

LOCAL PLANS TO PRIORITIZE INTERVENTIONS

DT1.4.2

Version 1
10/2018

Split - Dalmatia County

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Introduction

The aim of the present document is to finalize the data collections and analysis built in DT1.3.2 (Report of the quantity of industrial waste in the CIRCE2020 industrial areas), DT1.3.3 (Report of the present destinations of industrial waste) and DT1.3.4 (M-scale analysis of the physical flows at local industrial system level). In a short way, this document summarizes the process that leads to pilot cases identification, from the recognition of waste production & destination to the physical flows maps. The present process to prioritize the interventions is also supported by a permanent consultation with the local stakeholders (administrations located in the pilot regions, trade and industrial associations, environmental authorities etc.) to come to a shared hierarchy of waste flows to optimize and/or to close (in DT1.1.3 and DT1.4.1).

1. Waste flows analysis

Pilot area description

Split - Dalmatia County (SDC) is located in the central part of the eastern Adriatic coast. The surface of the land area, with the surface of the island is about 4,540 km² (about 8% of the land area of the Republic of Croatia), and the surface of the sea part is 9,576 km² (about 31% of the sea surface of the Republic of Croatia).

In SDC area there are 454,798 inhabitants (about 10% of the population of the Republic of Croatia) in 368 settlements. The average population density is approximately 100 inhabitants / km². According to geographical, demographic and developmental elements, the SDC area is divided into three units: the coast, hinterland and the islands. The hinterland area occupies the largest area, or about 59% of the SDC space. The coast is a narrow belt between the sea and the mountains of the seaside and occupies about 21% of the SDC area. The islands makes about 20% of SDC space.

The SDC is characterized by unequal economic development and population density. The majority of the economy and the population are concentrated in the coastal area, where the average density of population is 375/km². The Split, administrative, administrative and economic center of SDC is located in the coastal area. With a population of 167.121 inhabitants, Split is the second largest settlement in the Republic of Croatia. Hinterland has a low density, the first evaluation shows that it is less than 40 inh./km². The largest settlement on the hinterland is Sinj with 11,478 inhabitants, which is also the subregional center of the hinterland. All settlements in the island area are smaller than 4,000 inhabitants.

Gross Domestic Product (GDP) of SDC was 3,712,508.51 EUR in 2015, which represents about 8% of total GDP of the Republic of Croatia. GDP per capita SDC in 2015 was 8,185.72 EUR. The data below for the financial results of the entrepreneurs, the number of business entities and



the number of employees by activities in 2016, show that the main activities of SDC are: G Wholesale and retail trade, repair of motor vehicles and motorcycles, I accommodation and preparation of food and C Manufacturing but in 2016, manufacturing had a negative net financial result.

Source/ quality of data

The quantities of the produced industrial waste in the Split - Dalmatia County have been determined with the help of the Environmental Pollution Register (EPR database). This is a central database operated by the Croatian Environment Agency (AZO). EPR database is a database where data on waste generation and management, based on the provisions of the Ordinance on the Environmental Pollution Register (OG 87/15).

Quantities of waste that are relevant for the Project, are the quantities reported by the waste producer (hazardous and non-hazardous) and downloaded from the EPR database. Companies of technological waste in which data was collected have to report their technological waste in EPR system (Environmental Pollution Register) through default application forms. That is required within the institutional framework.

The quality of data directly from the companies is not the same as the one from the mentioned database. Reason for that is loophole in the application forms for database, because companies sometimes give wrong or incomplete data, or data is not available. However, this is the most accurate database publically available. Companies have to report also their waste treatment based on self-declaration. Out of these figures, only the generation statistics are publically available. Now the data from 2016 are the most recent ones.

Overview of the main treatment operation of industrial waste

Total waste generated in the pilot area is 47 858 tons/year shown in **Table 1** (2016 data from the Environmental Pollution Register - EPR¹).

Table 1: Reported amount of generated industrial waste

Reported industrial waste			
Year	Non-hazardous (t)	hazardous (t)	Total (t)
2016.	47 858	3 987	51 845

¹ <http://roo.azo.hr/>



In the EPR database waste is reported by types of waste using key numbers determined by the activities from which is generated. The key waste numbers are listed in the Ordinance on Waste Catalogue (NN 90/15). List of Recovery Procedures (R) and Disposal (D) of Waste is contained in Annex I and Annex II of the Sustainable Waste Management Law (OG 94/13).

