

**WASTE MANAGEMENT PLAN OF THE REPUBLIC  
OF CROATIA FOR THE PERIOD FROM 2023 TO 2028**

PROVISIONAL TRANSLATION

Decision on adopting the Waste Management Plan of the Republic of Croatia for the period  
2023-2028 (Official Gazette, No. 84/2023, 22.7.2023)

[https://narodne-novine.nn.hr/clanci/sluzbeni/2023\\_07\\_84\\_1334.html](https://narodne-novine.nn.hr/clanci/sluzbeni/2023_07_84_1334.html)

---

1.	INTRODUCTION .....	12
2.	WASTE MANAGEMENT STATUS IN THE REPUBLIC OF CROATIA.....	15
2.1.	Waste management information system .....	15
2.2.	Origin, composition, categories and types of waste.....	15
2.2.1.	<i>Total amount of waste in the Republic of Croatia</i> .....	16
2.2.2.	<i>Hazardous waste</i> .....	21
2.2.3.	<i>Municipal waste</i> .....	25
2.2.4.	<i>Biowaste</i> .....	35
2.2.5.	<i>Sludge from municipal waste water treatment plants</i> .....	36
2.2.6.	<i>Marine litter</i> .....	38
2.2.7.	<i>Special categories of waste</i> .....	41
2.3.	Transboundary shipment of waste .....	63
2.4.	The existing waste management facilities, devices and systems .....	68
2.4.1.	<i>Waste management facilities and devices</i> .....	68
2.4.2.	<i>The existing waste management systems</i> .....	86
2.4.3.	<i>An overview of the companies engaged in waste management activities</i> .....	89
2.4.4.	<i>Statuses of the 'hot spot' remediation projects</i> .....	91
3.	ASSESSMENT OF WASTE MANAGEMENT IN THE REPUBLIC OF CROATIA .....	94
4.	WASTE MANAGEMENT OBJECTIVES .....	96
5.	ASSESSMENT OF WASTE FLOW DEVELOPMENT, REQUIREMENTS AND METHODS OF IMPLEMENTATION OF NEW WASTE MANAGEMENT SYSTEMS AND THE CONSTRUCTION OF NEW WASTE MANAGEMENT INFRASTRUCTURE AND PLANTS.....	102
5.1.	Assessment of the municipal waste flow development .....	102
5.2.	Packaging waste.....	103
5.3.	Residual sludge from waste water treatment plants .....	105
5.4.	Other assessments of the waste flow development .....	106
6.	ASSESSING THE NEED TO CLOSE THE EXISTING AND BUILD NEW FACILITIES FOR THE PURPOSE OF DISPOSAL AND RECOVERY OF MIXED MUNICIPAL WASTE FROM HOUSEHOLD WASTE.....	106
6.1.	Basic considerations and prerequisites for the establishment and development of the mixed municipal waste disposal and recovery systems .....	108
6.2.	Establishment of Waste Management Centres (Cro. abbrev. CGOs) .....	111
6.3.	Non-hazardous waste landfills.....	114
6.4.	Energy recovery of waste.....	116
7.	RECOVERY AND/OR DISPOSAL OF SLUDGE FROM MUNICIPAL WASTE WATER TREATMENT PLANTS.....	119
8.	CRITERIA FOR DETERMINING PLANNED LOCATIONS AND THE NECESSARY CAPACITY OF NEW FACILITIES AND PLANTS .....	120

8.1.	Technical requirements for waste management facilities.....	122
8.2.	Method of determining the required capacity of new waste recovery and disposal facilities	123
8.2.1.	<i>Sorting plants for separately collected dry recyclables.....</i>	<i>123</i>
8.2.2.	<i>Separately collected bio-waste recovery facilities .....</i>	<i>127</i>
8.2.3.	<i>Plants for recovery and disposal of mixed municipal waste .....</i>	<i>131</i>
8.2.4.	<i>Construction and demolition waste recycling plants .....</i>	<i>142</i>
8.2.5.	<i>Plastic recovery plants .....</i>	<i>142</i>
8.2.6.	<i>Glass recovery plants .....</i>	<i>144</i>
8.2.7.	<i>Paper and cardboard recovery plants.....</i>	<i>145</i>
9.	ASSESSING THE SCALE OF THE NECESSARY INVESTMENT AND OTHER FINANCIAL RESOURCES FOR THE DEVELOPMENT AND IMPROVEMENT OF THE WASTE MANAGEMENT SYSTEM.....	147
9.1.	Assessment of the necessary investment in the construction of new sorting facilities.....	147
9.2.	Assessment of the necessary investment in the construction/extension for materials and energy recovery plants of the separately collected bio-waste.....	148
9.3.	Assessment of the necessary investment for material recovery plants of the separately collected and/or pre-sorted dry recyclables and construction waste.....	150
9.4.	Cost estimate of the closing of active waste landfills .....	153
9.5.	Cost estimate of the construction of waste management centres .....	153
9.6.	Assessment of the necessary investment in the construction of the plants for the energy recovery of waste.....	154
9.7.	The cost of investment in the infrastructure necessary for the recovery and disposal of the sludge from municipal waste water treatment plants .....	155
10.	ORGANISATIONAL ASPECTS OF WASTE MANAGEMENT AND ALLOCATION OF RESPONSIBILITIES	156
10.1.	National level .....	156
10.2.	Regional level .....	157
10.3.	Local level.....	157
10.4.	Companies owned by regional self-government and local self-government units.....	157
10.5.	Private companies (legal and natural persons engaged in waste management activities)	158
11.	EVALUATION OF THE USEFULNESS AND APPROPRIATENESS OF USE OF ECONOMIC INSTRUMENTS IN WASTE MANAGEMENT ENSURING THE PROPER FUNCTIONING OF THE INTERNAL MARKET.....	159
11.1.	Landfill tax.....	159
11.2.	Incentive fee.....	159
11.3.	Landfill proximity compensation .....	159

