

Action Plan for the development of the circular economy in Split-Dalmatia County



Split, September 2020



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1. INTRODUCTION

For the past hundred years, an accelerated global economic growth has been recorded. The growth model is linear in nature, which means that an increase in production leads to an increase in distribution, consumption and finally, an increase in waste production. In parallel with the above mentioned, the number of inhabitants and the standard of living increase as well. The consequence of growth is the expansion of cities, industrial facilities, and the growth of demand for all kinds of goods. The fact is that these trends take place on a limited area with limited resources, with an increasingly negative impact on them. Climate changes and environmental pollution are ever more in the public eye and present a growing global problem.

Namely, the environment's ability to receive a certain amount of waste and decompose it is limited and conditional upon the chemical composition of the waste. Likewise, special attention is paid to the disposal of hazardous waste. However, not all waste is unusable after its primary use. Each product has its life cycle in which raw materials are used to make a primary product which, after its disposal, can be used as raw material for creating another product and so on, until it becomes completely unusable.

The concept of a circular economy is based on a similar concept - where the waste from one industry can become raw material for another kind of industry. In that respect, it is necessary to properly separate the produced waste, collect, classify, and send it to the adequate recovery operation. The principle of the circular economy reduces the amount of total waste produced and enables the introduction of the concept of sustainable development, i.e., the connection between economic development and environmental protection.

This Plan identifies the areas which can influence waste reduction and the increase in the recycling rate and the rate of recovery operations through rational and ecologically oriented waste management. Achieving such objectives and producing



secondary raw materials clears the way to establish a circular economy and thus, the way to a cheaper business model.

The Action Plan was developed with the help of data collected from regional, national, and European bodies within the framework of various strategies, plans, and laws which provide for the collection and under which they are collected. The goal of the Action Plan is to determine which procedures should be implemented/improved in order to introduce the circular economy.

2. ANALYSIS OF THE SITUATION

Waste management should always begin with measures of waste prevention and reduction. For waste that has already been produced, it is necessary to select a processing or disposal method which will produce the lowest risk for human health and the environment. The modern waste management method establishes an order of priority for management activities as shown in Picture 1.



Source: <https://www.odvajamo.eu/otpad-2/>

Picture 1. Waste management order of priority

Pursuant to the Sustainable Waste Management Act (OG 94/13, 73/17, 14/19, 98/19) **production waste** is the waste generated during the production process in an industry, vocational craft, and other processes. Process scrap used in the production process of the same manufacturer shall not be considered as production waste. **Municipal waste** is the waste generated by a household and the waste similar in nature and composition to the household waste.



In order to gain an insight into the production waste management method on the territory of the County, several thorough analyses were conducted. Considering that the entry into force of the Ordinance on the Environmental Pollution Register (OG 87/15) significantly changed the quantities which present the obligation to report (submit) the information to the register, it is not possible to compare the information from 2016, 2017, and 2018 with previous years. In accordance with the above, analysed data concerns the period from 2016 to 2018. Furthermore, it is necessary to highlight that there are discrepancies between the information reported to the Environmental Pollution Register (hereinafter ROO) when different information filters are applied, as well as differences in total waste quantities / output materials due to information asymmetries between the Waste Management Registry (O-GO) of the Ministry of Environmental Protection and Energy Efficiency (hereinafter MZOE) and the reports on the end of waste status.

2.1. Territorial characteristics of the County

The County is organised into 55 local authorities (hereinafter local authorities), i.e., 16 cities and 39 municipalities with 463,676 inhabitants living on the territory. The City of Split is where the centre of the County is located. The County is divided into three geographical sub-units: the continental part, the coastal part, and the island archipelago.

The continental part of the County is interspersed with mountains which extend in parallel with the coast. The region is poorly inhabited, economically poor, and isolated from traffic. The coastal part consists of a narrow coastline between the mountain ranges and the sea. This area is highly urbanised and economically developed. The island region consists of 5 inhabited islands and numerous reefs, islets, and small islands. The islands are poorly inhabited, economically more developed than the continental part, however, due to different situations the population continuously emigrated.



2.2. Analysis of produced (generated) production waste

According to the information from the ROO for 2018, the County generated a total amount of 81,900.92 t production waste, which is an increase of 24.80% (16,274.52 t) when compared to 2017, i.e., an increase of 57.83% (30,007.42 t) when compared to 2016.

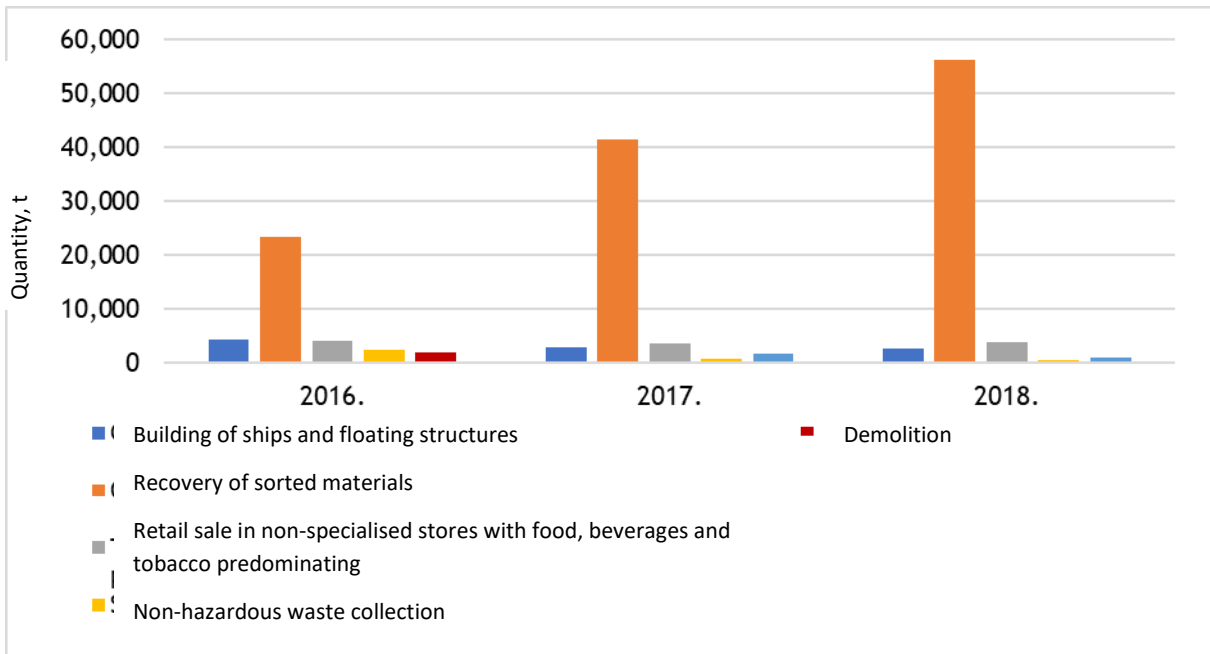
During the observed period, non-hazardous waste makes up for an average of 93.85% of the total quantities of reported production waste, but it shows a tendency of growth. Accordingly, the share of hazardous waste has been reduced (from 7.77% in 2016 to 4.79% in 2018).

Table 1: The quantities of produced production waste on the territory of the County

	2016.		2017.		2018.	
	t/year	share (%)	t/year	share (%)	t/year	share (%)
Non-hazardous waste	47,861.99	92.23	61,758.07	94.11	77,977.99	95.21
Hazardous waste	4,031.43	7.77	3,868.33	5.89	3,922.93	4.79
Total	51,893.42	100.00	65,626.40	100.00	81,900.92	100.00

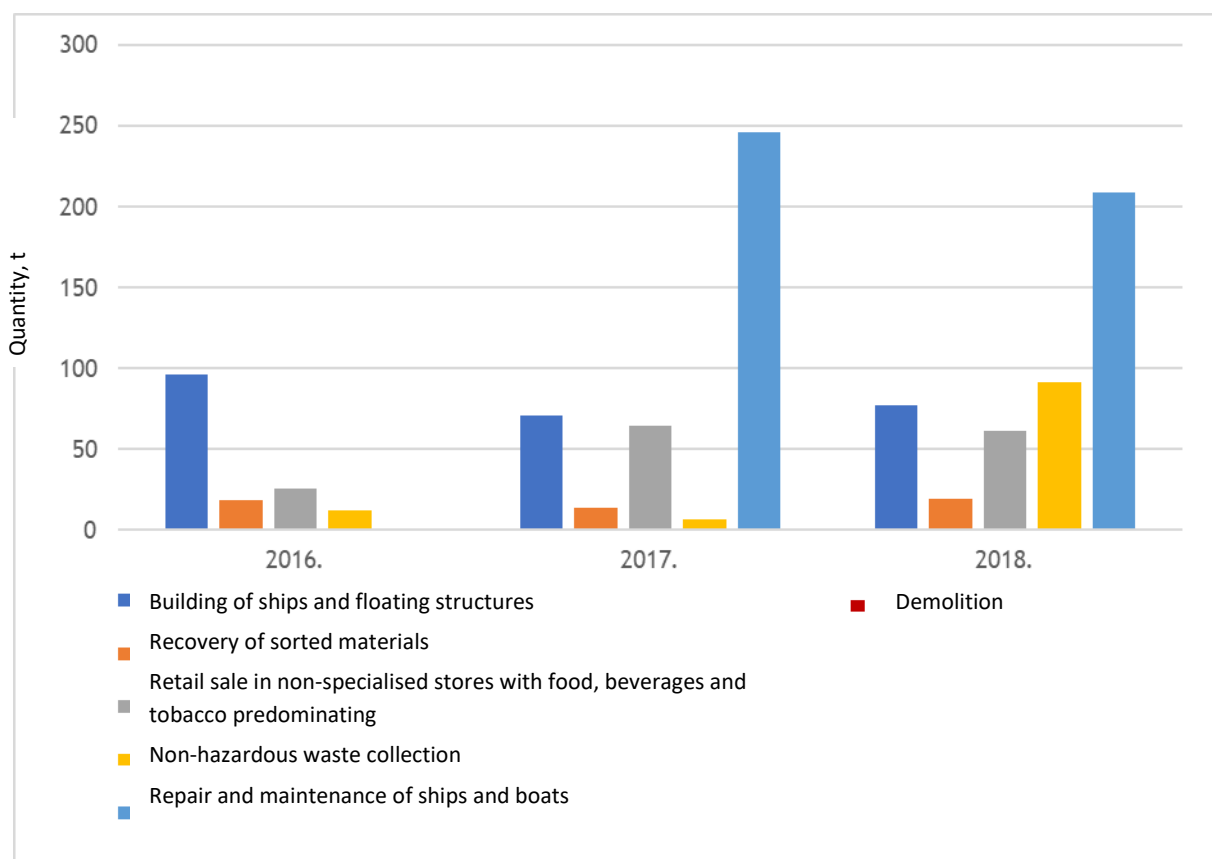
If economic activities are observed¹, the biggest producers of non-hazardous production waste are *Building of ships and floating structures* (category 30.11), *Recovery of sorted materials* (38.32), *Retail sale in non-specialised stores with food, beverages and tobacco predominating* (47.11), *Non-hazardous waste collection* (38.11) and *Repair and maintenance of ships and boats* (33.15). It can be observed that in 2016, the activity *Demolition* (43.11) can be found among the activities with 1,879.85 tonnes which is replaced by the activity *Repair and maintenance of ships and boats* in 2017 and 2018. Likewise, a trend of an increase in the activity *Recovery of sorted materials* can be observed, with the increase being 77% when compared to 2016, i.e., 35% in 2018 when compared to 2017.

¹ Pursuant to the Decision on the National Classification of Activities of 2007 - NKD 2007.



Graph 1: Generated non-hazardous production waste according to the activities from the NKD

The following graph shows an overview of the produced hazardous waste in those same five dominant activities. It can be observed that the activity Demolition did not generate hazardous waste in 2016. The largest amount of hazardous waste is generated by the activity Repair and maintenance of ships and boats, even though the quantity was reduced by 15% in 2018 when compared to 2017 (a reduction from 245.80 t to 208.8 t). It is possible to notice a jump of around 1,260% for the activity Non-hazardous waste collection in 2018 when compared to 2017 (from 6.7 t to 91.3 t), while the quantities of collected hazardous waste in other activities fluctuate.



Graph 2: Generated hazardous production waste according to the activities from the NKD

By analysing the structure of non-hazardous production waste based on the waste category code, it can be observed that it differs from one year to another, whereby quantities larger than 1,000 t/year were analysed. However, during all those three years, the following waste was represented: *paper and cardboard packaging, iron and steel, and ferrous metals*.