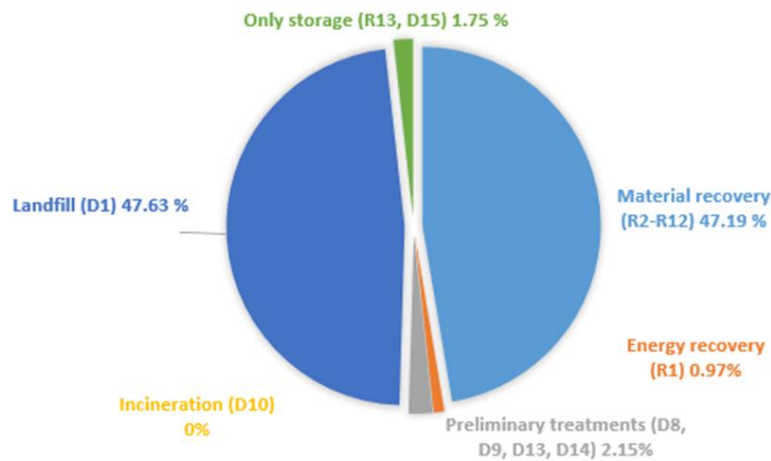
Based on the submitted data, an overview of treatment plants (quantity of waste in t/year) is provided at the level of the Republic of Croatia, as well as in individual counties, in our case, Split- Dalmatia County. In the table below (**Table 2**), the quantities of recovered waste by types of recovery (D,R) in Split - Dalmatia area and in Republic of Croatia in tonnes per year are shown.

Table 2: Quantity (according to report report in EPR database) in Republic of Croatia and in Split - Dalmatia County

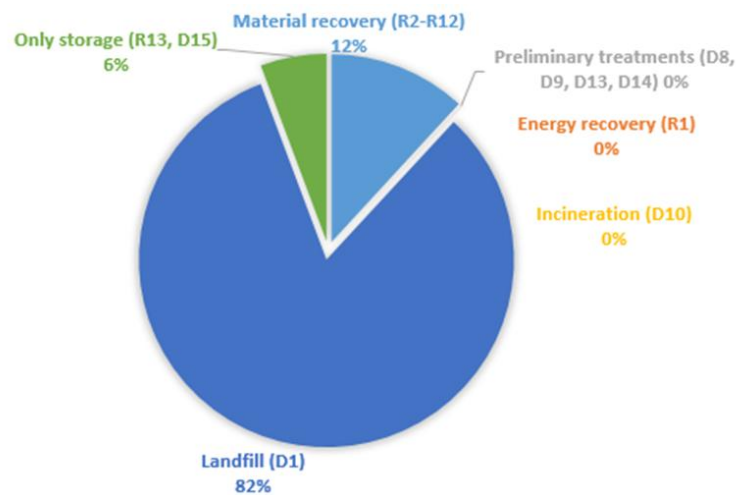
	Republic of Croatia (t/year)	Split - Dalmatia County
Material recovery (R2-R12)	1.757.352,98	29.105,09
Energy recovery (R1)	33.969,43	2.822,28
Preliminary treatments (D8, D9, D13, D14)	80.167,09	3.736,19
Incineration (D10)	51,79	/
Landfill (D1)	1.773.566,24	202.361,5
Only storage (R13, D15)	6.423,987	14.008,97
Total	3.723.968,58	252.189,95



Pie chart contains the percentages of recovered waste in Republic of Croatia by recovery types.



Pie chart contains the percentages of recovered waste in Split - Dalmatia County by recovery types.



From the pie charts it can be seen that the most of the waste in Republic of Croatia and in Split Dalmatia County is sent to the landfill while energy recovery and incineration are not represented, or are represented at very small percentages.

Main geographical destination and availability of treatment facilities in the pilot area

We don't have available information on geographical destination of waste produced in Split - Dalmatia County, but information about destination of produced waste, waste committed to collector, committed to the recovery / disposal and exported waste are available. Pie chart contains percentages of non - hazardous waste destination in Split Dalmatia County. As seen

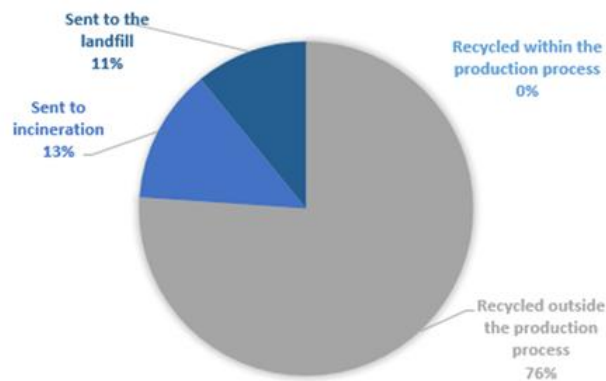


from pie chart, most of the waste is committed to the waste collector, followed by exported waste and smallest quantities of waste are committed to the recovery.