11.4.	Fee for the usage of the landfill on the territory of another local self-government unit or the City of Zagreb.....	160
11.5.	Deposit fee.....	160
11.6.	Waste management fee.....	160
11.7.	Public waste collection service rate.....	161
12.	MEASURES FOR THE IMPLEMENTATION OF THE WASTE MANAGEMENT PLAN.....	162
12.1.	Measures for the improvement of reuse, recycling and other procedures of the recovery of the municipal waste and the reduction of waste disposal in landfills.....	176
12.2.	Measures for the improvement of the special waste categories management system	181
12.3.	Measures for the improvement of the hazardous waste management.....	188
12.4.	Measures for the remediation of the sites affected by waste disposal .....	189
12.5.	Measures for the improvement of the waste management information system.....	191
12.6.	Measures for the improvement of waste management supervision .....	196
13.	FINANCIAL RESOURCES FOR THE IMPLEMENTATION OF THE WMP MEASURES .....	197
13.1.	Potential funding sources .....	197
14.	TIME SCHEDULE OF THE IMPLEMENTATION OF THE WMP.....	201
15.	WASTE PREVENTION PROGRAMME .....	205
15.1.	Introduction .....	205
15.2.	EU plans and strategies.....	207
15.3.	Status analysis in the area of waste prevention .....	209
15.4.	The existing measures and their contribution to the waste prevention .....	210
	<i>15.4.1. Implementation of measures of planning and other economic instruments promoting the efficient use of resources and a more responsible user behaviour towards the environment ...</i>	<i>210</i>
	<i>15.4.2. Improvement of the monitoring of waste prevention measures .....</i>	<i>213</i>
	<i>15.4.3. Promoting of the recognised eco-labels and waste management system .....</i>	<i>214</i>
	<i>15.4.4. Green and sustainable public procurement .....</i>	<i>216</i>
	<i>15.4.5. Implementation of education and information activities and improvement of the availability and transparency of waste prevention-related information.....</i>	<i>217</i>
	<i>15.4.6. Promoting reuse and/or repair of specific discarded products or their parts.....</i>	<i>219</i>
15.5.	Objectives and priorities .....	220
	<i>15.5.1. Specific objectives .....</i>	<i>221</i>
	<i>15.5.2. Municipal waste prevention.....</i>	<i>221</i>
	<i>15.5.3. Bio-waste prevention .....</i>	<i>222</i>
	<i>15.5.4. Electrical and electronic waste prevention .....</i>	<i>223</i>
	<i>15.5.5. Paper and cardboard waste prevention.....</i>	<i>224</i>
	<i>15.5.6. Plastic waste prevention .....</i>	<i>225</i>
	<i>15.5.7. Construction waste prevention .....</i>	<i>225</i>

15.5.8. Textile and footwear waste prevention .....	227
15.5.9. Marine litter prevention.....	227
15.6. Waste prevention measures.....	228

## List of Figures

Figure 1. Total amount of waste generated by economic activities and households in Croatia from 2016 to 2020.....	16
Figure 2. Amounts of primary and secondary waste in Croatia in 2016, 2018 and 2020.....	17
Figure 3. Composition of economic activities and households in the total waste in 2020 .....	18
Figure 4. Waste management activities in the period from 2016 to 2020 according to waste treatment operations (including quantities exported outside the EU and shipped to other EU Member States for processing).....	20
Figure 5. Amounts of hazardous waste and special categories of waste in the Republic of Croatia from 2012 to 2020 .....	21
Figure 6. Composition of economic activities and households in the total hazardous waste in Croatia in 2020 .....	22
Figure 7. Composition of specific types of hazardous waste in the total amount of hazardous waste in Croatia in 2020.....	23
Figure 8. Hazardous waste treatment in the Republic of Croatia in 2020.....	24
Figure 9. Annual volume of municipal waste generated in the period from 1995 to 2021 in Croatia. ....	26
Figure 10. Annual volume of municipal waste generated per capita in 2021, per county.....	26
Figure 11. Composition of separately collected municipal waste and mixed municipal waste in the period from 2010 to 2021 in Croatia .....	28
Figure 12. Separately collected municipal waste in 2021 per type .....	29
Figure 13. Quantities of the mixed municipal waste compared to the total municipal waste arisings and the separate MW collection rate in the period from 2015 to 2021 .....	29
Figure 14. Estimated composition of the mixed municipal waste in Croatia in 2015 .....	30
Figure 15. Recycling and disposal rates in the period from 2010 to 2021 compared to the set objectives in Croatia.....	31
Figure 16. Estimated municipal waste recovery rates by county in 2021 .....	32
Figure 17. Municipal waste management in the period from 2010 to 2021 in Croatia .....	33
Figure 18. Generated and landfilled biodegradable municipal waste in the period from 1997 to 2021 with respect to target quantity.....	34
Figure 19. Amount of generated bio-waste and share of the separate collection in the period from 2017 to 2021 .....	35
Figure 20. Generated municipal bio-waste and its management in the period from 2012 to 2021....	36
Figure 21. Generated amount of sludge from municipal waste water treatment plants from 2012 to 2021 .....	37
Figure 22. Handling the sludge from municipal waste water treatment plants in 2021 .....	38
Figure 23. Overall composition of different categories of solid waste on water surface according to sampling season during monitoring in 2020.....	40
Figure 24. Density of waste (unit weight per km <sup>2</sup> ) in the seabed in 2020 by waste category.....	40
Figure 25. Generated and separately collected textile and footwear waste in the period from 2010 to 2021 .....	44
Figure 26. Treatment of total quantities of textile and footwear waste arisings in 2021.....	45
Figure 27. Composition of packaging placed on the market in 2021 by type of material.....	46