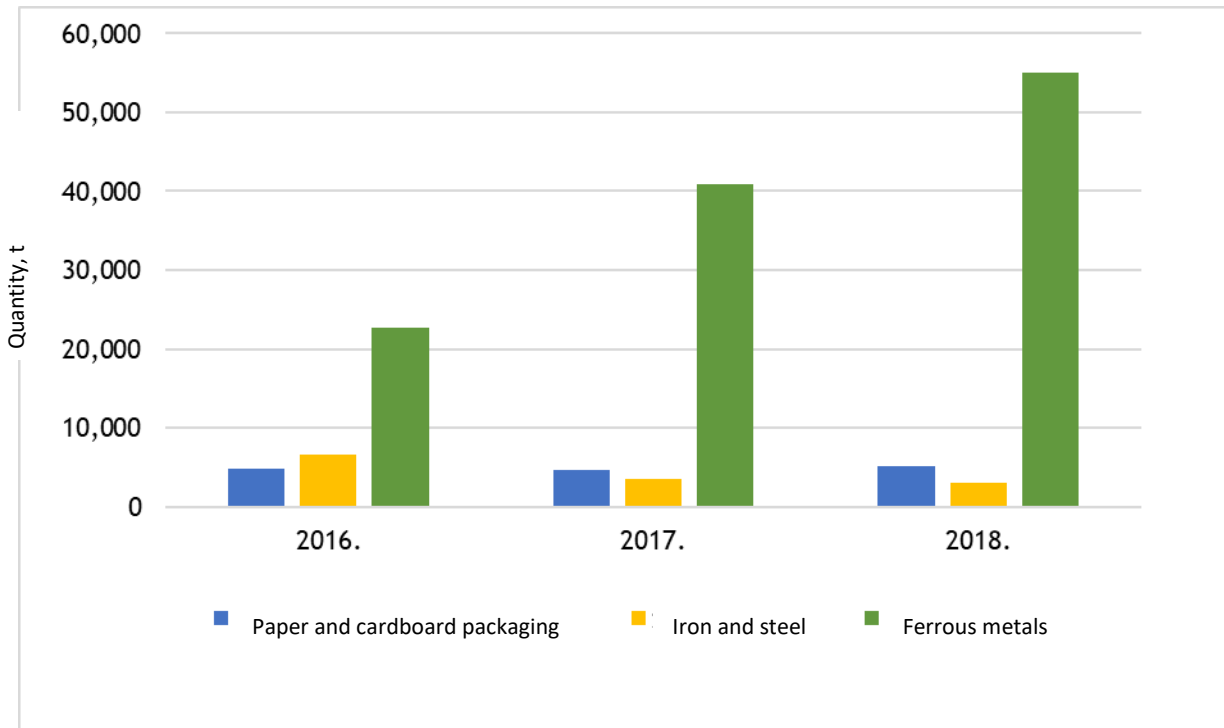
Table 2: Quantities of generated non-hazardous production waste larger than 1,000 t/year

Waste category code	Waste name	2016	2017	2018
12 01 01	ferrous metal filings and turnings		1,243.75	



12 01 03	non-ferrous metal filings and turnings			1,773.69
15 01 01	paper and cardboard packaging	4,841.57	4,652.76	5,224.21
15 01 07	glass packaging	1,181.86		
17 01 01	concrete	1,376.29		
17 04 05	iron and steel	6,660.13	3,593.42	3,059.25
19 07 03	landfill leachate other than those mentioned in 19 07 02*	1,392.49	1,607.23	
19 08 01	screenings		1,344.74	1,130.17
19 12 02	ferrous metals	22,626.68	40,870.82	55,059.56
20 01 01	paper and cardboard		1,043.65	1,201.97
	other	9,782.96	7,401.71	10,529.13
	Total	47,861.99	61,758.07	77,977.99

The most represented waste is the one under category code 19 12 02 (*ferrous metals*) which made up for 47.27% of the total generated quantities of non-hazardous waste in 2016, while in 2018, it made up for as much as 70.61%. On average, *paper and cardboard packaging* makes up for 8.12% of the total amount. A decrease in the quantities can be observed for the category *iron and steel* from 6,660.13 t in 2016 to 3,059.25 t in 2018, which constitutes a decrease of 54.07%.



Graph 3: Generated non-hazardous production waste - most represented categories

Iron and steel belong to category 17 *Construction and demolition wastes*, while ferrous metals belong to category 19 *Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption, and water for industrial use*.

Wastewater treatment plants (UPOV) are water supply works with facilities which treat the wastewater from the public drainage systems before their injection into the natural receiver.

According to the data from the Multi-annual municipal water supply works construction programme, 31 UPOVs are planned on the territory of the County by 2023, which shall generate 22,848 tonnes of sludge annually.



Table 3: Number and status of UPOVs on the territory of the County

No.	Agglomeration	Status	Type of treatment		Year of realisation	ES capacity (load)		Expected sludge quantities (t/year) *	
			Current	Planned		Current potential (2014)	Planned	Current potential (2014)	Planned
1.	Split - Solin	In function, upgrade envisaged	Mechanical pre-treatment	Secondary	2018	221,246	305,000	5,895	8,127
2.	Kaštela - Trogir	In function, upgrade envisaged	Mechanical pre-treatment	Secondary	2018	85,401	148,000	2,276	3,943
3.	Sinj	In function, upgrade envisaged	Mechanical pre-treatment	Tertiary	2018	20,667	30,000	551	799
4.	Trilj	In function	Secondary	Secondary	2023	5,029	9,000	134	240
5.	Omiš	In function	Mechanical pre-treatment	Secondary	2021	14,975	22,000	399	586
6.	Jelsa - Vrboska, Island of Hvar	Construction planned		Secondary	2019	18,269	35,700	487	951
7.	Bol - Island of Brač	Construction planned		Primary	2023	6,618	18,100	176	482
8.	Hvar - Island of Hvar	In function	Mechanical pre-treatment	Secondary	2023	10,250	25,000	273	666
9.	Postira, Island of Brač	Construction planned		Mechanical pre-treatment	2023	3,143	5,500	84	147
10.	Supetar, Island of Brač	Construction planned		Primary	2023	8,539	20,000	228	533
11.	Imotski	In function, upgrade	Secondary	Tertiary	2018	23,165	33,000	617	879



No.	Agglomeration	Status	Type of treatment		Year of realisation	ES capacity (load)		Expected sludge quantities (t/year) *	
			Current	Planned		Current potential (2014)	Planned	Current potential (2014)	Planned
	agglomeration	envisaged							
12.	Makarska	Construction planned	Mechanical pre-treatment	Secondary	2019	29,876	40,000	796	1,066
13.	Vrgorac	In function, upgrade	Secondary	Tertiary	2023	2,854	6,000	76	160
14.	Island of Brač	Construction planned	Mechanical pre-treatment	Mechanical pre-treatment	2023	2,164	2,900	58	77
15.	Municipality of Podstrana	Construction planned		Secondary	2023	14,876	21,500	396	573
16.	Vis - Island of Vis	Construction planned	Mechanical pre-treatment	Primary	2023	3,507	11,000	93	293
17.	Promajna - Kravica	Construction planned		Mechanical pre-treatment	2023	2,137	7,000	57	187
18.	Municipality of Brela	Construction planned		Primary	2023	7,958	14,500	212	386
19.	Komiža - Island of Vis	Construction planned		Mechanical pre-treatment	2023	2,737	7,900	73	210
20.	Municipality of Tučepi	Construction planned		Primary	2023	8,618	15,000	230	400
21.	Živogošće	Construction planned		Mechanical	2023	5,277	2,000	141	53



No.	Agglomeration	Status	Type of treatment		Year of realisation	ES capacity (load)		Expected sludge quantities (t/year) *	
			Current	Planned		Current potential (2014)	Planned	Current potential (2014)	Planned
				pre-treatment					
22.	Baška Voda	Construction planned		Secondary	2023	11,589	20,000	309	533
23.	Municipality of Podgora	Construction planned		Mechanical pre-treatment	2023	6,486	9,000	173	240
24.	Drvenik	Construction planned		Mechanical pre-treatment	2023	3,170	7,500	84	200
25.	Mimice	Construction planned		Mechanical pre-treatment	2023	3,064	6,000	82	160
26.	Dicmo	Construction planned		Tertiary	2023	2,173	4,600	58	123
27.	Otok	Construction planned		Secondary	2023	3,986	7,000	106	187
28.	Dugi rat	Construction planned		Primary	2023	3,894	11,000	104	293
29.	Municipality of Muć	Construction planned		Tertiary	2023	2,732	5,400	73	144
30.	Nečujam - Island of Šolta	Construction planned		Mechanical pre-treatment	2023	1,803	3,300	48	88
31.	Vinišće	Construction planned		Mechanical pre-	2023	2,376	4,600	63	123



No.	Agglomeration	Status	Type of treatment		Year of realisation	ES capacity (load)		Expected sludge quantities (t/year) *	
			Current	Planned		Current potential (2014)	Planned	Current potential (2014)	Planned
				treatment					
								14,350	22,848

*Expected quantities determined based on a conservative estimate of 73 g/ES/d

Estimate of the annual sludge production of all UPOVs in the County	14,350	t/year
Estimate of the annual sludge production of all UPOVs in the County after upgrades and the completion of Split - Solin agglomeration	22,848	t/year

Source: Multi-annual municipal water supply works construction programme

[1] A. Karagiannidisa*, P. Samarasb, T. Kasampalisa, G. Perkoulidisa, P. Ziogasa, A. Zorpasc (2011) Evaluation of sewage sludge production and utilization in Greece in the frame of integrated energy recovery, Desalination and Water Treatment

[2] Beltzung Edwige, Bilanzierung einer Belebungsanlage zur Analyse des Klärschlammanfalls (2015) Universität für Bodenkultur Wien, Ermittlung der Schlammproduktion nach ATV-A 131



By analysing the structure of hazardous production waste (quantities larger than 100 t/year were analysed), it can be observed that it differs throughout the observed period. During all three years, the types of waste represented belong to the following categories: 11 *Wastes from chemical surface treatment and coating of metals and other materials; non-ferrous hydro-metallurgy*, 13 *Oil wastes and wastes of liquid fuels (except edible oils, and those in chapters 05, 12, and 19)*, 18 *Wastes from human or animal health care and/or related research (except kitchen and restaurant wastes not arising from immediate health care)* and 19 *Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption and water for industrial use*.

Table 4: Quantities of generated hazardous production waste larger than 100 t/year

Waste category code	Waste name	2016	2017	2018
08 01 17*	Wastes from paint or varnish removal containing organic solvents or other dangerous substances		111.43	
11 01 09*	Sludges and filter cakes containing dangerous substances	229.74	264.89	239.35
13 02 05*	Mineral-based non-chlorinated engine, gear, and lubricating oils	175.20	211.53	196.06
13 02 08*	Other engine, gear, and lubricating oils	252.95	214.25	233.10
13 04 03*	Bilge oils from other navigation	694.42	820.69	827.04
13 05 02*	Sludges from oil/water separators	172.02	234.01	114.83
13 05 07*	Oily water from oil/water separators	242.13	292.80	281.38
16 01 04*	End-of-life vehicles	100.68		109.09
16 06 01*	Lead batteries	173.09	130.43	
17 02 04*	Glass, plastic, and wood containing or contaminated with dangerous substances	299.33		
18 01 03*	Wastes whose collection and disposal is subject to special requirements in order to prevent infection	127.58	210.90	210.80
19 08 10*	Grease and oil mixture from oil/water separation other than those mentioned in 19 08 09	305.86	159.23	112.2



	other	1,192.59	1,218.12	1,598.27
	Total	3,965.59	3,868.29	3,922.93

The most represented waste is under category code 13 04 03* (*bilge oils from other navigation*) which made up for 17.5% of the total generated production waste in 2016, while that share was increased to 21.1% in 2018. The wastes under category codes 11 01 09* (*sludges and filter cakes containing dangerous substance*) and 13 05 07* (*oily water from oil/water separators*) also participate with a significant share which, on average, amounts to 6.2% or 7% annually. At the same time, both types of waste increased in 2017, when compared to 2016, but decreased in 2018.

2.2.1. Analysis of the number of businesses on the territory of the County

The number of active businesses on the territory of the County has increased in the observed period. Compared to 2016, there were 1,167 more enterprises active in 2018, which represents a growth of 7.95%. With a share of 17.15% in 2018, the dominant sector is (G) Wholesale and retail trade; repair of motor vehicles and motorcycles, followed by sectors (I) Accommodation and food service activities (11.92%), (M) Professional, scientific and technical activities (11.25%) and (F) Construction (11.07%). Sector (S) Other service activities has a share of 9.08% and (C) Manufacturing has 8.66%. When compared to 2016, the greatest growth in 2016 was recorded in the sector I (228 businesses more, which is a growth of 15.66%), followed by sector F (142 businesses more, which is a growth of 9.20%).



Table 5: Number and structure of active businesses in the County

Activity	2016	2017	2018
(A) Agriculture, forestry, and fishing	185	195	195
(B) Mining and quarrying	38	32	31
(C) Manufacturing	1,261	1,297	1,372
(D) Electricity, gas, steam, and air conditioning supply	42	41	39
(E) Water supply; sewerage, waste management, and remediation activities	77	74	76
(F) Construction	1,543	1,612	1,754
(G) Wholesale and retail trade; repair of motor vehicles and motorcycles	2,720	2,653	2,718
(H) Transportation and storage	580	619	791
(I) Accommodation and food service activities	1,456	1,660	1,888
(J) Information and communication	396	412	423
(K) Financial and insurance activities	61	63	62
(L) Real estate activities	628	666	687
(M) Professional, scientific, and technical activities	1,574	1,649	1,783
(N) Administrative and support service activities	859	973	1,077
(O) Public administration and defence; compulsory social security	113	71	70
(P) Education	346	349	357
(Q) Human health and social work activities	249	262	249
(R) Arts, entertainment, and recreation	916	991	835
(S) Other service activities	1,634	1,730	1,438
TOTAL	14,678	15,349	15,845

From the activities identified as generating the most quantity of production waste, Recovery of sorted materials (38.32) and Non-hazardous waste collection (38.11) belong to sector E, Building of ships and floating structures (30.11) and Repair and maintenance of ships and boats (33.15) belong to sector C, while Retail sale in non-specialised stores (47.11) belongs to sector G.

By observing the number of micro, small and medium-sized enterprises (hereinafter SME) in these three sectors and according to the data from the Croatian Chamber



of Commerce's Digital Chamber, it is possible to observe a growing trend among them, mostly the growth of micro-enterprises. The largest number of SMEs belong to sector G, followed by C and E.

Table 6: Number of SMEs in sectors C, E, and G

Year	Number of SMEs in sectors C, E, and G			
	Micro	Small	Medium	Total
2016	2,769	459	57	3,285
2017	2,956	463	57	3,476
2018	3,239	466	57	3,762

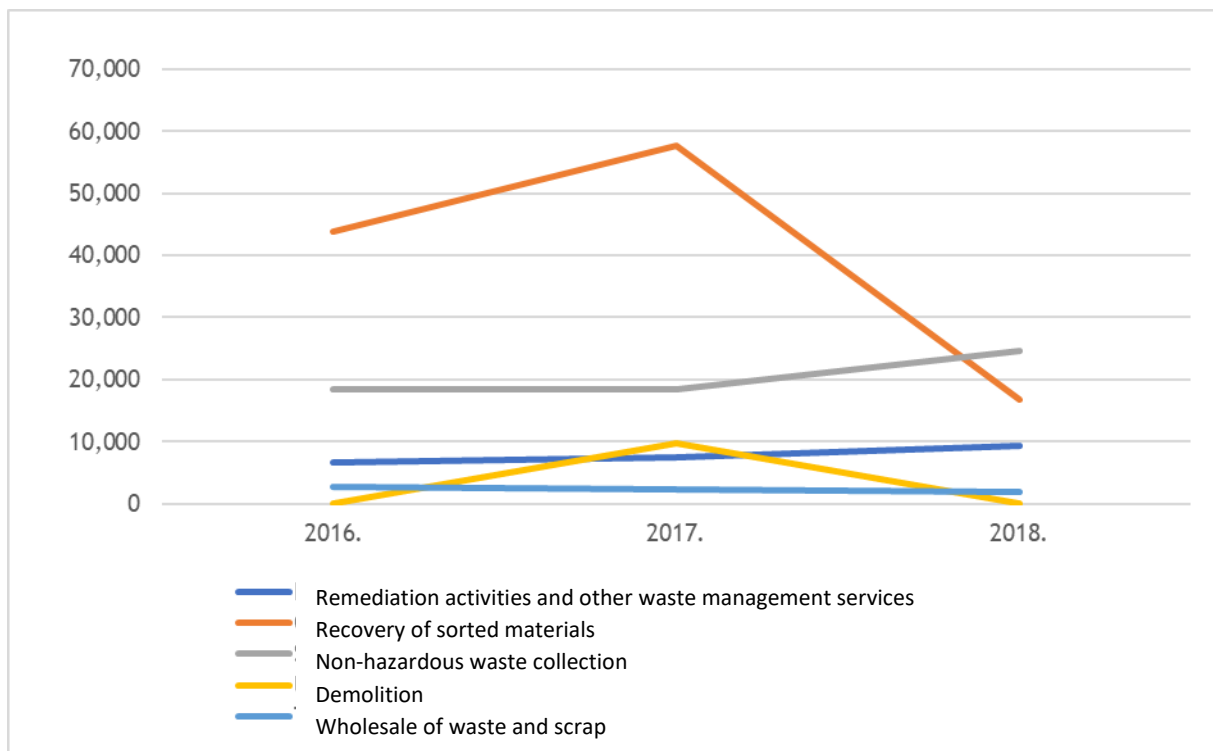
2.2.2. Analysis of the collected waste quantity

According to the data from the ROO, 57,699.71 tonnes of production waste was collected on the territory of the County in 2018, which is 15,795.67 tonnes (21.49%) less than in 2016. The recorded quantity is 41,040.74 tonnes less than in 2017. The share of the non-hazardous waste in the collected quantities falls within the range from 81.15% to 90.48%.