NON-HAZARDOUS WASTE DESTINATION



During the conducted interviews with companies, relevant non - hazardous waste by key numbers are determined. In analysis, 11 companies provided an overview of the treatment operations for the relevant waste flows by key numbers. Data is shown as pie chart for the relevant waste treatment, according to the data determined in interviews in Spit -Dalmatian County.





2. Most promising waste flows

The analysis of groups, sub-groups and waste key numbers was made for the purpose of considering the possibilities of business development in the field of waste management. The procedure for selecting the type of waste that is of interest for the Circular Economy can be briefly described in the following steps:

1. Defining assumptions,
2. Definition of criteria (definition of quantitative threshold),
3. Identification of groups, subgroups and types of waste by key number of interests for the Project.

For the analysis to be correct and in accordance with the requirements of the Project task and the previously conducted analysis of the type and amount of waste in the territory of Split - dalmatia County, it was necessary to initially define the assumptions on which further steps will be taken and ultimately to select industrial waste and material waste flow of interest for the Project. Key assumptions of this analysis are the following: (1) Waste of interest for the Project is determined by knowledge on the activities, type of industry, processes in which waste is generated and industrial sector of the SDC and (2) Waste of interest for the Project shall be determined according to the project assignment, taking into account the current direction and activities with non-hazardous waste in SDC.

Due to the available data, quantitative thresholds for non-hazardous waste are defined according to which the waste subgroups are further eliminated. The main criteria was: Quantitative threshold for non-hazardous waste - eliminating those sub-groups of waste that do not exceed the quantitative threshold of 500 t / year. for non-hazardous waste.

The identification of groups, sub-groups and types of waste by key number of interests for the Project has been carried out at three levels:

1. Selection of waste groups (Level I) - selection of sub-groups was made which do not exceed the defined annual thresholds of 500 t/year for non-hazardous waste in 2016.
2. Selection of waste sub-group (Level II) - a analysis of sub-groups that are beyond² the quantitative threshold.
3. Selection of waste by Key Number (Level III) - performed within the selected sub-groups, at the level of the waste key number.

² Considering that the industrial sector is not developed in our Pilot area, some waste streams with annual thresholds lower than 500 t/year were selected.



Analysis of the non-hazardous selected industrial waste streams is based on the result of the conducted analysis and waste key numbers of interest for Project are identified (Selected waste stream significant for further analysis are marked yellow) :

Selected waste by key numbers of interest for the Project		
Non – hazardous waste		Average annual (t)
02 03 01	Plant-tissue waste	720
02 01 02	Fish tissue residue from fish cleaning/gutting	501
02 01 99	Fish oil derived from canned fish production. Extracted from industrial wastewater	125
02 01 99	Salt (NaCl) extracted from industrial wastewater	400
10 13 04	Waste from calcination and hydration of lime	816
12 01 01	Ferrous metal filings and turnings	856
15 01 01	Paper and cardboard packaging	4 857
15 01 02	Plastic packaging	569
15 01 07	Glass packaging	1 182
16 01 03	End-of-life tyres	836
17 01 01	Concrete	1 376
17 04 05	Iron and steel	6 660
19 12 02	Ferrous metal	22 627
19 12 03	Ferrous metal	660
19 08 01	Screenings	868
19 07 03	Landfill leachate other than those mentioned in 19 07 02	1 392
20 01 01	Paper and cardboard	532



OLIVE OIL PRODUCTION (02 03 01, 02 03 99)

The following waste streams were identified in olive oil production processes, which could be better handled, and those are:

- Solid olive residues after extraction of olive oil - Olive seed and remains of olive pulp
- Acidified wastewater

In 2017, the company undertook in process 1000 tons of olives. Of the total quantity of processed olives, about 70% is the byproduct and 15% refers to the acidified water extracted from olive fruit. Olive, as input is processed in two ways: *Separation of olive seed before the process of grinding olive pulp and oil extraction*, and *Grinding the olives together with olive seed prior to oil extraction*.

After process, two types of biological waste are formed, (1) olive seed and (2) grounded mixture of olive seed and olive pulp. The mixture of grinded olive seed and olive pulp residues is handled at present in such a way that one part, after being dried, is burned in a nearby cement production facility and is thus energetically recovered and the rest is disposed of at the landfill. Separated olive seeds are handled in an unorganized manner or disposed on a landfill. An authorized handler that neutralizes water before discharging collects acidified wastewater.

The potential solution considers the disposal of olive residues after production in several more favorable ways: *production of high quality fertilizer for agriculture purposes, production of a briquette for firewood, reuse at the olive oil processing facility - production of heat for the needs of olive oil processing plant and use of acidified water for the purposes of agriculture for treating (acidifying) alkaline soil*.