Figure 28. Amount of packaging placed on the market, quantities of collected, recovered and recycled packaging waste within the EPEEF (Cro. abbrev. FZOEU) scheme, and waste recycling and recovery rate in the period from 2015 to 2021.....	47
Figure 29. Amount of plastic carrier bags placed on the market in Croatia in the period from 2018 to 2021 by category.....	49
Figure 30. Amount of tyres placed on the market and quantities of refuse tyres collected and recovered using the EPEEF (Cro. abbrev. FZOEU) system in Croatia in the period from 2015 to 2021 .....	50
Figure 31. Amount of lubricating oils placed on the market, estimated quantities of generated waste lubricants and quantities of waste lubricants collected and recovered through the EPEEF (Cro. abbrev. FZOEU) system in the period from 2015 to 2021 .....	51
Figure 32. Amount of portable batteries and accumulators placed on the market that were collected through the EPEEF scheme from 2015 to 2021 .....	52
Figure 33. Collection rate of waste portable batteries and accumulators in terms of the set objectives in the period from 2015 to 2021.....	53
Figure 34. The recycling efficiency of portable batteries and accumulators in terms of the targets set from 2016 to 2021 .....	53
Figure 35. Amount of collected ELV vehicles in the period from 2015 to 2021 Amount of collected ELV vehicles in the period from 2015 to 2021.....	54
Figure 36. Reuse and recycling rate of ELV vehicles in Croatia from 2015 to 2021.....	55
Figure 37. Reuse and recovery rate of ELV vehicles in Croatia from 2017 to 2021.....	55
Figure 38. Construction waste management in the period from 2015 to 2021 .....	57
Figure 39. Construction waste recovery goal achievement for the period from 2015 to 2021 .....	57
Figure 40. Amount of construction waste containing asbestos disposed of in 'cassettes' in the period from 2011 to 2021 .....	58
Figure 41. Generated medical waste (HCW) in the period from 2015 to 2021.....	59
Figure 42. Generated EEE waste quantities (expressed as an average of quantities placed on the market in the last three years), collected and recovered quantities in the period from 2015 to 2021 (t).....	60
Figure 43. Achieved EEE waste collection rates for the period from 2015 to 2021, showing the set targets .....	60
Figure 44. Total amount of the disposed PCB waste and PCB waste to be disposed of in the period from 2008 to 2021 .....	62
Figure 45. Transboundary shipment of waste in Croatia in the period from 2017 to 2021 .....	64
Figure 46. Import/entry of waste subject to the notification procedure from 2014 to 2021 .....	64
Figure 47. Variations in the amount of various types of imported/introduced waste subject to the notification procedure from 2014 to 2021 .....	66
Figure 48. Number of civic amenity sites recorded by August 2022 .....	70
Figure 49. Number of registered civic amenity sites and reported amounts of municipal waste collected through civic amenity sites from 2015 to 2021 .....	70
Figure 50. Overview of composting facilities in the Republic of Croatia in 2021 .....	72
Figure 51. Overview of biogas plants in Croatia in 2021 .....	73
Figure 52. Plastic material recovery plant location .....	75
Figure 53. Glass recycling plant location.....	76
Figure 54. Paper recycling plant locations .....	76
Figure 55. Electrical and electronic waste recovery plant locations .....	77
Figure 56. End-of-life vehicle recovery plant locations .....	77
Figure 57. Overview of the locations of the plants with valid waste management licences for R1 recovery operation in 2022.....	78

Figure 58. Position and status of the implementation of the envisaged waste management centres, April 2023.....	82
Figure 59. Locations of landfills in Croatia in 2021.....	85
Figure 60. Cassette layout and status of disposal of construction waste containing asbestos in 2021.....	188
Figure 61. Number of companies with a waste disposal licence from 2015 to 2020.....	90
Figure 62. Estimates of annual amounts of generated municipal waste for the period from 2023 to 2035.....	103
Figure 63. Estimate of annual amounts of total collected packaging waste and packaging waste collected through the EPEEF (Cro. abbrev. FZOEU) system for the period from 2023 to 2035.....	104
Figure 64. Estimate of annual amounts of total collected packaging waste by type of material for the period from 2023 to 2035.....	104
Figure 65. Estimated amount of generated residual sludge from waste water treatment plants for the period from 2018 to 2051.....	105
Figure 66. Total required capacity of waste sorting facilities in 2028 – SCENARIO Nr.1.....	125
Figure 67. Total required capacity of waste sorting facilities in 2028 – SCENARIO Nr. 2.....	126
Figure 68. Total required capacity of composting facilities and biogas plants in 2028 – SCENARIO nr. 1.....	129
Figure 69. Total required capacity of composting facilities and biogas plants in 2028 – SCENARIO nr. 2.....	131
Figure 70. Organisational aspects of waste disposal and division of responsibility.....	158
Figure 71. European Green Deal.....	207
Figure 72. Disconnection of the link between the municipal waste production and economic development.....	210
Figure 73. Overview of reported amounts of by-products from 2015 to 2021.....	212
Figure 74. Composition of individual types of by-products in the total generated waste in 2021....	213
Figure 75. Number of reported activities/projects carried out for the purpose of waste prevention per year.....	219

## List of tables

Table 1. Composition of waste per economic activity and household in 2020.....	18
Table 2. Quantity and share of waste in the total amount of waste per waste type (statistical waste category) in 2020.....	18
Table 3. Handling of the total generated waste in the period from 2016 to 2020 according to processing procedures (including quantities exported/shipped outside the Republic of Croatia).....	19
Table 4. Quantity and share of waste in the total amount of hazardous waste per waste type (statistical waste category) in 2020.....	22
Table 5. Quantities of hazardous waste processed using final waste treatment procedures in Croatia in 2020 per type of waste.....	24
Table 6. Amount of municipal waste generated by tourist activity from 2015 to 2021.....	27
Table 7. The amounts of generated and landfilled biodegradable municipal waste in the period from 1997 to 2021.....	34
Table 8. Amounts of special category waste collected in the period from 2015 to 2021.....	42
Table 9. Estimated total quantity of the generated textile and footwear waste in 2021.....	44
Table 10. Achieved recycling rates per packaging material for the period from 2015 to 2021, showing the set objectives.....	47
Table 11. Share of reusable packaging placed on the market from 2017 to 2021.....	48