Table 7: Quantities of collected production waste on the territory of the County

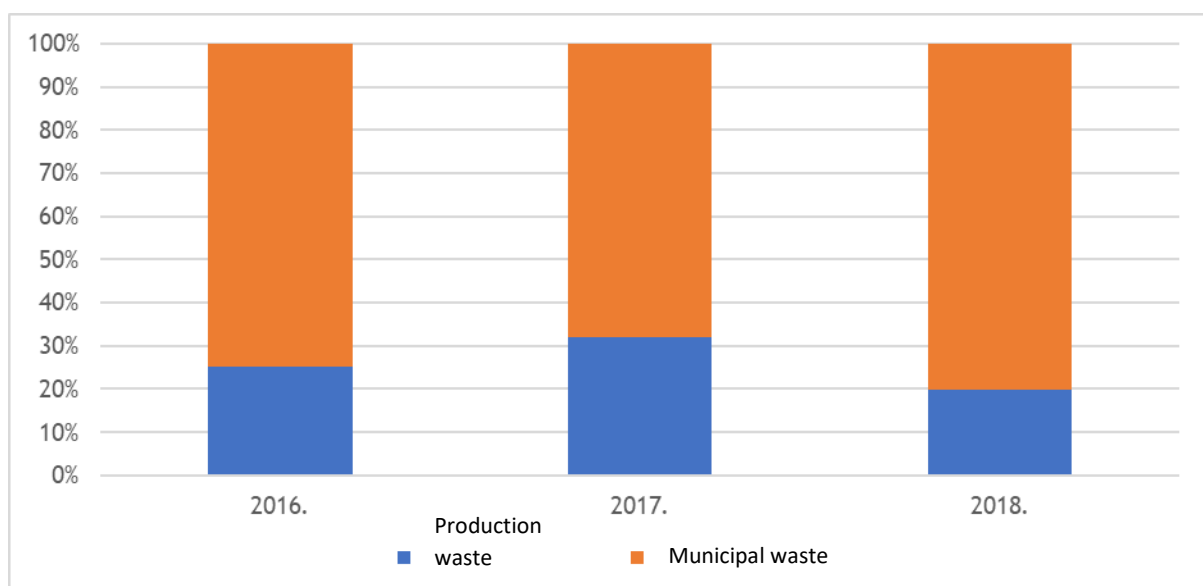
	2016		2017		2018	
	t/year	share (%)	t/year	share (%)	t/year	share (%)
Non-hazardous waste	64,798.91	88.17%	89,336.12	90.48%	46,826.06	81.15%
Hazardous waste	8,696.47	11.83%	9,404.33	9.52%	10,873.65	18.85%
Total	73,495.38	100.00%	98,740.45	100.00%	57,699.71	100.00%

The data related to the quantities of collected waste according to NKD with the largest share in the observed period are presented below (2016 - 2018). The graph below shows that the quantity of collected waste from the activity Non-hazardous waste collection (38.11), *Remediation activities* and *Other waste management services* (39.00) has a tendency of growth. The activities *Demolition* (43.11) and *Recovery of sorted materials* (38.32) grew in 2017 when compared to 2016, but it is possible to observe a sudden decline by 99%, i.e., 71% in 2018. There are no large changes in the activity *Wholesale of waste and scrap* (46.77), the quantity of collected waste has remained almost equal throughout the observed period.



Graph 4: Collected production waste according to NKD (in tonnes)

By comparison, the following graph shows the share of production and municipal waste in the collected waste. From the above, it can be observed that the largest quantity of production waste was collected in 2017 (an increase of 34% when compared to 2016), while there is a decrease of 42% in 2018.



Graph 5: Share of collected production/municipal waste



The structure of collected waste (quantities larger than 1,000 t/year) is different every year, with the exception of *paper and cardboard packaging* (category code 15 01 01), *plastic packaging* (15 01 02), *glass packaging* (15 01 07), *iron and steel* (17 04 05), *ferrous metals* (19 12 02), and *paper and cardboard* (20 01 01), which all appear every year.

Table 8: Quantities of collected non-hazardous production waste larger than 1,000 t/year

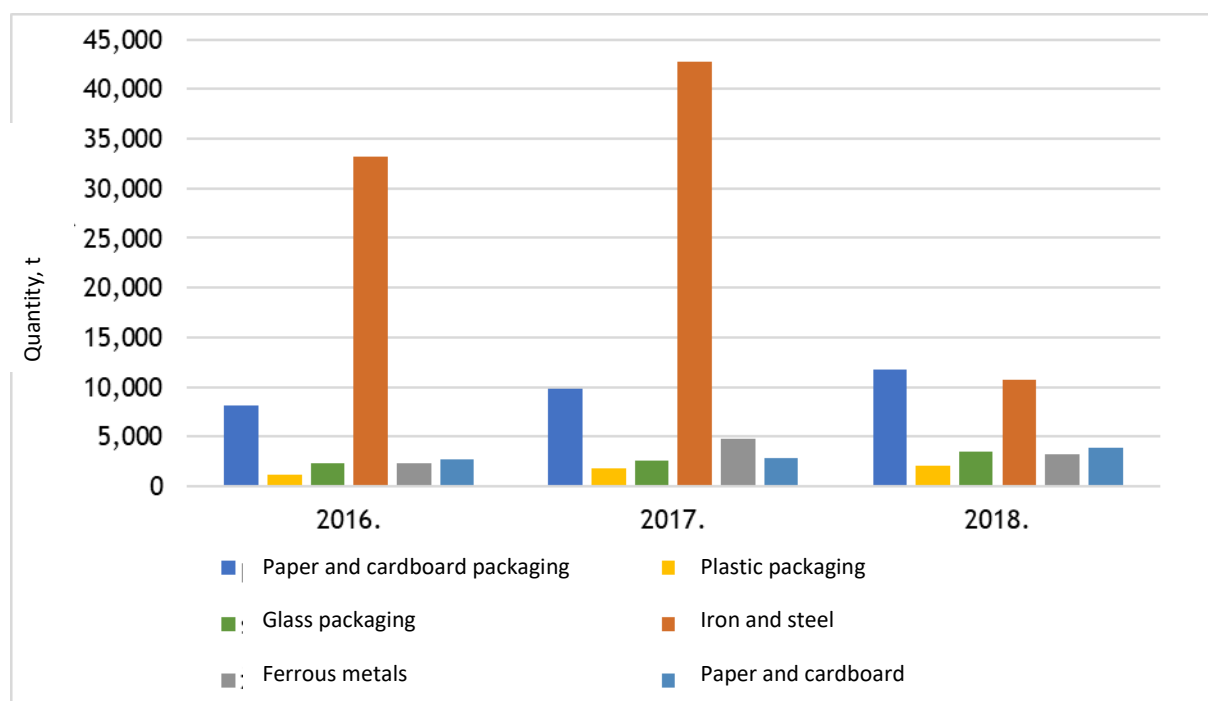
Waste category code	Waste name	2016	2017	2018
12 01 01	ferrous metal filings and turnings		1,516.87	
15 01 01	paper and cardboard packaging	8,109.97	9,821.82	11,733.16
15 01 02	plastic packaging	1,219.91	1,810.12	2,067.50
15 01 07	glass packaging	2,282.29	2,633.34	3,445.47
17 01 01	concrete		4,585.11	
17 04 01	copper, bronze, brass	2,232.10		
17 04 02	aluminium	1,017.90		
17 04 05	iron and steel	33,183.76	42,807.09	10,731.02
17 09 04	mixed construction and demolition wastes		5,192.30	
19 08 09	grease and oil mixture from oil/water separation containing only edible oil and fats		1,244.83	1,444.13
19 12 01	paper and cardboard		1,011.45	
19 12 02	ferrous metals	2,339.24	4,717.20	3,192.92
20 01 01	paper and cardboard	2,722.72	2,897.09	3,887.65
20 01 38	wood			1,249.77
20 01 40	metals	5,196.72	5,491.49	
20 03 07	bulky waste		1,188.79	
	other	6,494.30	4,418.64	9,074.44



	Total	64,798.91	89,336.12	46,826.06
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The most represented category of waste during 2018 was *paper and cardboard packaging* (25.06% of the total quantity), while the most represented one in 2017 and 2016 was *iron and steel* (51.21%, i.e., 47.92%).

Along with *paper and cardboard*, *paper*, *cardboard*, *plastic*, and *glass packaging* all have a trend of growth in the observed period, with the largest growth being that of *plastic packaging* with 847.59 t more collected in 2018, when compared to 2016 (growth of 69.48%).



Graph 6: Collected non-hazardous production waste - most represented categories

During the three observed years, an average of 249,612 t of municipal waste was produced on the territory of the County, with mixed municipal waste being the most frequent one.

Table 9: Municipal waste quantities expressed in t/year

Year	Produced municipal waste (t)	Produced mixed municipal waste (t)	Share of the mixed waste in the total collected municipal waste (%)
2016	222,037	199,086	89.99



Year	Produced municipal waste (t)	Produced mixed municipal waste (t)	Share of the mixed waste in the total collected municipal waste (%)
2017	255,036	194,630	92.0
2018	271,764	197,507	89.0

By analysing the share of organic municipal waste in the observed period, excluding the share of bio-waste in the *mixed municipal waste* (20 03 01), four categories of waste can be singled out, *biodegradable waste* (20 02 01), *edible oils and fats* (20 01 25), *waste from markets* (20 03 02), and *street-cleaning residues* (20 03 03). The organic waste share in the municipal waste is 0.73% on average. By establishing the Single methodology for municipal waste composition analysis, determining the average composition of the municipal waste in the Republic of Croatia and the forecast of municipal waste quantities, it was possible to estimate the composition of the mixed municipal waste with bio-waste having a share of 37.06% in it. Assuming the situation on the territory of the County is also like that, the bio-waste share in the total collected municipal waste would be 37.79%.

According to the data of the Implementation report for the waste management plan of the Republic of Croatia for the period from 2017 - 2022, the separately collected waste makes up for only 2% of the total collected municipal waste on the territory of the County (in 2018).

According to the publication Improvement of the bio-waste and food waste data collection system, from the total generated bio-waste quantity on the territory of the Republic of Croatia in 2017, only 11% was separately collected production waste. Likewise, separately collected municipal waste had a share of 12%, while the rest regarded the share of bio-waste in mixed types of municipal waste (77%). The largest shares in separately collected quantities of bio-waste consist of *biodegradable garden and park waste* (38%), *animal-tissue waste* (10%), and *materials unsuitable for consumption originating from the dairy industry* (10%). In other words, the rate of the separately collected bio-waste under the public



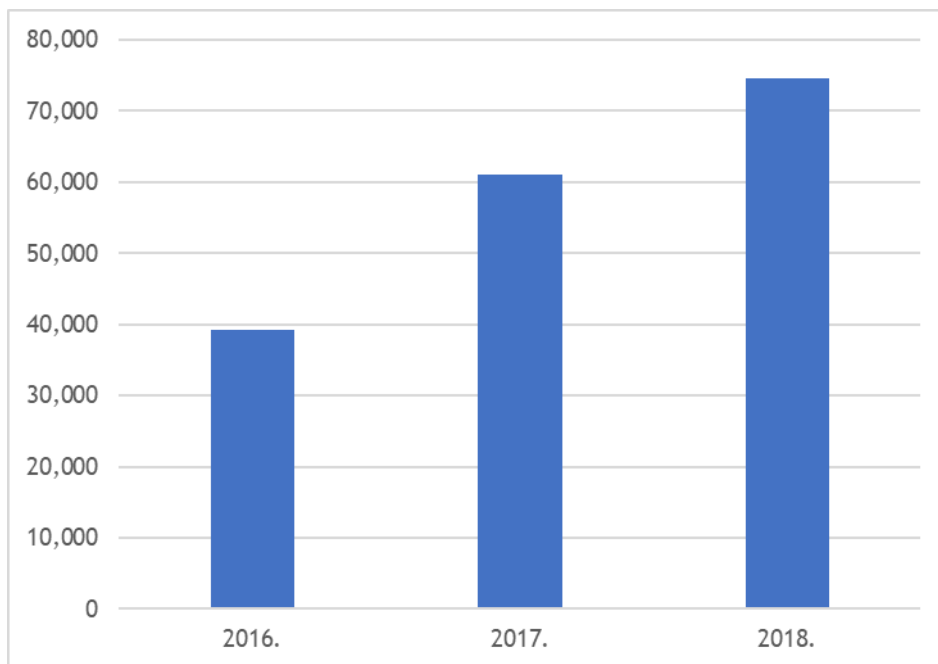
service on a national level was 8.7% in 2017, which is far from achieving the goal of 15% for that year, as foreseen by the Republic of Croatia's PGO.

