, G., Portaliou, G. (2022). Integrated Action Plan (Kavala). *URGE – Circular Building Cities*.
- European Commission (EC), 2008. Construction and demolition waste. https://environment.ec.europa.eu/topics/waste-and-recycling/construction-and-demolition-waste_en [accessed: 21 December 2023]
- European Climate Initiative (EUKI), 2017. German Federal Ministry for Economic Affairs and Climate Action. About EUKI. <https://www.euki.de/en/more-about-euki/>
- European Commission (EC), 2015, The European Economic and Social Committee and the Committee of the Regions — Closing the loop — An EU action plan for the Circular Economy (COM(2015) 614/2 of 2 December 2015), European Commission, Brussels, Belgium.
- European Environment Agency (EEA), 2020, Eionet Report - Construction and Demolition Waste: challenges and opportunities in a circular economy. European Topic Centre Waste and Materials in a Green Economy.
- Ellen MacArthur Foundation (EMF), 2015, Towards a circular economy: business rationale for an accelerated transition, Ellen MacArthur Foundation, London, UK. Eionet Report - ETC/WMGE 2020/1 50 https://www.ellenmacarthurfoundation.org/assets/downloads/publications/TCE_Ellen-MacArthurFoundation_26-Nov-2015.pdf [accessed 20 November 2023]
- Enviterra, 2020. Improved management of construction and demolition waste (CDW) in Greece (Final Report). *Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety & Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH*. Athens Greece.
- Galvez-Martos, J.-L., Styles, D., Schoenberger, H., Zeschmar-Lahle, B., 2018. Construction and demolition waste best management practice in Europe. *Resources, Conservation and Recycling* Volume 136, September 2018, Pages 166-178. <https://doi.org/10.1016/j.resconrec.2018.04.016>
- Hellenic Recycling Association. (2020). Objectives of the ECDW strategic plan 2020-2030. https://www.eoan.gr/wp-content/uploads/2020/12/%CE%95%CE%A3%CE%94%CE%91_2020-2030_%CE%A6%CE%95%CE%9A185%CE%91_29.9.2020.pdf [accessed: 18 March 2024].
- Kavala. Kavala: Intelligent City Transformation Overview (ICC Final Deliverables)
- Municipality of Kavala. (n.d.), The municipality today. Accessed date: 28 February 2024, website: <https://kavala.gov.gr/o-dimos/o-dimos-xthes-kai-simera/sintomi-perigrifi?lang=en-gb>
- Samourkasidou, E., Kitis, K. & Gkiouzepas, G. (2022). Integrated Management of Construction and Demolition Waste as Key Factor of Urban Circular Economy. *Journal of Sustainability and Environmental Management*, 1(2), 197-209.

Supported by:



on the basis of a decision
by the German Bundestag

Appendix A: Objectives OF THE ECDW strategic plan 2020-2030

Abbreviations

AMS	Alternative Management System
HRO	Hellenic Recycling Organization
MEE	Ministry of Environment and Energy
SWMA	Solid Waste Management Agency
MITN	Ministry of Infrastructure, Transport and Networks
CAMS	Collective Alternative Management System

Abbreviations (Origin language - Greek)

ΣΕΔ	Σύστημα Εναλλακτικής Διαχείρισης
ΕΟΑΝ	Ελληνικός Οργανισμός Ανακύκλωσης
ΥΠΕΝ	Υπουργείο Περιβάλλοντος και Ενέργειας
ΦΟΣΔΑ	Φορέας Διαχείρισης Στερεών Αποβλήτων
ΥΠΟΜΕΔΙ	Υπουργείο Υποδομών, Μεταφορών και Δικτύων
ΣΣΕΔ	Συλλογικό Σύστημα Εναλλακτικής Διαχείρισης

Table. Indicative proposed measures and actions for ECDW (Excavation, Construction and Demolition Waste) - monitoring indicators

	Measure	Target	Indicator	Time schedule	Body	Comments
ECDW.1	Creation of ECDW processing plants with sufficient capacity to cover all management needs	13.1	Number and installed capacity of ECDW processing units in t/year.	2022-2024	Individuals/ Responsible managers	Fixed or mobile units, licensed mobile processing unit reception areas
ECDW.2	Promotion of reinforcing actions, actions and new legislative regulations to strengthen the degree of performance of the alternative management of ECDW (especially in cooperation with Local Government Organizations)	13.1	Percentage of reuse, recycling and recovery per material, in each AMS separately, at the level of Regions and overall for the country (%).	202-2022	MEE/HRO	