Table 12. Amount of plastic carrier bags placed on the market of the Republic of Croatia in the period from 2018 to 2021 by category .....	48
Table 13. Recovery and recycling rates in 2021 per EEE waste category in relation to set targets .....	61
Table 14. Correlation table of the amount of waste subject to the notification procedure, which was imported/introduced and exported/shipped out of the country during 2020 and 2021 .....	67
Table 15. Correlation table of the amount of waste not subject to the notification procedure, which was imported/introduced and exported/shipped out of the country from 2017 to 2021 .....	68
Table 16. List of composting facilities with the corresponding capacities available in 2021 .....	71
Table 17. New composting facilities construction projects being implemented .....	71
Table 18. Completion status of the planned waste management centres, April 2023 .....	79
Table 19. List of waste management centres with the corresponding local self-government units ...	80
Table 20. Overview and status of the completion of the planned waste transfer stations (status April, 2023) .....	83
Table 21. Overview of the status and capacities of active landfill sites by county in 2021.....	85
Table 22. Number of companies with a certificate of entry in the Waste Management Activity Register (logbooks and records), August 2022. ....	91
Table 23. List and status of remediation of waste 'hot spots' in 2022 .....	91
Table 24. Status of the achievement of the targets required under EU acts .....	97
Table 25. Waste Management Plan objectives.....	99
Table 26. Quantities of separately collected municipal waste and rate of change 2017 – 2021 .....	108
Table 27. Estimate of municipal waste quantities that must be prepared for reuse or recycled in the period from 2022 to 2035.....	109
Table 28. Estimate of quantities of municipal waste that must be collected separately in the period from 2022 to 2028 and the required rate of change (assuming it contains 13 % of impurities) .....	110
Table 29. Estimate of quantities of municipal waste that must be collected separately in the period from 2022 to 2035 and the required rate of change (assuming it contains 13 % of impurities) and assuming the ultimate objective is achieved in 2035 amounting to 65 % .....	110
Table 30. List and rated capacities of waste management centres.....	114
Table 31. Legal regulations providing minimal requirements for the design, construction, management of facilities and the monitoring of emissions.....	122
Table 32. Total required capacities of sorting facilities in 2028 – SCENARIO nr. 1.....	124
Table 33. Total required capacities of sorting facilities in 2028 – SCENARIO nr. 2.....	125
Table 34. Total required capacities of composting facilities and biogas plants in 2028 – SCENARIO nr. 1 .....	128
Table 35. Total required capacities of composting facilities and biogas plants in 2028 – SCENARIO nr. 2 .....	130
Table 36. Estimate of the changes in quantity and composition of the mixed municipal waste that must be recovered and disposed of in the key years – SCENARIO nr. 1.....	132
Table 37. Assumed efficiency of the mixed municipal waste treatment plants and the expected WMC outputs in 2025 – SCENARIO nr. 1 .....	132
Table 38. Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2025 – SCENARIO nr. 1 .....	133
Table 39. Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2030 – SCENARIO nr. 1 .....	133
Table 40. Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2035 – SCENARIO nr. 1 .....	134
Table 41. Estimate of the changes in quantity and composition of the mixed municipal waste that must be recovered and disposed of in the reference years – SCENARIO nr. 2 .....	134



Table 42. Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2025 – SCENARIO nr. 2 .....	135
Table 43. Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2028 – SCENARIO nr. 2 .....	135
Table 44. Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2030 – SCENARIO nr. 2 .....	135
Table 45. Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2035 – SCENARIO nr. 2 .....	136
Table 46. Key quantities of municipal waste in the period from 2025 to 2035 – SCENARIO nr. 1.....	136
Table 47. Key quantities of municipal waste in the period from 2025 to 2035 – SCENARIO nr. 2.....	138
Table 48. Required capacities of waste management centres – SCENARIO nr. 1 .....	140
Table 49. Required capacities of waste management centres – SCENARIO nr. 2 .....	141
Table 50. Required capacities of mobile and stationary construction waste crushers .....	142
Table 51. Required capacities of plastic recycling facilities - SCENARIO nr. 1 .....	143
Table 52. Required capacities of plastic recycling facilities - SCENARIO nr. 2 .....	143
Table 53. Required capacities of glass recycling facilities - SCENARIO nr. 1 .....	144
Table 54. Required capacities of glass recycling facilities - SCENARIO nr. 2 .....	144
Table 55. Required capacities of paper recycling facilities - SCENARIO nr. 1 .....	145
Table 56. Required capacities of paper recovery facilities - SCENARIO nr. 2 .....	145
Table 57. Assessment of the necessary investment in the construction of sorting facilities – SCENARIOS 1 and 2 .....	147
Table 58. Assessment of the necessary investment in the construction and/or upgrade of composting facilities and biogas plants – SCENARIO nr. 1 .....	148
Table 59. Assessment of the necessary investment in the construction and/or upgrade of sorting facilities, composting facilities and biogas plants – SCENARIO nr. 2 .....	149
Table 60. Assessment of the necessary investment in the building of construction waste treatment plants.....	151
Table 61. Assessment of the necessary investment in the construction of plastic recycling plants - SCENARIO 1 .....	152
Table 62. Assessment of the necessary investment in the construction of plastic recycling plants - SCENARIO 2 .....	152
Table 63. Cost estimate of the closing of all the active municipal waste landfill sites .....	153
Table 64. Cost estimate of the building of waste management centres – SCENARIO nr. 1 .....	154
Table 65. Cost estimate of the building of waste management centres – SCENARIO nr. 2 .....	154
Table 66. Correlation between the objectives and measures taken to achieve the objectives set by the EU specified in the WMP for the period from 2023 to 2028 .....	163
Table 67. Potential funding sources.....	197
Table 68. Indicative ratios of funding by financial resource and year .....	199
Table 69. Assessment of financial allocations necessary for the implementation of WMP measures .....	199
Table 70. Time schedule of the implementation of the Waste Management Plan.....	202
Table 71. Consumption of plastic bags in Croatia.....	211
Table 72. Amount of generated food waste in 2020 by origin .....	214
Table 73. Number of awarded EU Ecolabel certifications in the Republic of Croatia in the period from 2017 to 2022 .....	215
Table 74. Overview of campaigns and projects addressing the issue of waste prevention organised by the EPEEF (Cro. abbrev. FZOEU).....	217
Table 75. Overview of waste prevention measures and links to specific objectives.....	228