The inhabitants pay a public utility charge for the collection of municipal waste under the public service. The amount of the charge is determined by local authorities which use the income to finance the maintenance and construction of municipal infrastructure, but also to finance the construction of institutions for preschool, school, health care, and social contents, public buildings for sports and cultural purposes and to improve the energy efficiency of buildings owned by local authorities. The price of the monthly charge varies depending on the type of space owned by the natural or legal person who is also liable to pay it. In addition, the price also varies considering the location where the real estate property is located and in certain local authorities where waste separation was introduced, the calculation is performed either according to the number of household members or by the number of times the container was emptied, depending on the size of the container itself.

Besides the public utility charge paid by the liable person, there is also a stimulus reimbursement measure for packaging waste. It is calculated per unit of PET, glass, aluminium, and can packaging for all kinds of drinks and beverages with a volume larger than 0.2 l and amounts to HRK 0.5/unit.

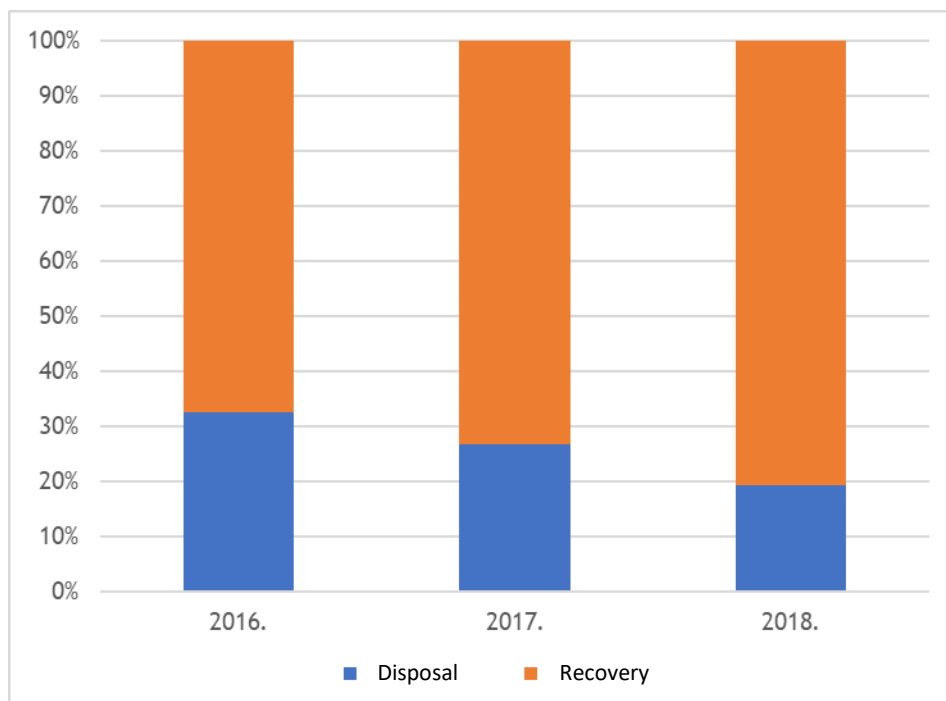
2.2. Analysis of the method for handling waste

The total quantity of treated production waste in the County is increasing within the observed period. Compared to 2016, a total of 35,283.317 t more was treated (disposed/recovered) in 2018 (a growth of around 90%). Recovery of waste (R) is a waste reprocessing process for its further use for material or energy purposes, while the disposal of waste (D) is a process of final processing or waste disposal.



Graph 7: Total quantity of treated production waste in the County

There is more recovered than disposed waste in the total treated production waste, which is shown by the graph below.



Graph 8: Quantity of disposed / recovered production waste



The production waste recovery share is 67.5% in 2016 and it increased to 80.8% in 2018, while on the other hand, the disposal share decreased to 19.2% in 2018, when compared to its share of 32.5% in 2016. A trend of an average annual increase of 6.65% in the recovery of production waste can be observed.

The most frequent processes for treating the production waste in the County are shown in the following table.

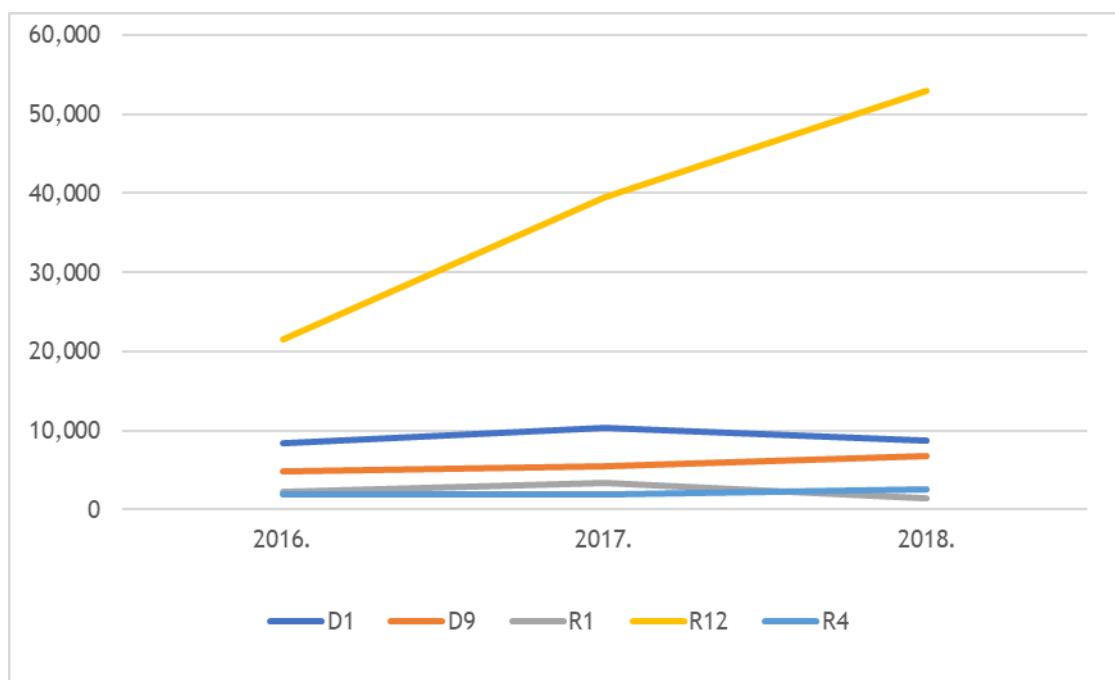
Table 10: The most frequent processes of waste treatment in the County

Operation		Description
Disposal	D1	Disposal of the waste into or on the ground - encompasses above-ground landfill sites for final waste disposal. Inert and non-hazardous waste landfill sites are included, as well as other forms of disposal, e.g., waste heaps, waste mineral and rock heaps in the extractive industry.
	D9	Physico-chemical treatment which is not specified in operations elsewhere and which results in final compounds and mixtures which are discarded by means of any of the operations from D1 to D12 - it encompasses the pre-treatment of mostly liquid and paste-like hazardous waste with different kinds of chemical, thermal and physical processes so as to achieve an output product which can finally be disposed of.
Recovery	R1	Using waste as fuel or other means of generating energy - the operation encompasses waste incineration and co-



		incineration as fuel in power plants and industrial incineration plants in order to use the energy to produce heat and electricity
	R4	Recycling/reclamation of metals and metal compounds - the operation encompasses all treatment processes with the purpose of recycling scrap metal and complex products where metals are the predominating materials. This includes various integral steps and processes such as cutting, sorting, heat treatment, and electrolytic processes.
	R12	Exchange of waste for submission to any of the recovery operations from R1 to R11 - it encompasses preparatory actions such as cutting, mixing, and homogenising waste and similar processes with the aim of preparing the waste for transport and/or further treatment processes.

The graph below shows the change in the quantity of waste (in tonnes) treated with a certain process in the observed period.



Graph 10: Quantity of waste treated according to processes



The largest share of waste in the County is treated with operation R12, while operation D1 prevails on the national level. Likewise, there is an increasing trend for operation D9 on the County level in the observed period, while it is decreasing on the national level in the Republic of Croatia.

The recovered waste rate (including the municipal waste) in EU-28 was 59.3% in 2016, while the rate of disposed waste was 40.7%. In that same period in Croatia, that rate was 55.6%, i.e., 44.4%. The share of the municipal waste sent to recovery is continuously growing and amounts to 15.3% on average.

Table 11: Quantities of generated municipal waste with additional quantities sent to recovery included

Year	Produced municipal waste (t)	Sent to recovery (t)	Share of municipal waste sent to recovery (t)
2016	262,531	34,821	13.3
2017	255,036	37,514	14.7
2018	271,764	48,584	17.9

There are 15 official landfill sites in the County and 34% of the total quantity of deposited mixed municipal waste is deposited in the City of Split, while other local authorities participate with less than 10%.

There is also a problem of illegal dumping of waste on the territory of the County, i.e., the existence of so-called “unauthorised landfill sites”. 177 sites where waste was illegally dumped were reported in 2018. 35 sites have already been cleaned up and three of them are active again, while 30 have been partially cleaned and 109 sites still have not been cleaned. It has been estimated that 294,973.00 m³ of waste has been illegally dumped at unauthorised landfill sites. 20% of the total waste quantity has not been removed from the territory of 19 local authorities. According to the ELOO system (Record of dumped waste sites), the largest quantity of dumped waste belongs to the categories of *construction material*, *bulky waste*,



and *mixed municipal waste*. More than a half of the total waste quantity consists of construction waste in the form of soil excavated during construction works.

In order to gain an insight into the categories of waste treated with these processes, five leading categories of waste collected in the County were selected (a combination of hazardous and non-hazardous categories of waste) and are shown in the table below.

Table 12: Treatment processes according to waste category

Waste category	Waste category code	Description	Operation
Non-hazardous	17 04 05	Iron and steel	R12
	15 01 01	Paper and cardboard packaging	R13
	20 01 40	Metals	R12
Hazardous	13 04 03*	Bilge oils from other navigation	R1, D1, D9
	16 01 04*	End-of-life vehicles	R4

Operation R13 regards the storage of waste before any recovery operation from R1 to R11 (apart from temporary storage of waste at the place of its production before collection). The operation encompasses the temporary storage of waste which shall be recovered.

Alternatives to mixed waste landfill sites are waste incineration plants and mechanical biological treatment facilities. They resolve the problem of waste in a manner which does not harm humans and the environment, and the waste which remains after the treatment process and is disposed of by depositing does not present a hazard nor an expense for future generations. Incineration plants produce energy from waste which is used for heating, cooling, and production of electricity, which in turn enables a circular economy to be established. There are 748 incineration plants operating within Europe, while there are currently none in the County, just as there are none in the whole of Croatia. Apart from Croatia, other EU Member States without incineration plants are Malta, Cyprus, and Luxembourg.



2.3 Analysis of the number of permits and decisions on non-hazardous production waste management

The following table shows the data on the number of permits and decisions for non-hazardous production waste management on the territory of the Split-Dalmatia County, taken from the Registry of permits and certificates for waste management. The waste management permit is issued for five years, after which it is possible to revise and extend the permit or issue a temporary permit. Likewise, various amendments to the permit are also possible, depending on the change of the items prescribed in the issue of the initial permit.

Table 13: Data on the number of permits and decisions on non-hazardous production waste management

Year	Number of permits for			Number of amendments to			Total number of permits/decisions issued
	Disposal and recovery	Disposal only	Recovery only	Disposal and recovery	Disposal only	Recovery only	
2016	1	1	9	-	-	-	11
2017	2	-	10	1	-	6	19
2018	-	1	2	1	-	5	9

As it can be observed in the table, the number of issued waste management permits increased by 72% in 2017 when compared to 2016, while in 2018, it decreased by 47% when compared to 2017.

The number of companies which requested the permit is larger by 55% in 2017, when compared to 2016, but again, it decreases by 50% in 2018.

Table 14: Number of companies which requested permits/decisions

Year	The number of companies which requested a permit for			Total number
	Disposal and recovery	Disposal only	Recovery only	
2016	1	1	7	9
2017	3	-	11	14
2018	1	1	5	7

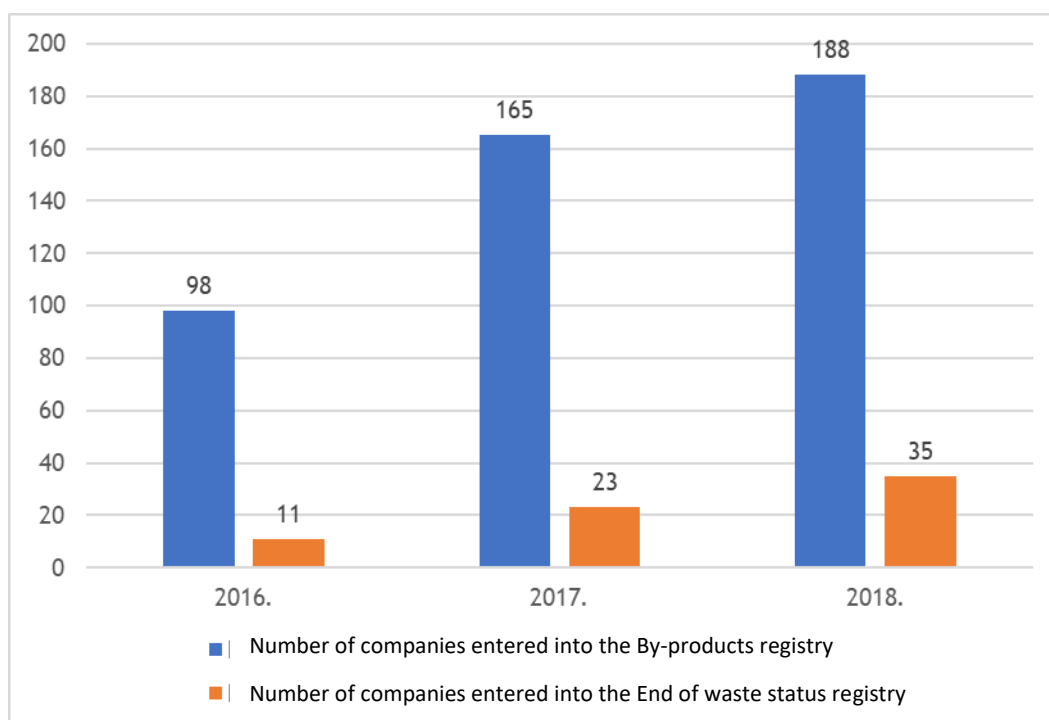


2.4 Analysis of the number of companies entered into the By-products registry and End of waste status registry

A by-product is a production residue which is created in the production process, the primary goal of which is not the production of that substance or object and it is not considered as waste, but rather, it can serve as an input for another kind of production process. End of waste status is a procedure through which waste ceases to be waste if it has undergone a recovery process, including recycling and if it meets the conditions in the law.