CANNED FISH PRODUCTION (02 01 02, 02 01 99)

The following waste streams were identified which could be better handled and those are:

- Biological by-product after cleaning/gutting fish (fish remains),
- Fish oil from the wastewater,
- Salt (NaCl) from the wastewater

Fish byproduct contains a high share of fish oil (more than 20%) and the possibility of producing omega 3 oil, it is suggested to implement oil extraction technology instead. In addition to the mentioned omega 3 oil, it is possible to produce biodiesel that can be used



for the energy needs of the plant (thermal energy for the production of technological steam) and production of protein for livestock feed.

4. PLASTIC (12 01 05)

After a detailed insight look into the production plant of the PVC window and door manufacturing plant, it has been established that waste disposal is at an optimal level and at this time, we have not found an alternative to the already implemented form of waste disposal. The majority of waste refers to PVC profile sections and plastic material shredding during machining. This material is almost completely collected and recycled.

5. The role of stakeholders

Frequent meetings and phone calls were organised with the Split - Dalmatia County, partners and the representatives of the different stakeholder groups. The chosen pilot area is the Split - Dalmatia County but with the accent on the largest settlement on the hinterland - Sinj, which is also the subregional center of the hinterland.

So after detailed analysis of Split - Dalmatia County, main waste streams from industrial sector were chosen. It was harder task, because in Split - Dalmatia County the industrial sector is not developed enough and if it is, the quantities of waste are very small. As a result of the research, together with the Čistoća Cetinske Krajine we defined the companies which produce the industrial waste and regarding to that, main waste streams. We selected three companies in Split - Dalmatia area and those are: Conex Trade, Ltd. - for canned fish production, Canicula Ltd., - for salting and processing of fish and seafood, and Uljara Vukšić - for the production of olive oil (twice). Several PVC producers were also selected in the area of Sinj. But with the detailed and after the insight into the production plant, it has been established that waste disposal is at optimal level and in this time we have not found alternative to the already implemented form of waste disposal. Also we visited Cemex Croatia, where we had a meeting with director about their waste disposal, but we did not selected companie for further analysis.

Discussions and meetings were organised with external experts, with the managers of the selected companies which are producers of industrial waste in order to determine the initial situation regarding legislation, general waste management tendencies in Croatia and to get to know the pilot area generally. The industrial waste generation statistics could be acquired with the help of the who are responsible for uploading and analysing the information reported by the companies to a central online database.

In april and september of 2018, meetings were held with selected companies in the pilot area. The companies are mainly located in the area of Sinj, only one companie, Uljara Vukšć is located in Solin. The main objective of the meetings was to get an insight of the destination of the collected industrial waste materials, and production overview - from the arrivale of raw material, until the formation of the waste. During the discussion the representatives of the



company expressed their willingness to cooperate further within the framework of the project, they do support these initiatives and want to be involved in later stages of the project. They are a relevant information source regarding waste treatment technologies, identifying possible partners for the implementation of CE.



The 11 manufacturing companies operating in the territory of the Split - Dalmatia County were contacted directly to maintain a direct and interactive contact and to know the waste treatment practices and their attitude towards circular economy and industrial symbiosis. Questionnaires were sent out electronically and all companies sent them back, but only 7 of them showed their interest towards the CIRCE2020 project. Out of the 7 companies, 4 of them were PVC doors and windows manufactures, and as it was mentioned before, their waste disposal is at optimal level and in this time we have not found alternative to the already implemented form of waste disposal. Considering that, the remaining companies were selected. On meetings, companies introduced themselves and their problems regarding the waste disposal, and their wishes and expectations towards the project.

In MFA analysis, we decided to analyse three main flows which are present in our area. Split Dalmatia County is very important County in Republic of Croatia, and as we already mentioned, main industry production is related, among the others, on olive oil production and fishery (in our case we took canned fish production within fishery sector). So it is very clear why the waste from these industries is interesting and why we selected it. Secondary researches also helped the final outcome but the most important is that the companies were deeply involved in the process of analysis.

S3 agents were also contacted and meetings will be organised in autumn, 2018. In the meantime, all the city's relevant strategies, plans and the countrywide S3 strategy were analyzed to find the common goals.

On the 29th of October we had a meeting with S3 manager in the Ministry of Economy, Entrepreneurship and Crafts in Zagreb. Croatia is a small country with a very open economy and its size is comparable to the size of regions in large EU member states and this is a reason why the concept of smart specialization has not been applied in a formal regional dimension, but remained only at the national level. Our experts from Ekoneerg went to the Ministry and we had a meeting over Skype. The aim has been to find out possible collaboration for CIRCE2020 activities. We have presented our company and project goals and our experts have explained technical part from the beginning of the Project to the MFA analysis S3 manager



explained the goals of the Smart Specialization Strategy and gave us some advices about EU projects

Regarding the identified waste, further meetings are going to be organised to connect and to find the best solutions for development and use of CE.