Table 76. Overview of measures and activities associated with the implementation of the Waste Prevention Plan for the period from 202 to 2028 ..... 235

## ABBREVIATIONS

The following abbreviations were used in this document:

BBC	Bjelovar-Bilogora County
GDP	Gros Domestic Product
BPC / BPŽ	Brod-Posavina County (Brodsko-posavska županija)
WMC	Waste Management Centre
CS	Civil society
SIRC / DIRH	State Inspectorate of the Republic of Croatia (Državni inspektorat Republike Hrvatske)
DNC / DNŽ	Dubrovnik-Neretva County (Dubrovačko-neretvanska županija)
EEE	Electrical and Electronic Equipment
EC	European Commission
EU	European Union
EC	European Community
EPEEF	Environmental Protection and Energy Efficiency Fund
HV	Hrvatske vode (Croatian Water Management Company)
SGU	Self-Government Unit
L(R)SGU	Local (Regional) Self-Government Unit
KKC	Koprivnica-Križevci County
KZC	Krapina-Zagorje County
KC	Karlovac County
LSC	Lika-Senj County
MBT	Mechanical Biological Treatment
MPPCSA MPGI	/ Ministry of Physical Planning, Construction and State Assets
MESD MINGOR	/ Ministry of Economy and Sustainable Development
MoA MINPOLJ	/ Ministry of Agriculture
MMW	Mixed Municipal Waste
MMATI MMPI	/ Ministry of the Sea, Transport and Infrastructure
MEE / MZOE	Ministry of Environment and Energy (the present-day MESD (Cro. abbrev. MINGOR))
MC	Međimurje County

OBC	Osijek-Baranja County
OECD	Organisation for Economic Co-operation and Development
OPKK	Operational Programme Competitiveness and Cohesion
PCBs/PCTs	Polychlorinated biphenyls and polychlorinated terphenyls
WMP	Waste Management Plan of the Republic of Croatia for the period from 2023 to 2028
WPP / PSNO	Waste Prevention Programme
PSC	Požega-Slavonija County
RoC	Republic of Croatia
EPER / ROO	European Environmental pollution register
SDC	Split-Dalmatia County
SMC	Sisak-Moslavina County
DM	Dry matter
ŠKC	Šibenik-Knin County
VPC	Virovitica-Podravina County
VC	Varaždin County
WMA /ZGO	Waste Management Act (Official Gazette No. 84/21)
ZC	Zagreb County

# 1. INTRODUCTION

The EU's Circular Economy Action Plan entitled 'Closing the Loop – An EU Action Plan for the Circular Economy' adopted in 2015 and the 'Action Plan for a Cleaner and More Competitive Europe' adopted in 2020 ensured that the prerequisites for an accelerated transition towards a circular economy have been met, the purpose of which is to preserve the value of resources and products within the economy for as long as possible, while minimising waste generation.

The EU's Circular Economy Action Plan seeks to achieve the following:

- Prevent waste generation with particular focus on the prevention of food waste and marine litter generation;
- extend producer responsibility;
- promote recycling and reuse;
- gradually reduce waste disposal.

The result of the Action Plan is the adoption of the four new Waste Directives, also known as a 'waste package', amending the six existing directives on waste as follows:

- Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000, on end-of-life vehicles - Commission Statements (OG 269, 21. 10. 2000.) as last amended by Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018 amending Directive 2000/53/EC on end-of-life vehicles, Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) (OG 150, 14. 6. 2018.) (hereinafter referred to as: Directive 2000/53/EC)
- Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) (OG 197, 24. 7. 2012.) as last amended by Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018 amending Directive 2000/53/EC on end-of-life vehicles, Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) (OG 150, 14. 6. 2018.); (hereinafter referred to as: Directive 2012/19/EC)
- Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC (OG 266, 26. 9. 2006.) as last amended by Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018 as amended by Directive 2000/53/EC on end-of-life vehicles, Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) (OG 150, 14. 6. 2018.) (hereinafter referred to as: Directive 2006/66/EC)
- Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (OG 182, 16. 7. 1999.) as last amended by Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste (OG 150, 14. 6. 2018.) (hereinafter referred to as: Directive 1999/31/EC)
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing the specific directives (OG 312, 22. 11. 2008.) as last amended by Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (OG 150, 14. 6. 2018.) (hereinafter referred to as: Directive 2008/98/EC)

- Directive of the European Parliament and of the Council 94/62/EC of 20 December 1994 on packaging and packaging waste (OG 365, 31. 12. 1994.) as last amended by Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste (OG 150, 14. 6. 2018.) (hereinafter referred to as: Directive 94/62/EC).

The aforementioned directives set out more ambitious objectives for the separation and recycling of waste and the reduction of waste disposal by 2035.

As part of The European Strategy for Plastics in a Circular Economy, in June 2019, the Directive (EU) 2019/904 of the European Parliament and the Council was adopted on June 5th, 2019 on the reduction of the impact of certain plastic products on the environment (OG 155, 12. 6. 2019.) (hereinafter referred to as: Directive 2019/904) with the measures aiming to ban the marketing of single-use plastic products and imposing restrictions on the labelling of products, extended producer responsibility, public information, etc.

National legislation complies with the said directives through the Waste Management Act (Cro. abbrev. ZGO). The Waste Management Act sets out the measures to achieve the objectives specified in the European Green Deal and the Action Plan for a Circular Economy, integrating waste management into circular economy.