Due to the unavailability of the information for the territory of the Split-Dalmatia County in the document *Overview of the information from the Registry of permits and certificates for waste management in 2019*, issued by the Ministry of Environment and Energy, the data taken and shown are for the national level.

In total, 69% more companies were entered into the By-products registry in 2017 than in 2016, while there was an additional 14% increase in entered companies in 2018. In the observed period, a trend of an increase in companies entered into the End of waste status registry can also be observed. In 2017, there was an increase of 109% in entered companies when compared to 2016, while the growth trend continued in 2018 with an increase of 52% in the number of companies when compared to 2017.



Graph 9: Number of companies entered into the By-products registry and End of waste status registry, 2016 - 2018, Republic of Croatia

According to the existing data from the By-products registry and End of waste status registry, there are seven entered companies in total, i.e., two companies with a registered office in Split-Dalmatia County.

2.5 Analysis of reported waste quantities for which the waste status has ceased

The following tables show the categories of waste which entered the recovery processes and categories of waste for which the status of waste ceased after the recovery (with their corresponding quantities). Due to the unavailability of data for counties, the data was analysed at a national level and taken from the web pages of HAOP.

Total quantities of waste which entered the recovery processes fluctuate during the observed period. Namely, the total reported quantity of waste decreased by 15% in 2017, when compared to 2016, while in 2018, there was a recorded growth of 39% when compared to 2017. The largest share of reported quantities in 2016 belongs to the waste categories *glass* (44%), *plastic waste* (32.6%), and



biodegradable waste for anaerobic treatment (11.3%). A decrease was recorded in those exact categories in 2017, but there was a significant increase in the categories *EE waste* (14.4%) and *construction waste* (24%). The largest share in 2018 belongs to the category *biodegradable waste for aerobic treatment (composting)* (25.8%) and *glass* (25.6%), but the categories *construction waste*, *biodegradable waste for anaerobic treatment*, and *EE waste* also participate with increased shares.

EE waste is a hazardous waste which falls under special categories of waste. It contains valuable metal and non-metal raw materials which are obtained through recovery and they can be used for energy purposes. However, a problem can occur if it is inadequately disposed of because it contains elements of lead, cadmium, mercury, beryllium, and arsenic, all of which have an adverse effect on human health and the environment. EE waste has to be collected separately and managed properly, which has been prescribed in a special ordinance.

Table 15: Reported waste quantities which have entered recovery processes, after which their waste status ceased

Waste category	Quantity (t)		
	2016	2017	2018
Biodegradable waste for aerobic treatment (composting)	9,342.47	7,351.51	28,932.91
Glass	41,740.56	28,482.21	28,758.92
Construction waste	966.85	19,557.84	17,125.42
Biodegradable waste for anaerobic treatment	10,743.51	6,982.31	15,029.78
EE waste	0.00	11,564.26	13,513.96
Waste from wood and other bio-waste	0.00	3,613.61	6,613.59
Plastic waste	30,980.57	2,581.57	1,994.42
Waste printing toners	15.30	116.13	170.53
Clothes and textile waste	87.78	80.13	44.52
Other	0.00	5.40	5.23
Fuel oil	881.58	122.30	0.00
Total:	94,758.63	80,457.27	112,189.28

The quantities of output material for which the status of waste has ceased increase in the observed period on average by 21.5%. Thereby, the largest quantity of the output material belongs to the following types of product *glass granulate (packaging and flat)* and *glass aggregate*, *polymer raw material* which participate in the quantity with 38.7% and 32.6%

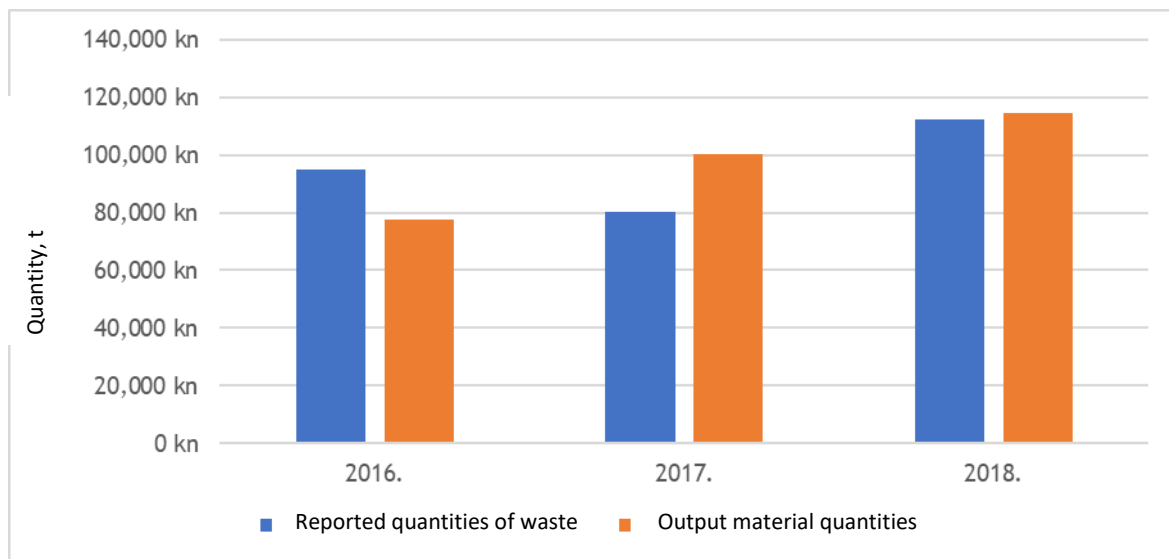


on average. During 2017 and 2018, a significant increase in the output material share belonging to *recycled aggregate* (17.4%, i.e., 17.8%) was also recorded.

Table 16: Quantities of output material/product for which the waste status ceased after recovery

Product name	Product quantity (t)		
	2016	2017	2018
glass granulate (packaging and flat) and glass aggregate	37,303.43	36,299.07	36,881.93
Polymer raw material	28,985.30	36,198.11	28,059.10
Recycled aggregate	874.83	17,480.52	20,403.75
I., II. and III. class compost and soil improver	1,825.53	2,596.13	15,004.70
Anaerobic digestate	3,715.70	3,855.03	11,400.76
Solid biofuel	0.00	3,539.71	2,581.04
Cotton cloths and raw cotton	69.36	60.10	37.35
Toner cartridges	15.30	11.44	6.87
wardrobe, dresser, drawer, display case, bedside cabinet, table, chair, bench, sofa, bed, armchair, carpet, clothes, footwear, book, painting, ornaments, and similar things	0.00	5.40	5.30
Fuel oil Aeks	881.58	122.30	0
Wood packaging	4,080.71	73.90	0
Total:	77,751.74	100,241.71	114,380.80

The difference in total quantities of waste/output material is due to the information asymmetries on the waste category codes in reports to the O-GO database - Waste Management Registry of the Ministry of Environmental Protection and Energy Efficiency and the data and waste category codes which have entered the recovery processes and have been reported in reports on the end of waste status.



Graph 10: Comparison of the total reported/output material quantities

2.6 Analysis of the quantities of by-products

According to the data from the web pages of HAOP, the quantities of by-products on the national level of the Republic of Croatia in the period from 2016 to 2018, divided by waste categories, are shown in the following table.

Reported quantities of by-products increase annually in the observed period by 55.8% on average. Accordingly, a growth of 80.8%, 94%, and 110.5% on average has been recorded during the entire period in the waste categories that make up for the largest shares, *residues from wood use, manure and liquid manure, and by-product of plant origin*. In the category *milk-derived products' by-product*, a decrease of 10.25% on average was recorded.

Table 17: Reported by-product quantities

Waste category	Quantity (t)		
	2016	2017	2018
Residues from wood use	65,706.54	143,960.29	205,383.08
Manure and liquid manure	58,250.99	151,958.55	201,927.82
By-product of plant origin	24,468.44	72,732.12	89,849.79
Milk-derived products' by-product	74,268.36	67,270.05	59,809.82
Construction material	9,857.12	10,059.20	19,481.24
By-product of animal origin	10,078.48	16,912.09	15,175.72
Other	13,708.34	14,196.82	13,216.06
Metals	244.19	736.59	1,351.69
Ash	0.00	1,679.82	944.40



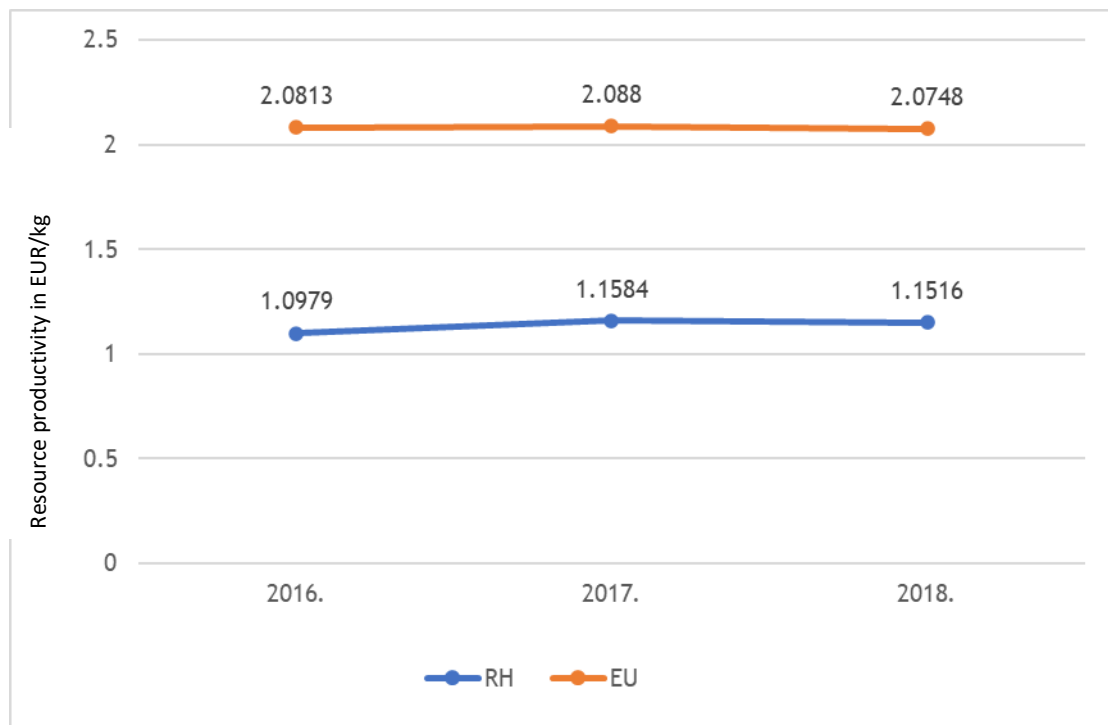
Polymers	2 564.89	557.92	691.67
Textile	459.35	618.68	682.18
Total:	259,606.69	480,682.13	608,513.46

2.7 Analysis of circular economy indicators on the level of the Republic of Croatia

According to Eurostat statistics, the circular economy indicators analysed are resource/material productivity, material reuse rate, secondary raw materials circulation rate, and trade in recyclable raw materials.

Resource productivity represents the ratio between GDP (gross domestic product) and domestic material consumption. Domestic material consumption measures the total number of materials directly used in the economy, while consumption is to be treated as consumption in production, not as final consumption. This indicator measures whether the economy is developing in a way that uses natural resources efficiently, along with reducing the negative impact on the environment during material exploitation and use. In other words, it measures the transition of the economic system of a country to a more rational form, from the aspect of the consumption of its own resources. It is expressed in EUR/kg.

Considering that there are no data on the county level, the indicators were analysed on the national level even for certain available periods.



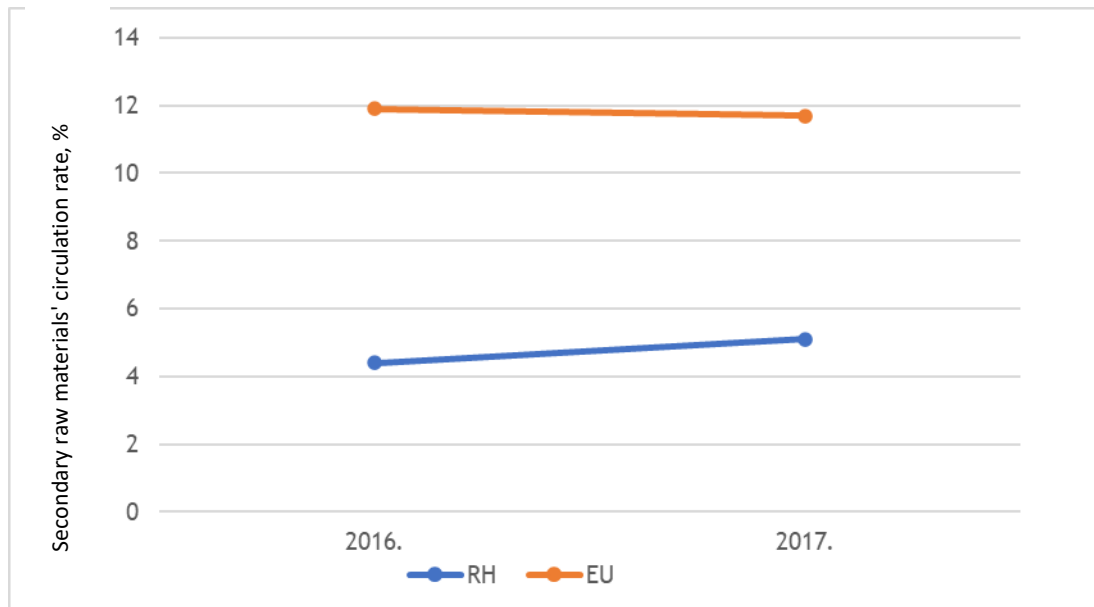
Graph 11: Resource productivity indicator

If the indicator amount is growing, it means that a lesser quantity of raw materials produces an equal quantity of wealth, which represents added value or, in other words, the same quantity of raw materials produces a larger quantity of wealth. According to the graph, the indicator shows a trend of growth from 2016 to 2017, after which there is a small decrease from 2017 to 2018. Even though the trend in the Republic of Croatia follows the one in the EU, the amount of the indicator in the Republic of Croatia is still two times lower than the European average.