ECDW.3	Common categorization of the ECDW into streams, categories and subcategories for all AMS sets. Determining the total quantities of ECDW produced in the country, using a defined calculation methodology	13.1	ECDW production in t/year	2020-2021	MEE/HRO	
			Average composition of produced ECDW (%)			
ECDW.4	Intensification of controls to deal with illegal activities of ECDW distribution	13.1	1. Number of checks 2. Number of violations	2021 and therefore	MEE/HRO	
ECDW.5	Development of the relevant AMS with the aim of optimal coverage of the Regions	13.2	Number and installed capacity of ECDW processing units in t/year.	2021-2021	MEE/HRO	
ECDW.6	Construction of required Sanitary Landfills for the disposal of ECDW processing residues that cannot be recycled/recovered and directed to the production of alternative fuel. Priority will be given to the islands.	13.2	Number and capacity of ECDW treatment waste landfills in t/year.	2020-2022	SWMA/ AMS	Sanitary Landfills of ECDW processing residues that cannot be recycled/recovered. Priority will be given to the islands.
ECDW.7	Clarification on the inclusion of the areas of quarries declared as renewable, in the provisions of the Law referring to the installation of Recycling Units and the rehabilitation of quarries	13.2	Number and capacity of ECDW treatment waste landfills in tonnes/year.	2021-2022	MEE	
ECDW.8	Establishment of a minimum percentage of secondary aggregates to be used in public technical projects, in the context of the implementation of Green Public Contracts	13.3	Quantities in total and by material of secondary products produced (t).	2021 and therefore	MEE/ HRO/ MITN	Provision for additional scoring in cases of exceeding the minimum percentage, as well as for its further increase gradually. The development of the relevant market

						and the increase in the recycling of aggregates of mineral origin produced during the processing of ECDW are expected.
ECDW.9	Promotion of Technical Specifications for mandatory use of high-quality recycled materials in projects	13.3	Percentage of reuse, recycling and recovery per material, for each AMS separately, at the level of Regions and overall for the Country (%).	2021-2022	MEE/ HRO/ MITN	
ECDW.10	Financial incentives through taxes and fees, landfill bans for many fractions of MSW, VAT reduction for recycled materials, taxation and/or levy of natural materials	13.3	<ol style="list-style-type: none"> 1. Percentage of reuse, recycling and recovery per material, for each AMS separately, at the level of Regions and overall for the Country (%). 2. Rate of sorting at source and diversion to recycling facilities for wood, glass and metal streams (%). 	2020-2021	MEE	
ECDW.11	Homogenization of contributions for similar ECDW management tasks and reduction of administrative costs	13.4	Publication of relevant regulation	2021 and therefore	HRO	
ECDW.12	Monitoring the proper operation of the ECDW Processing Units, including the monitoring of the ECDW circulating quantities (incoming and outgoing)	13.4	Number and installed capacity ECDW processing units in tons/year	2020 and therefore	MEE/ HRO	

ECDW.13	Streamlining of good practices by CAMS to increase the incentive of recycling units to recycle	13.4	<ol style="list-style-type: none"> 1. Good practice guide 2. Performance of units 	2020-2022	HRO	
ECDW.14	Provision of instructions and technical advice to the liable ECDW managers, regarding their obligations, the application of the appropriate management methods, the separate collection at the construction site, the possibilities/options of promoting the secondary materials on the market.	13.5	Quantities in total and by material of secondary products produced (t).	2021-2022	HRO	Publication of informational instructions and providing guidelines and technical advice to liable managers.
ECDW.15	Establishment of financial incentives for their separate collection.	13.5	<ol style="list-style-type: none"> 1. Percentage of reuse, recycling and recovery per material, for each AMS separately, at the level of Regions and overall for the Country (%). 2. Rate of sorting at source and diversion to recycling facilities for wood, glass and metal streams (%). 	2021-2022	MEE	
ECDW.16	Enhancing separate collection at selected points (such as green points) and gradually expanding it	13.5	<ol style="list-style-type: none"> 1. Percentage of reuse, recycling and recovery per material, for each AMS separately, at the level of Regions and overall for the Country (%). 2. Rate of sorting at source and diversion to recycling facilities for wood, glass and metal streams (%). 	2020-2022	SWMA/AMS	

ECDW.17	Separation of individual materials at their source of production, particularly during demolition operations using selective demolition techniques	13.5	<ol style="list-style-type: none"> 1. Percentage of reuse, recycling and recovery per material, for each AMS separately, at the level of Regions and overall for the Country (%). 2. Rate of sorting at source and diversion to recycling facilities for wood, glass and metal streams (%). 	2020-2022	SWMA/AMS	
ECDW.18	The quality of CDW collected and transported to Recycling Units should be improved by amending the legal framework, including provisions for mandatory sorting, pre-demolition checks and selective demolitions, surveillance and protection measures for containers and ensuring waste traceability.	13.5	Average composition of produced ECDW (%)	2020-2021	MEE	
ECDW.19	Adoption of quality protocols of other Member States for the declassification of ECDW, until the completion by the European Commission and the issuance of a relevant regulation	13.6	Percentage of reuse, recycling and recovery per material, for each AMS separately, at the level of Regions and overall for the Country (%).	2020-2021	MEE/ HRO	The relevant European quality standards for construction aggregates will be taken into account
ECDW.20	Encouraging the use of secondary materials of ECDW processing by public bodies (in particular through their procurement tenders / contracts) based on specific specifications	13.6	Quantities in total and by material of secondary products produced (t).	2021 and therefore	MEE/ HRO	
ECDW.21	Green Public Procurement through the introduction of mandatory percentages of recycled	13.5	Percentage of reuse, recycling and recovery per material, for each AMS separately, at the	2021-2022	MEE	

	aggregates, at least in major civil engineering projects		level of Regions and overall for the Country (%).			
ECDW.22	Use of secondary aggregates of mineral origin as filling material in Sanitary Landfills or in Uncontrolled Waste Disposal Sites rehabilitation projects	13.5	Quantities in total and by material of secondary products produced (t).	2021 and therefore	MEE	

Note: The end year in the timetable of each measure means up to and including the end of the indicated year.