Within the waste management industry, the measures proposed by the European Green Deal supporting the compliance with the existing national obligations arising from the said EU directives on waste are considered to be particularly important, and in particular the objectives to be achieved by 2035, as specified in the Directive 2008/98/EC – to increase waste sorting and recycling rates to 65 % and reduce waste disposal rate to 10 %.

In addition to the special measures which give priority to waste prevention, reuse and recycling before final disposal at landfill sites, the aforementioned directives from the so-called 'waste package' additional requirements were added to the directive which must be included in the waste management plans of the Member States and waste prevention programmes.

In terms of the set waste management objectives, in the present Waste Management Plan a more detailed calculation methodology was used, governed by the acts adopted by EU legislation referred to in Chapter 4: Waste Management Objectives.

The integral part of the Waste Management Plan for the period from 2023 to 2028 (hereinafter referred to as: WMP) is the Waste Prevention Programme (hereinafter referred to as: WPP). Article 30 of Directive 2008/98/EC provides for the obligation to assess national waste management plans and waste prevention programmes at least every six years, or audit where necessary.

In addition to the application of circular economy principles in waste management, the WMP is also important within the context of programming and planning of the use of EU funds for the next multiannual financial programming period from 2021 to 2027.

The implementation of the Waste Management Plan measures contributes to the compliance with the OECD guidelines, which is one of the prerequisites for the Republic of Croatia to become a full member of the Organisation for Economic Co-operation and Development (OECD), in accordance with the 'Plan for the Process of Accession of the Republic of Croatia to the OECD' of June 2022. The Waste Management Plan measures form a part of the integrated approach towards a sustainable resource management, including the life cycle waste and materials management for

the purpose of creating the conditions for the functioning of circular economy that will enable a more efficient use of resources. The implementation of the Waste Management Plan will contribute to reducing waste, including hazardous waste, strengthen waste management practices in an environmentally sound manner, contribute to the strengthening of the capacities necessary for the management and control of transboundary shipment of hazardous waste, the reduction of waste export for the purpose of waste disposal at landfill sites and will further strengthen waste trade using the economically efficient and environmentally sustainable waste recovery procedures within the OECD.

The Waste Management Plan is adopted as an umbrella national planning document that will harmonise the waste management system on the territory of the Republic of Croatia with the new waste management objectives and policies. Although it covers the period by 2028, the WMP is based on the objectives to be achieved by 2035 on the basis of which the waste management system development is planned.

## **2. WASTE MANAGEMENT STATUS IN THE REPUBLIC OF CROATIA**

### **2.1. Waste management information system**

For the purpose of a comprehensive management environmental protection and environmental load monitoring, the Waste Management Information System has been established as part of the environmental protection information system as a basis for drafting and adopting sustainable development and environmental protection acts, as well as monitoring the implementation of measures adopted in the said acts and other acts pursuant to the Environmental Protection Act (Official Gazette No. 80/13, 153/13, 78/15, 12/18, 118/18).

In accordance with the Waste Management Act, the Waste Management Information System (hereinafter referred to as: Information system) is used in the monitoring of the implementation and governance of the waste management system in the Republic of Croatia, which is established and run by the Ministry of Economy and Sustainable Development (Cro. abbrev. MINGOR). The Waste Management Act prescribes the data and applications the system must contain.

Among the prescribed applications within the Information system, the following applications have been set up: Electronic Register on Waste Creation and Transport (e-ONTO), Environmental pollution register (Cro. abbrev. ROO), application for Locations containing Discarded Waste (Cro. abbrev. ELOO), application for landfill operators and monitoring of biodegradable municipal waste disposal, Waste Prevention Portal and application for the monitoring of waste prevention, reuse, as well as waste education and information projects and activities.

The Waste Management Activity Register is being established, including the Application for the Service Provider Performance Reporting, and the Extended Producer Responsibility Register.

Considering frequent amendments to the existing provisions and the adoption of new provisions in the area of waste management at EU level, and thus at the national level as well, the established information system applications require continuous adjustments and improvements at the same time. In addition to this, the adoption of new provisions, and of delegated and implementing acts in particular defining new methods of data collection and production of new statistics in the area of waste management, result in the need to establish new applications for data collection, such as the applications for the conducting of new statistical surveys, etc.

In addition to the activities aimed at the improvement of the existing applications and the setting up of the new ones, it is necessary to proceed with the activities related to the improvement of quality and the scope of information system data, education of all the participants in the chain of data collection and processing (data reporting entities, competent authorities for quality control and data verification, etc.).

### **2.2. Origin, composition, categories and types of waste**

Status analysis in the area of waste management presented in this document is based on the following: data contained in the Waste Management Information System, special reports and publications issued at national level by each Member State in the area of waste management by the Ministry of Economy and Sustainable Development (Cro. abbrev. MINGOR), data from the EUROSTAT database, and for the purpose of special categories of waste that are submitted to the Environmental Protection and Energy Efficiency Fund (EPEEF, Cro. abbrev. FZOEU) by legal entities.