Material reuse rate implies the share of materials recovered and returned to the production process of the so-called secondary raw material, which reduces the extraction of primary raw materials and the total consumption of materials. Using the enterprises' secondary raw materials leads to cost savings in the annual turnover and reduces greenhouse gas emissions. It is calculated as the ratio between secondary raw material consumption and total material consumption. The secondary raw materials quantity is approximated by the quantity of recycled waste within the country minus the waste imported for recovery purposes plus the waste exported for recovery abroad. Larger rate of material circulation means that more secondary raw materials became the substitute for primary raw materials,



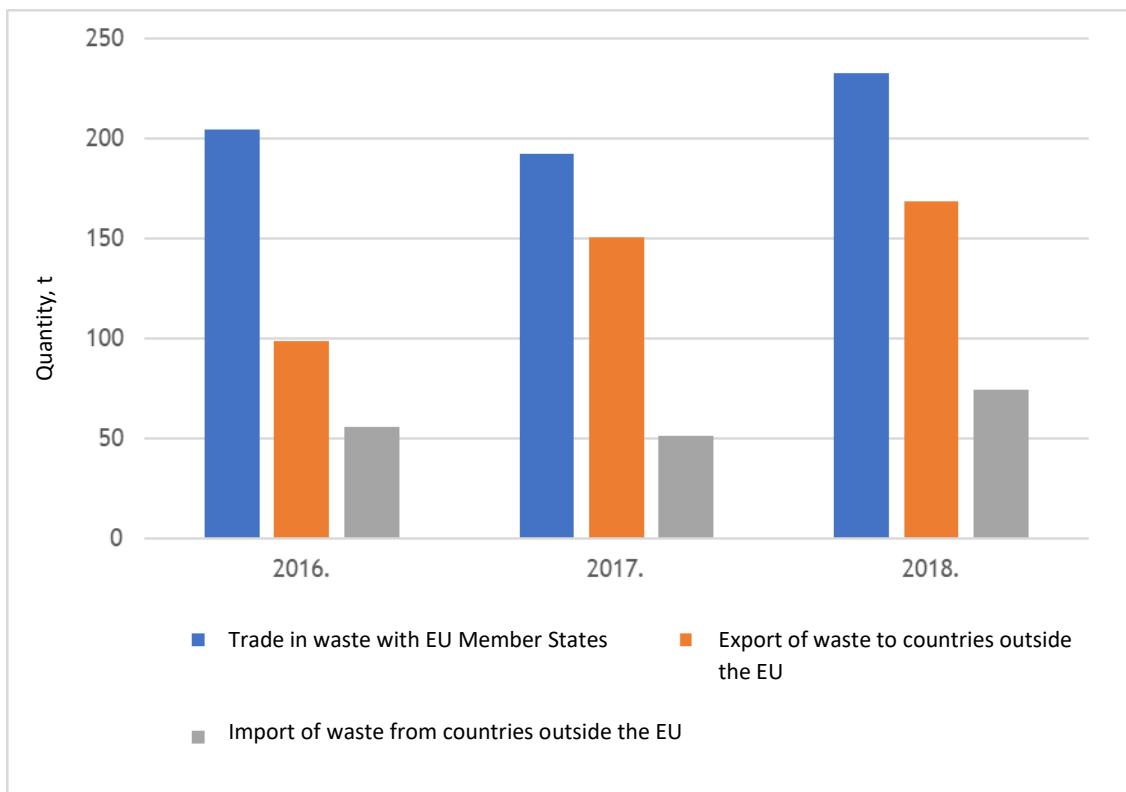
which reduced the extraction of primary raw materials and the negative environmental impact that such a process causes.



Graph 12: Secondary raw materials' circulation rate

Even though a 16% growth in the rate is present in Croatia from 2016 to 2017, it is still two times lower than the European average which reports a decrease of 2% in that same period.

Trade in recyclable raw materials (secondary raw materials) is a circular economy indicator which measures the quantities of chosen categories of waste and by-products which were traded within and outside of the borders of the European Union. Five categories of waste are observed: plastics, paper and cardboard, iron and steel, aluminium and nickel, and precious metals, while the indicators show data on the trade in waste between EU Member States (such as the import/export from EU countries) and the import and export of waste from countries outside the EU.

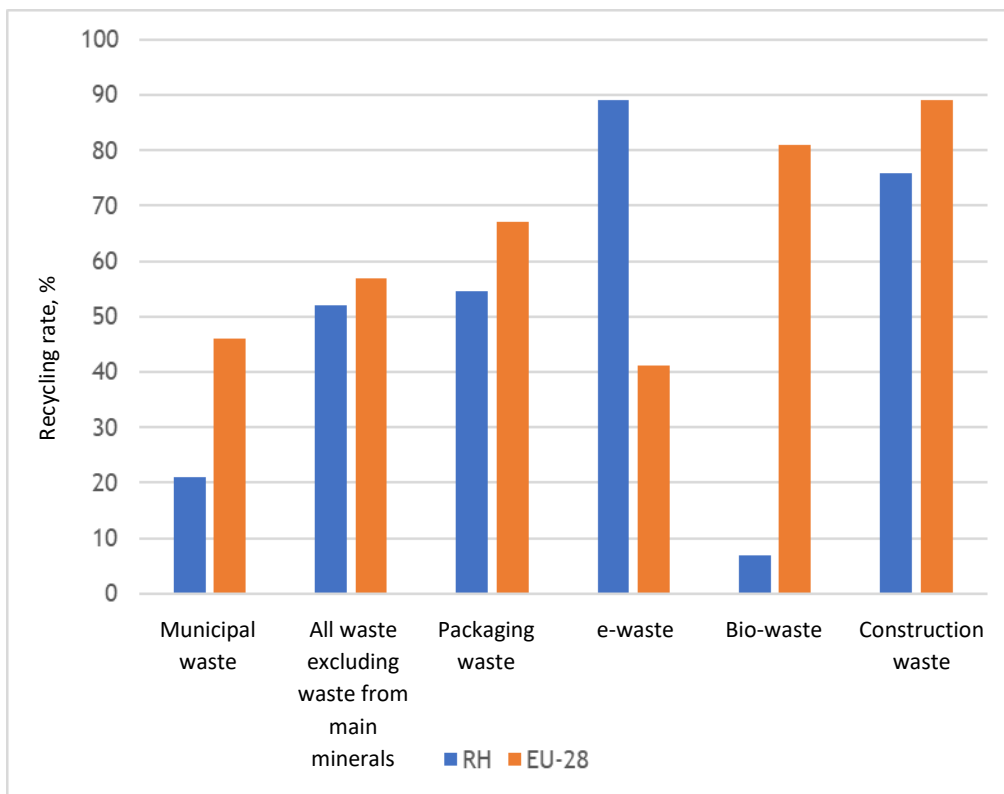


Graph 13: Import/export of waste on the level of the Republic of Croatia

The export of waste to countries outside the EU has a tendency of growth during the observed period, while import of waste from countries outside the EU, as well as the trade in waste with the EU Member States both decreased in 2017 (7%, 6%), then increased again in 2018 (21%, 46%). A tendency of growth in all mentioned categories was recorded on the level of the European Union in the same observed period.

In order to gain a deeper insight into the status of waste management, production and consumption, trade in secondary raw materials, and other details on the territory of the Republic of Croatia in relation to the EU, several other circular economy indicators were analysed below.

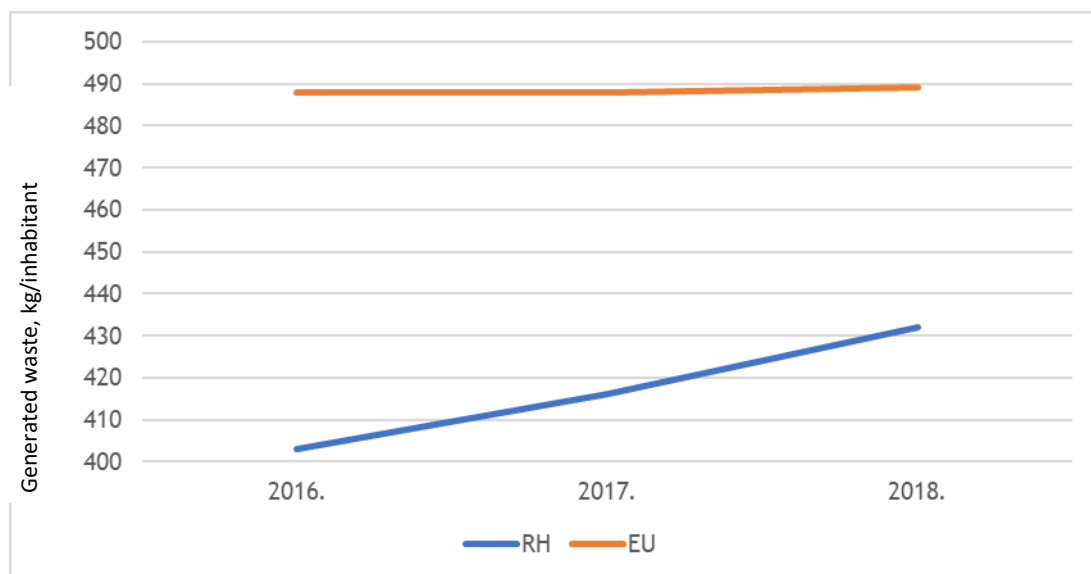
1. Indicator of the recycling rate for different categories of waste in 2016
(complete data is not available for 2017 and 2018):



Graph 14: Recycling rate

2. Indicators of waste generation

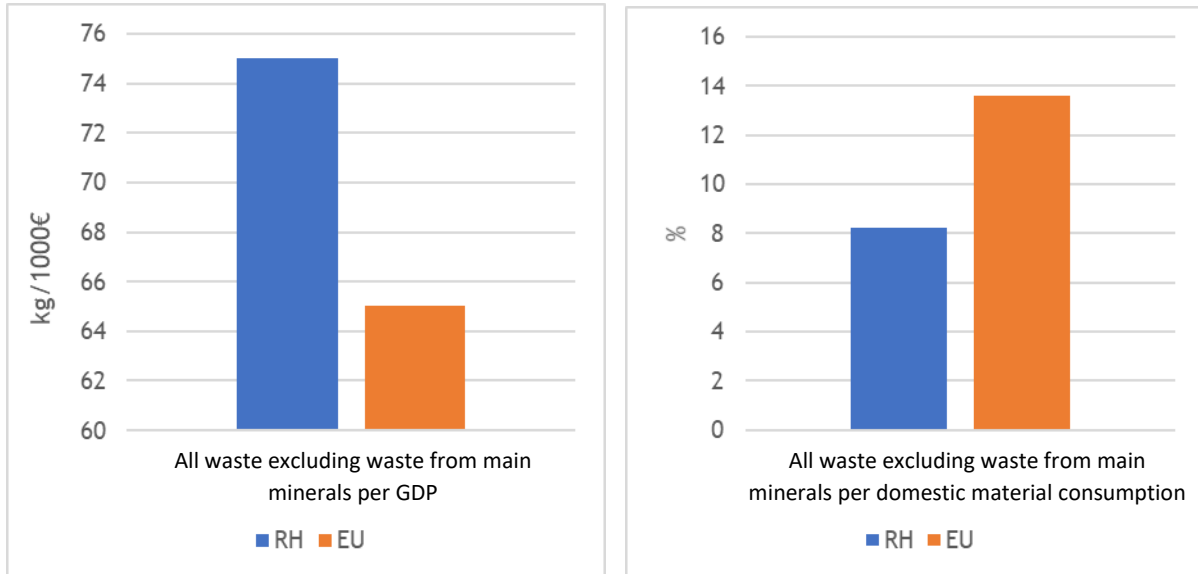
2.1. Generated municipal waste per inhabitant in the Republic of Croatia and in the EU in the period from 2016 - 2018



Graph 15: Generated municipal waste

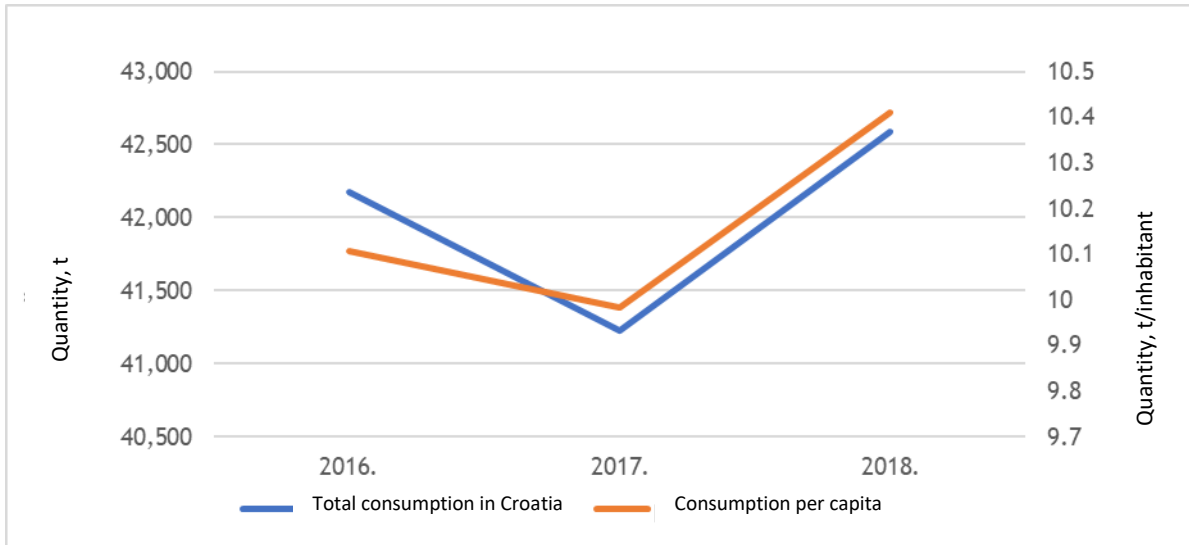


2.2. Waste generated per GDP unit and per domestic material consumption in 2016



Graph 16: Indicators of waste generation

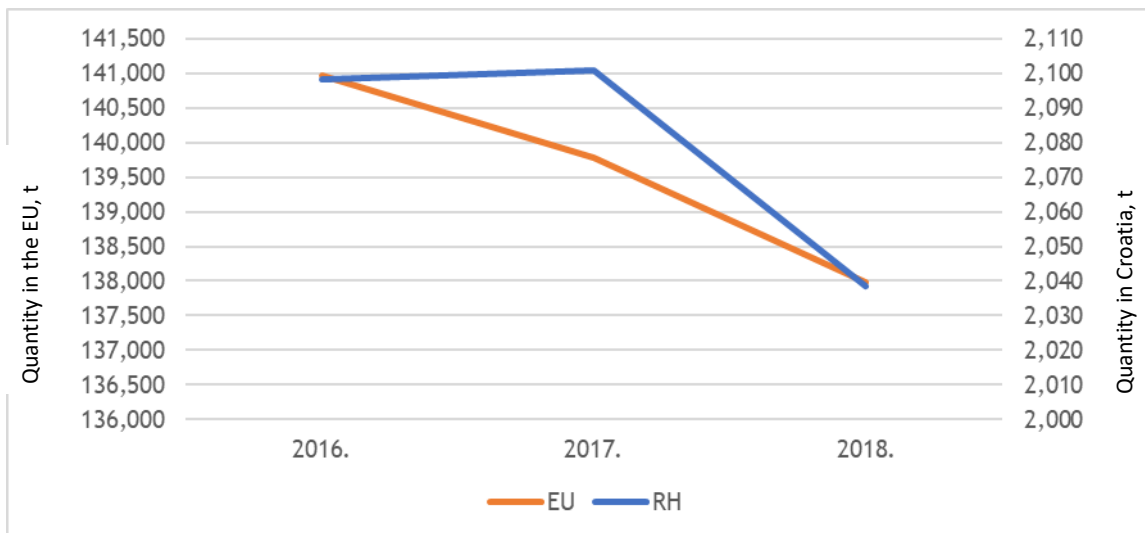
The first indicator shows the generated quantity of waste in the country in relation to the GDP of that country, while the second one shows the quantity of waste generated in relation to the consumed quantity of materials/raw materials in the domestic economy. The quantity of domestic material consumption (DMC) in the Republic of Croatia in the period from 2016 - 2018 is also included. DMC is the quantity of primary raw materials (used directly in the domestic economy), extracted from domestic territory in one year plus imported raw materials, minus exported raw materials.