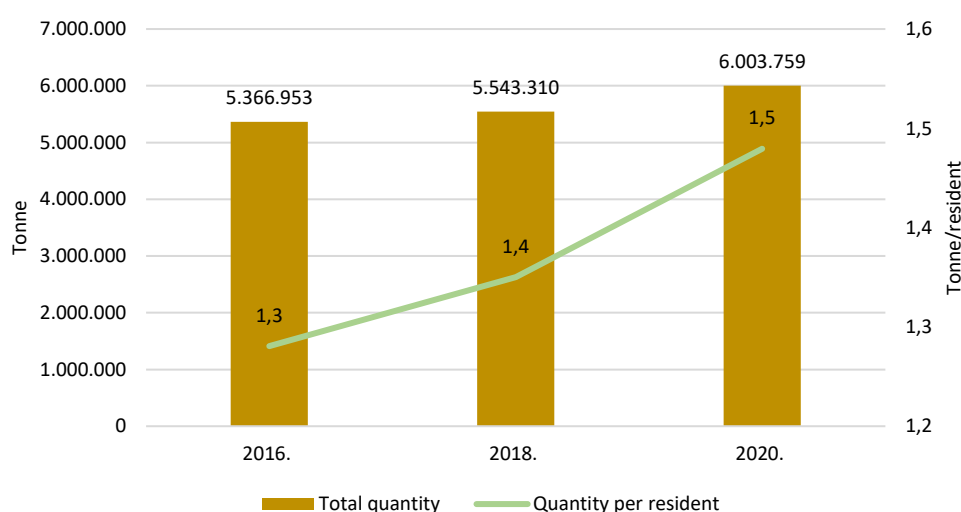
The presented waste statistics have been harmonised with methodologies prescribed by delegated and implementing acts, as well as other guidelines of the European Commission's competent authorities.

Although a further increase in the scope and quality of the collected data for specific waste management segments are necessary, including data related to products pertaining to the Extended Producer Responsibility (EPR) policy approach, as well as further improvements of IT solutions related to the Waste Management Information System, data used in this document for the purpose of the analysis of the situation provide a credible and complete overview of the situation in the area of waste prevention and waste management in the Republic of Croatia.

### 2.2.1. Total amount of waste in the Republic of Croatia

The waste (both hazardous and non-hazardous waste) amount statistics were compiled in line with the EUROSTAT methodology required by Directive (EC) No. 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics (OG 332, 9.12.2002), as last amended by the Commission Regulation (EU) nr. 849/2010 of 27 September 2010 amending Directive (EC) No. 2150/2002 of the European Parliament and of the Council on waste statistics (OG 253, 28. 9. 2010.).

The upward trend in total amounts of waste generated in the Republic of Croatia is continuing, amounting to 12% in the period from 2016 to 2020<sup>1</sup>. In 2020<sup>2</sup>, the quantity of waste generated amounted to 6,003,759 tonnes, i.e., 1.5 tonnes/resident (Figure 1). The upward trend is also present at the EU level, with a significantly larger amount of waste generated per capita (5.2 tonnes/resident, 2018<sup>3</sup>).



Source: MESD (Cro. abbrev. MINGOR)

**Figure 1.** Total amount of waste generated by economic activities and households in Croatia from 2016 to 2020

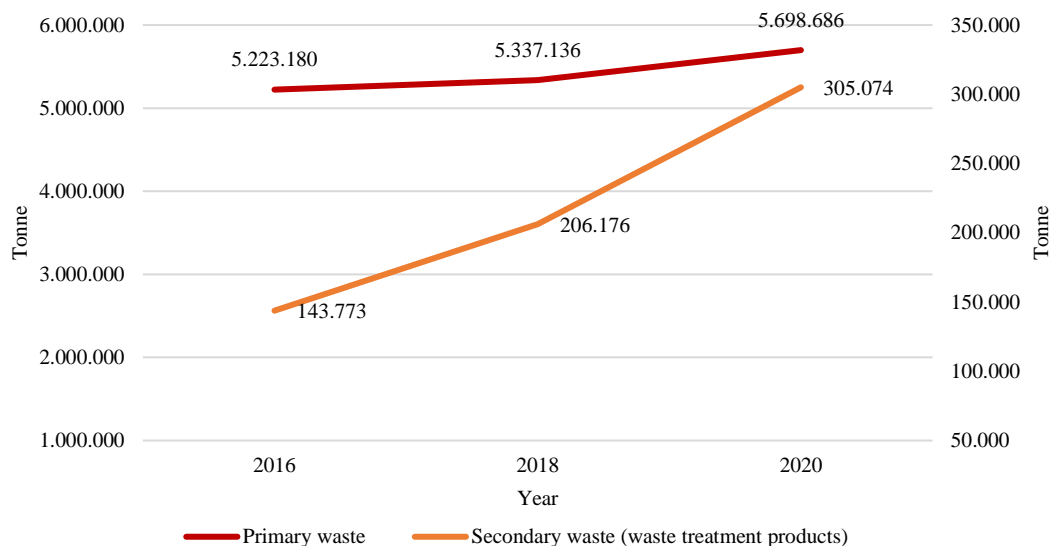
<sup>1</sup> The chart regards the period from 2016 to 2020. Starting with the year 2016, the data covers the assessments for specific types of waste, such as construction waste and mineral waste, that was not the case for the period before 2016. Consequently, the data for the period from 2016 to 2020 is not comparable with the data from previous years, therefore for the previous years the total amount of waste is not available.

<sup>2</sup> In accordance with the Waste Statistics Regulation – Regulation (EC) nr. 2150/2002, the data is estimated every two years for an even year, so the latest available data is provided for the year 2020.

<sup>3</sup> [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Waste\\_generation,\\_2018\\_\(kg\\_per\\_capita\)-vs\\_20220729.png#file](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Waste_generation,_2018_(kg_per_capita)-vs_20220729.png#file)



The largest increase in the amount of waste volumes for the observed period (112 %) is associated with the generation of secondary waste<sup>4</sup> (Figure 2). The obtained data is the result of construction and commissioning of the waste treatment facilities for the mixed municipal waste (mechanical biological treatment facilities), particularly from 2018 onwards. The amounts of the generated primary waste<sup>5</sup> have increased slightly since 2016 (9 %), which is recorded in particular for scrap metal, waste paper and cardboard, slurry manure and construction waste.