Graph 17: DMC in the Republic of Croatia

The quantity of consumed raw materials in the Republic of Croatia makes up for only 0.6% of the total consumed raw materials on the EU-28 territory.

3. Indicator of greenhouse gas emissions generated by waste management



Graph 18: Greenhouse gas emission

Greenhouse gasses are carbon dioxide (CO₂), methane (CH₄), nitrogen oxide (N₂O), hydrofluorocarbon (freon, HFC), perfluorocarbon (PFC), sulphur hexafluoride (SF₆), and nitrogen trifluoride (NF₃). The indicator shows the number of greenhouse gases generated by waste management activities in a certain country (including



international air traffic) in one year. 1.4% of gas emissions on the territory of Europe are generated in the Republic of Croatia.

2.8 Analysis of the strategic and legal waste management framework

2.8.1. Strategic framework

The ten-year development strategy Europe 2020 proposes sustainable growth as one of the priorities of the development of the European Union. The concept of sustainable growth and development is based on promoting an economy which uses its resources more efficiently, more competitively and in a manner that is greener. This economical model is called the circular economy and one of its fundamental objectives is to minimise the generation of waste. This does not concern only the waste generated in a production process, but rather systematically, during the entire life cycle of a product and its components. The reduction of waste generation is achieved through waste management policy which has the use of waste as a valuable resource as its objective.

The Republic of Croatia, as a Member State of the European Union, is subject to meeting the measures and objectives provided for achieving the concept of the circular economy within the scope of the development strategy Europe 2020 and the EU Circular Economy Action Plan. In accordance with the above, the Republic of Croatia has adopted the Waste Management Plan of the Republic of Croatia for 2017 - 2022 (OG 3/2017), which states the main objectives and obligations that should be achieved by 2022. According to the Plan, local authorities should draft their own Waste Management Plans and Reports on plans implemented on an



annual level, determine the landfill sites in spatial plans, implement the measures for managing the municipal waste and collect and provide information.

Apart from the mentioned documents, the strategic waste management framework encompasses the Waste Management Strategy which has the reduction and sustainable management of produced waste as its goals. Furthermore, it also includes the Sustainable Development Strategy of the Republic of Croatia and drafting the National Development Strategy until 2030 which serves to formulate and implement the development policies of the Republic of Croatia and the National Action Plan for Green Public Procurement for the period from 2015 to 2017 with a view to 2020, with the aim of greening the market and encouraging the development of eco-innovations. Through the green public procurement process, the public administrative bodies reduce the consumption of resources and the emission of greenhouse gases as the fundamental items of the development of the circular economy. Likewise, climate changes also impact the generation of waste so as part of the framework, the Strategy of adaptation to climate changes in the Republic of Croatia for the period until 2040 with a view to 2070 is also included. With the aim of reducing the mixed municipal waste and encouraging the separation within the scope of waste management, the Plan for prevention and reduction of food waste generation in the Republic of Croatia 2019 - 2021 is also included.

According to the Sustainable Development Strategy of the Republic of Croatia, the Counties shall determine the sites in the spatial plans and the issue of permits for non-hazardous and inert waste landfill sites, ensure the conditions and the implementation of measures for managing the production, packaging, construction, and other waste, issue corresponding permits and collect data on the waste. According to the Plan, the Counties are competent to dispose of asbestos waste and to ensure the capacities for treating mixed municipal waste and the waste which is generated after its treatment, the construction of facilities for sorting, recycling, and waste management centres.

An account shall be taken of all previously mentioned documents, guidelines, and objectives for achieving the concept of circular industry on the territory of the



Split-Dalmatia County and the goals of this Plan. Likewise, according to the Waste Management Plan of the Republic of Croatia for 2017 - 2022, to achieve the “deposition of less than 25% of municipal waste”, the City of Split must construct a facility and/or procure equipment necessary for sorting and biological treatment of separately collected waste by 2022.

The realisation of the project “Waste management centre in the Split-Dalmatia County” which has scheduled the construction of the County Centre for recovery (CPU) Lećevica with six transfer stations is currently in progress. Waste from the territory of all 55 local authorities in the County will be transported to the CPU and it will comprise of a facility for mechanical treatment of unsorted, mixed municipal waste, a plant for the treatment of biodegradable waste mechanically separated from mixed municipal waste, a plant for maturing the product similar to compost, a plant for biological treatment and compost maturing from previously separated bio-waste, a recycling yard, a facility for treating construction waste, landfill sites for hazardous and non-hazardous waste and a system for collecting and treating wastewater. The initial realisation of the project was planned for 2018, but according to the latest information, the CPU should be commissioned in 2023 at the latest. It is important to highlight that there is no composting plant which could dispose of bio-waste nor a waste incineration plant on the territory of the County. In 2018, educational and informative activities were conducted in 38 local authorities, 4 are planned and there were none in 13 local authorities, while eco-activities were not conducted in 25 local authorities.

The financial aspect of waste management that has to be secured is also an important item. The funding intended for waste management has been secured in the County budget and local authorities’ budgets. Inter alia, the funds are intended for the procurement of the equipment for collecting and disposing of garbage, the construction of the CGO, cleaning unauthorised landfill sites, raising the awareness about the environment, testing the water quality for swimming in rivers and lakes on the territory, the preparation, design, clean-up, and construction of recycling yards and official landfill sites, the development of water supply and drainage facilities and transport infrastructure. Once a year, the County also adopts a



Programme for raising the awareness about the environment on its territory under which civil society organisations are granted funds for projects/programmes concerning the education and promotion of lifestyles in the field of waste management, avoiding the generation of waste, recycling and recovery of waste, and proper handling of waste.

The County development strategy for the period up to 2020 has established development goals which encompass waste management, but also establishing a circular economy. Goals which regard the above-mentioned are raising the quality, sustainability and efficiency of the municipal and energy system, assessment, protection, conservation, and sustainable use of natural values, improving the system of integrated and sustainable waste management, creating a competitive, sustainable, and inclusive economy based on knowledge and the development of green and social entrepreneurship.

The Waste Exchange was created under the Croatian Chamber of Commerce for easier finding and recovery of secondary raw materials to the production process. The Exchange connects the supply and demand for all categories of waste generated in the production and which interconnect with each other. This improves the waste management system which enables the stakeholders to inform themselves transparently on the available secondary raw materials and special categories of waste. There are certain minimum technical requirements for the waste in supply/demand which must be met so it can be traded. There are also various platforms which can track the status of waste, quantities, landfill sites, information on the persons manufacturing, collecting, and recovering waste and others, such as ONTO, Regdzo, Csuio, ELOO, and similar ones.

2.8.2. Legal framework

The waste management field is regulated by different international treaties, European Union acts, and national legislation (general issues and special categories of waste):

- Waste Framework Directive (2008/98/EC) - determines the human health and environmental protection measures by preventing or reducing the



adverse effects of waste production and management, by reducing the overall effects of resource recovery and by improving the efficiency of such recovery

- Directive on hazardous waste (91/689/EEC)
- Regulation on waste transport (1013/2006/EC)
- Directive on waste incineration (2006/76/EC)
- Directive on the landfill of waste (1999/31/EC)
- Directive on waste oils (75/439/EEC)
- Sustainable Waste Management Act (OG 94/13, 73/17, 14/19, 98/2019) - determines the measures for preventing or reducing the adverse effects of waste to human health and the environment by way of reducing the quantities of waste generated and/or in production and regulates the management of waste without the use of procedures risky for human health and the environment, along with the use of the valuable properties of waste.
- Regulation on municipal waste (OG 50/17, 84/19)
- Ordinance on waste catalogue (OG 90/15)
- Ordinance on waste management (OG 117/17)
- Ordinance on by-products and end of waste status (OG 117/14)
- The Act on Ratification of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (OG IT 3/94, 7/2019, 8/2019)
- Ordinance on the methods and conditions for waste disposal, categories, and operating conditions for landfill sites (OG 114/15, 103/2018, 56/2019)
- Instruction on bulky waste (OG 79/15)
- Regulation on border crossing points on the territory of the Republic of Croatia through which import of waste from the EU and export of waste from the EU is permitted (OG 6/14)
- Ordinance on heat treatment of waste (OG 75/16)
- Environmental Protection Act (OG 80/13, 78/15, 118/2018)
- Ordinance on environmental pollution registry (OG 87/15)



- Ordinance on the form, content, and manner of keeping the registry of the persons liable for paying the charge for burdening the environment with waste (OG 120/04)
- Ordinance on the manner and time limits for calculating and paying the charges for burdening the environment with waste (OG 95/04)
- Ordinance on the criteria, procedure, and manner of determining the charge amount for real estate owners and local authorities (OG 59/06, 109/12)

Including other laws, regulations, and ordinances which govern special waste categories.

2.8.3. Green public procurement in the Republic of Croatia

Green public procurement is a measure which encourages environmental protection and sustainable consumption and production. It is defined as the procedure in which public administrative bodies procure goods, works, and services which have a lesser effect on the environment during their life cycle than the goods, works, and services with the same basic function that they would have normally procured. For that purpose, criteria which consist of key pressures on the environment are defined for each group of products, which include resource and energy consumption, the effect on biodiversity and eutrophication, toxicity, pollutant emission, greenhouse gas emission and CO₂, and the generation of waste on the site of its generation.

Public procurement contracting entities can be public or sectoral. Public contracting entities consist of national authorities of the Republic of Croatia, local (regional) authorities, and legal persons which have been established for certain purposes in order to meet the public interest needs, which do not have industrial or commercial relevance and meet one of the criteria provided by Article 5 of the Public Procurement Act. Sectoral contracting entities are contracting entities which perform an activity in the field of water supply, energy, transport, and postal services (Article 6 of the Public Procurement Act). The share of the total value of public procurement without VAT in the GDP of the Republic of Croatia

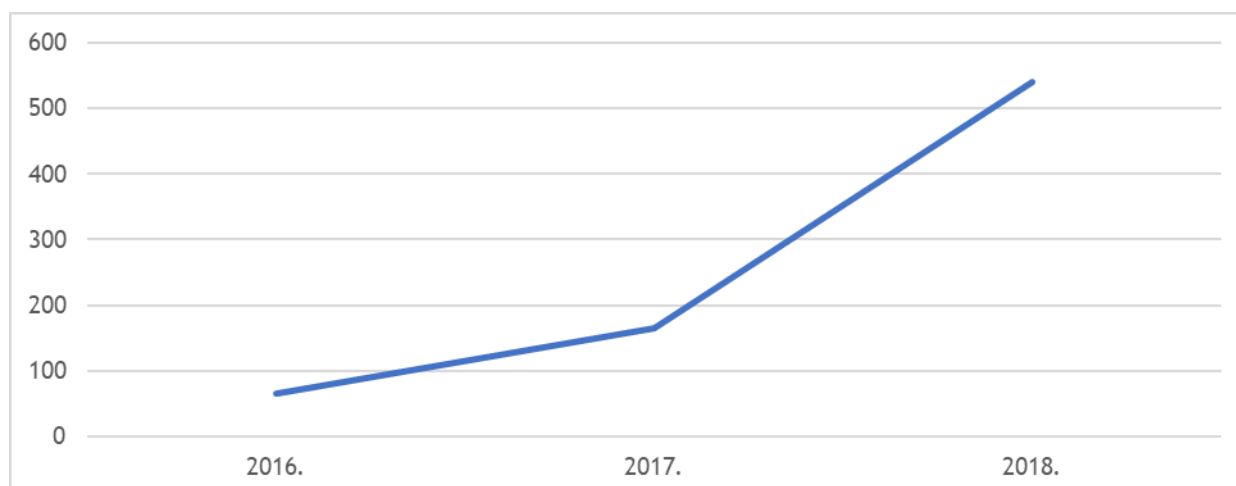


grows continuously. It was 13.06% in 2016, 13.41% in 2017 and it reached 14.88% in 2018.

Table 18: Green public procurement contracts

Year	Number of contracts concluded		Number of GPP contracts according to the type of contracting entity		Object of procurement		
	Green public procurements	Total	Public	Sectoral	Works	Goods	Services
2016	65	13,838	57	8	3	51	11
2017	164	11,408	144	20	28	126	10
2018	541	18,112	441	100	64	406	71

13,838 public procurement contracts were concluded in 2016, out of which only 65 belong to green public procurement (GPP), which makes up for only 0.5% of the total number of contracts concluded. The share of GPP contracts was 1.5% in 2017 which represents an increase of 99 contracts, i.e., 53%, while 377 contracts more were concluded in 2018, which represents an increase of 330%.



Graph 19: The number of GPP contracts in the Republic of Croatia, 2016 - 2018



3. SWOT analysis

The goal of the SWOT analysis is to recognise internal strengths and weaknesses and external opportunities and threats to waste management on the territory of the County. It is based on a previous analysis of the same.

	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> - Existing County development strategy for the Split-Dalmatia County for the period until 2020 - Existing local authority waste management plans on the territory of the County - Growing number of SMEs as an indicator of a favourable business environment (a growth of 7.6% in 2018, when compared to 2017) - Availability of funds intended for waste management in the County/local authorities' budget on the territory of the County - Continuous implementation of educational and informative campaigns in the media - Existing initiatives for socially responsible waste collection activities - Existing, implemented, and planned projects for improving the waste management system - Existing scientific research and highly educated capacities of the University of Split - Implementation of the project "Waste management centre in Split-Dalmatia County" in progress 	<ul style="list-style-type: none"> - Delay in establishing the waste management centre with other accompanying infrastructure - High share of municipal waste in collected waste (78% of collected waste in 2018) - Low share of sorted municipal and industrial waste on the County level - Non-existing waste recycling industry - Insufficient infrastructure capacities for sustainable waste management - Low share of production waste in total waste (21.6% of collected production waste in 2018) with a tendency to further decrease - Below-average rate of recovery when compared to the national and EU level (in 2016, EU 59.3%, Republic of Croatia 55.6%, County 15.3%) - Depositing as the most represented method of waste management - Large number of unauthorised landfill sites - Significant decrease in collected production waste in 2018, when compared to 2017 (42 %) - Discontent of the inhabitants due to paying a high public utility charge - Geographical characteristics of the County, insularity and insufficiently developed transport connections of the islands as limiting factors for the recovery and recycling of waste - Non-existing composting plant on the territory of the County



	Opportunities	Threats
External	<ul style="list-style-type: none"> - A trend of improving the waste management system at the national level - Existing stimulus reimbursement measures for certain categories of waste - Existing legal framework which enables the use of green public procurement - An increase in green public procurement contracts - Implementing activities for the promotion and education of citizens at the national level - Existing policies which regulate waste management and enable the development of circular economy in the Republic of Croatia and the EU. - Availability of national and EU funds which contribute to the development of the circular economy - A trend of growth in companies entered into the End of waste status registry in the Republic of Croatia (the number of companies increased by 52% in 2018, when compared to 2017) - High share of organic waste in total waste (with seasonal fluctuations) on the national level - Construction of UPOVs which will generate significant quantities of sludge (with seasonal fluctuations) in progress - Existing validated technologies for sustainable waste management on the market 	<ul style="list-style-type: none"> - Certain vagueness in the legal framework - Low share of sorted municipal and industrial waste on the level of the Republic of Croatia - Low share of production waste in total waste (in 2016, Republic of Croatia 44.6%, EU 91.5%) - Information asymmetries in different databases for the same waste categories - Slow development of the secondary raw materials market - Low level of knowledge on the organisational models and technologies in the field of circular economy - Inefficient monitoring of the waste stream - Non-existing waste incineration plant



4. STAKEHOLDERS INCLUDED

In order to achieve the goals and resolve the issues identified in this Action Plan, the engagement and interaction of all relevant stakeholders are necessary, among which are:

- County Administrative Department for Economy, EU Funds and Agriculture
- County Administrative Department for Environmental Protection, Municipal Affairs, Infrastructure, and Investments
- County Administrative Department for Construction and Zoning
- Public institution RERA S.D. for coordination and development of the Split-Dalmatia County
- Local authorities
- Regionalni centar čistog okoliša d.o.o. /Regional Centre for a Clean Environment Ltd.
- entrepreneurial associations/chambers, such as the Croatian Chamber of Commerce and the Croatian Employers' Association
- entrepreneurial supporting institutions (incubators, accelerators, entrepreneurial centres, and other entities registered into the Single entrepreneurial infrastructure register)
- utility companies and public suppliers of water supply services
- scientific research organisations
- civil society organisations
- the inhabitants.



5. KEY ISSUES

Based on the analysis of the situation, key issues of the development of the circular economy have been identified and they include:

- Low share of production waste in the total quantities of waste
- Increased generation of municipal waste during the tourist season
- The inhabitants' lack of interest and information on the importance of waste separation
- Insufficiently developed secondary raw materials market
- Unsatisfactory municipal infrastructure
- Low rate of recovery/recycling
- Disposing of waste into the ground
- Low share of green public procurement
- Large expected quantities of sludge coming from UPOVs.



6. GOALS, PRIORITIES AND MEASURES

Based on the analysis of the situation and the SWOT analysis, goals and areas which represent the foundation for the development of the concept of the circular economy on the territory of the County have been identified below. Set goals are complementary and it is expected that their realisation will lead to the increase in the share of municipal waste sent to recovery from **17.9 % (in 2018) to 25.0 % in 2027**, as well as lead to the reduction in the number of unauthorised landfill sites from **204 (in 2019) to 0 in 2027** (verification sources: Annual reports on the implementation of the WMP of the Republic of Croatia by local authorities in the County).

Goal 1	Changing the behaviour of consumers with the purpose of preventing the generation of waste, encouraging the ecological design of products and services, as well as reusing waste.
Explanation	<p>The transition to a circular economy and the reduction of excessive consumption of resources requires a change in consumer priorities and habits, and the development of new forms of behaviour, because daily consumption actions are the most efficient drivers of change.</p> <p>The prerequisite for using secondary raw materials is adequate waste management which enables a part of the waste to be recycled and recovered, i.e., reused in the production process.</p>
Priority area 1.1	The level of awareness about the circular economy
Explanation	<p>The level of awareness about the circular economy should be increased in all levels of the society (decision-makers, scientific research organisations, business sector, citizens, etc.). It is necessary to inform the manufacturers and consumers more objectively on the possibilities of consumption and direct them towards circular behaviour, for</p>



	<p>example, through continuous implementation of information and education, and encouraging the activities on a local level.</p>
Measures	<ul style="list-style-type: none"> - Informing and education of all stakeholders on the concept of circular economy (web pages, the media, organising circular economy weeks, business acceleration workshops, round tables, and other activities) - Further funding of projects/programmes of civil society organisations concerning the education and promotion of lifestyles in the field of sustainable waste management, avoiding the generation of waste, recycling and recovery of waste, proper handling of waste. - Development of an advanced waste collection system which will encourage separation (development of digital tools for control and education, charging by the quantity of waste, control of the processes through the monitoring of municipal services, etc.)
Key stakeholders	The County, local authorities, civil society organisations, public utility companies, the Croatian Chamber of Commerce
Possible sources of funding	The County budget, local authorities' budgets, EU funds
Indicators and verification sources	<ul style="list-style-type: none"> - Increase in the number of local authorities which conduct educational and informative activities from 38 (in 2019) to 55 (2027). Verification source: Annual reports on the implementation of the WMP of the Republic of Croatia by local authorities in the County - Increase in the number of local authorities which conduct eco-activities from 29 (in 2019) to 55 (2027). Verification source: Annual reports on the implementation of the WMP of the Republic of Croatia by local authorities in the County.
Priority area 1.2	Green public procurement as a lever for starting the



	circular economy
Explanation	<p>Public procurement bodies are significant consumers and annually spend around 13% of the GDP of the Republic of Croatia. The public sector could have an important role in creating the market for secondary raw materials through green public procurement.</p> <p>By using their purchasing power to select works, goods, and services with a lesser impact on the environment, it can contribute to sustainable consumption and production, and the decrease in resource consumption. As a tool to change the consumption methods, green public procurement has the potential to play a key role in the circular economy. Buying “green” products and services from public contracting entities provides positive examples to the private sector and the public in general. In this manner, the private sector can be encouraged to introduce the green public procurement practice into its business and offer as much “green” products and services on the market as possible.</p>
Measures	<ul style="list-style-type: none"> - Raising the capacities in public administrative bodies for the implementation of green public procurement of energy-efficient and environmentally friendly goods, works, and services (education of qualified persons) - Establishing a GPP policy in such a manner that implements GPP promoting measures in the strategic/planning documents of the County and local authorities
Key stakeholders	The County, local authorities, the Croatian Chamber of Commerce
Possible sources of funding	The County budget, local authorities’ budgets, EU funds
Indicators and verification	<ul style="list-style-type: none"> - The number of workshops conducted in the field of GPP. <p>Target value for 2027: 20. Verification source: Annual</p>



sources	education programmes in the field of public procurement - Local authorities which have GPP promoting measures in their strategic/planning documents (target value for 2027: 55). Verification source: strategic/planning documents of the local authorities.
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Goal 2	Strengthening and encouraging new circular business models while simultaneously developing and implementing innovative technological solutions and knowledge in the region
Explanation	Investments in innovations, not just technological, but rather in new business models and processes and the cooperation of partners throughout the entire value chain are the foundation for the development of the circular economy. Encouraging the implementation of research and development projects founded on the principle of circular economy and connecting the enterprises supplying and the ones demanding waste, i.e., by-products, will enable the coordination of waste materials from one industry or enterprise with the raw material demands of others, the closing of the loop and industrial symbiosis.
Priority area 2.1	Favourable environment for research, development, and innovations in the field of the circular economy
Explanation	The key driver of the transition to a circular economy is innovation, which is why it is necessary to establish



	<p>financing mechanisms for the development of innovative technologies, solutions, products, and services which are new on the market or the implementation of innovative technologies, solutions, products which are new in the enterprise.</p> <p>Often because the circular economy solutions are not cost-effective, but have a larger social value, they provide an answer to the environmental challenges and offer the best practices for achieving sustainable development and it is necessary to enable the cooperation between the public and private sector which shall facilitate the flow of secondary raw materials and the creation of an economy based on short value chains.</p>
Measures	<ul style="list-style-type: none"> - Aid scheme for the transfer of knowledge and technologies in the field of circular economy - Aid scheme for research, development, and innovations in the field of the circular economy
Key stakeholders	The County, scientific research organisations, entrepreneurial supporting institutions
Possible sources of funding	The County budget, local authorities' budgets, EU funds
Indicators and verification sources	<ul style="list-style-type: none"> - The number of enterprises included in research, development and innovation projects and the projects for the transfer of knowledge and technologies. Target value for 2027: 5. Verification source: Research, development, and innovation projects' database. - The number of researchers included in research, development and innovation projects and the projects for the transfer of knowledge and technologies. Target value for 2027: 10. Verification source: Research, development, and innovation projects' database.



Priority 2.2	Promoting the secondary raw materials market through entrepreneurial supporting institutions
Explanation	<p>An indispensable element of the transition to a circular economy is quality and functional secondary raw materials market, i.e., recycled materials which can be returned to the economy as new raw materials. A national platform with a virtual secondary raw materials market (Waste Exchange) was developed in the Republic of Croatia, which enables the interconnection of those supplying and demanding all categories of waste generated in production. To stimulate this market, it is necessary to establish a support system which will enable entrepreneurs to access expert and technical knowledge on the regulatory framework, as well as the technological criteria which a certain waste category must meet in order to be suitable for recycling.</p>
Measures	<ul style="list-style-type: none"> - Aid scheme for the specialisation of entrepreneurial supporting institutions in the field of the circular economy
Key stakeholders	<ul style="list-style-type: none"> - The County, the Croatian Chamber of Commerce, entrepreneurial supporting institutions
Possible sources of funding	<p>The County budget, local authorities' budgets, EU funds</p>
Indicators and verification sources	<ul style="list-style-type: none"> - The number of entrepreneurial supporting institutions included in specialisation projects in the field of the circular economy. <p>Target value for 2027: 3. Verification source: Entrepreneurial supporting institutions' project database.</p> <ul style="list-style-type: none"> - An increased number of entrepreneurs with the permit for waste recovery from 5 (in 2018) to 15 (in 2027). Verification source: Registry of permits and certificates for waste management



	- An increased number of permits and decisions issued for waste recovery from 7 (in 2018) to 20 (in 2027). Verification source: Registry of permits and certificates for waste management
Priority area 2.3	Circular management of organic waste
Explanation	Due to large quantities of biodegradable municipal waste which is deposited and the planned number of UPOVs which will generate significant quantities of sludge on the territory of the County, organic waste management was recognised as the priority area necessary for closing the loop. To resolve this problem, the synergistic action of the scientific and expert public is necessary in order to find optimal technological solutions for the treatment and management of biodegradable waste and sludge from UPOVs.
Measures	- Development of an innovative technological solution for managing biodegradable waste and sludge from UPOVs
Key stakeholders	The County, local authorities, public utility companies
Possible sources of funding	The County budget, local authorities' budgets, EU funds
Indicators and verification sources	- The quantity of recovered sludge (dry matter) should increase from 0% (in 2019) to 100%, which is estimated to be 22,848 t/year (in 2027). Verification source: Annual reports on the implementation of the WMP of the Republic of Croatia by local authorities in the County.

Goal 3	Development of a functional system for sustainable waste management
Explanation	The development of a circular economy is not possible



	without the development of a functional waste management system which has the aim of using the waste as a valuable resource.
Priority area 3.1	Establishing an infrastructure for waste management
Explanation	Higher rates of recycling and recovery are limited by an undeveloped infrastructure for the separate collection of waste, primarily by the County waste management centre as a central structure in establishing an integrated waste management system on the territory of the County. In order to enable the conditions for separate collection of bio-waste and its valorisation, it is necessary to construct facilities for biological treatment of separately collected bio-waste.
Measures	<ul style="list-style-type: none"> - Establishing the County waste management centre - Constructing the facilities for biological treatment of separately collected bio-waste through composting - Development of ICT solutions for managing the process of sustainable waste management
Key stakeholders	Regionalni centar čistog okoliša d.o.o., the Environmental Protection and Energy Efficiency Fund, the County, local authorities, entrepreneurs
Possible sources of funding	The County budget, local authorities' budgets, EU funds
Indicators and verification sources	<ul style="list-style-type: none"> - County waste management centre constructed (in 2024). Verification source: Operating licence. - 14 facilities for biological treatment of separately collected waste through composting² constructed on the

² According to the document Annual report on the implementation of the WMP of the Republic of Croatia for the period from 2017 to 2022 on the territory of the Split-Dalmatia County and synthesis reports of local authorities for 2019. On the territory of the County, the construction of 14 composting plants in total is planned on the territory of the cities of Hvar, Komiža, Split, Kaštela, Omiš, Supetar and Vrgorac and the municipalities of Baška Voda, Bol, Dugi Rat, Gradac, Okrug and Zadarje. Apart from the composting plant within the CGO "Lećevica", a joint composting plant is



	<p>territory of the County (in 2027). Verification source: Annual reports on the implementation of the WMP of the Republic of Croatia by local authorities in the County</p> <ul style="list-style-type: none">- ICT solution for managing the process of sustainable waste management has been developed. Verification source: Report on the operation of the County waste management centre.
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also planned on the territory of the City of Split, in cooperation with neighbouring local authorities and one of the suitable locations is Kamen.