Source: MESD (Cro. abbrev. MINGOR)

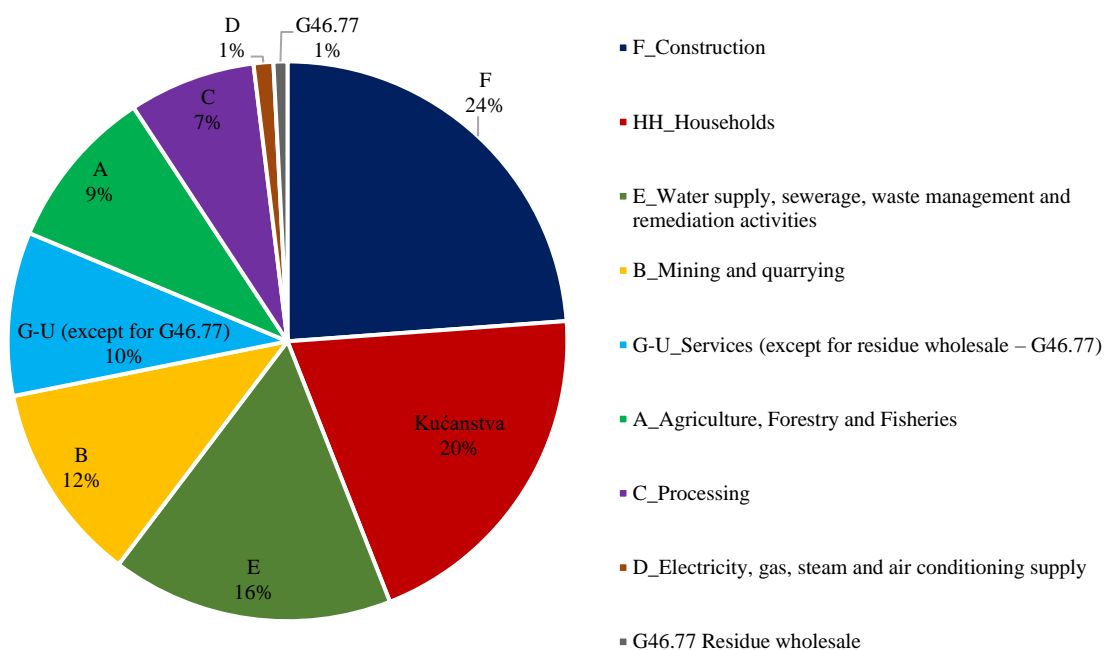
**Figure 2.** Amounts of primary and secondary waste in Croatia in 2016, 2018 and 2020

Considering the generated waste in terms of its origin (economic activity) the construction industry accounted for the largest share in the total amount of waste generated during 2020 (24 %, 1,431,694 tonnes), followed by the water industry, waste water treatment, waste management and environmental remediation industry (16 %, 977,321 tonnes), mining and quarrying industry (12 %, 693,517 tonnes) and service industry (10 %, 567,529 tonnes) (Figure 3) (Table 1).

Households account for 20 % (1,212,068 tonnes) of the total waste. Waste from households includes various types of waste produced by residents, (such as municipal waste, mixed municipal waste, bulky waste, packaging waste, waste electrical and electronic equipment – WEEE, etc.), and other types of waste, such as end-of-life vehicles, waste accumulators, waste tyres, etc.

<sup>4</sup> Secondary waste is waste generated in a process known as a waste treatment operation. It includes residual materials originating from recovery and disposal operations, such as sorting residues, mineral fractions obtained from mechanical treatment, incineration residues, etc. ([https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Secondary\\_waste](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Secondary_waste))

<sup>5</sup> Primary waste is waste from households and waste produced by economic activities in addition to the ones of waste recovery and disposal. ([https://ec.europa.eu/eurostat/cache/metadata/en/env\\_wasgt\\_esms.htm](https://ec.europa.eu/eurostat/cache/metadata/en/env_wasgt_esms.htm))



Source: MESD (Cro. abbrev. MINGOR)

**Figure 3.** Composition of economic activities and households in the total waste in 2020

**Table 1.** Composition of waste per economic activity and household in 2020

Economic activity/Household	Quantity (t)
F_Construction	1,431,694
Households	1,212,068
E_Water supply, waste water treatment, waste management and environmental remediation	977,321
B_Mining and quarrying	693,517
G-U_Service industry (excluding G46.77)	567,529
A_Agriculture, forestry and fishery	565,300
C_Processing industry	439,675
D_Electricity, gas, steam and air conditioning supply	68,400
G46.77_Wholesale of waste and scrap	48,255
<b>Total (hazardous and non-hazardous) waste</b>	<b>6,003,759</b>

Source: MESD (Cro. abbrev. MINGOR)

In terms of the type of waste, mineral waste accounts for the majority of the total waste generated, including mineral construction and demolition waste (22.3 %), household and similar waste (mixed municipal waste, bulky waste, waste from street cleaning services, etc.) (19.1 %), scrap metal (14.3 %), animal faeces, urine and manure (9.2 %), soil (8.4 %), and paper and cardboard (6.1 %) (Table 2).

**Table 2.** Quantity and share of waste in the total amount of waste per waste type (statistical waste category) in 2020

Type of waste <sup>6</sup>	Quantity (t)	Share
Mineral waste, including mineral construction and demolition waste	1,339,878	22.3 %
Waste from households and similar waste	1,147,784	19.1 %
Scrap metal	858,337	14.3 %
Animal faeces, urine, and manure	554,847	9,2 %
Soil	506,588	8.4 %

<sup>6</sup> Statistical waste categories – Classification of waste according to Regulation (EC) nr. 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics

Type of waste <sup>6</sup>	Quantity (t)	Share
Paper and cardboard	364,076	6.1 %
Sorting residues – secondary waste	249,954	4.2 %
Plastic waste	126,223	2.1 %
Wood waste	126,127	2.1 %
Combustion residues	100,905	1.7 %
Plant-based waste	100,550	1.7 %
Glass waste	83,051	1.4 %
Animal and mixed food waste	76,791	1.3 %
Mixed and undifferentiated materials	64,282	1.1 %
End-of-life vehicles	55,260	0.9 %
Mineral waste from waste processing and stabilised waste – secondary waste	50,807	0.8 %
Discarded equipment (excluding discarded vehicles, batteries and accumulators)	48,855	0.8 %
Rubber waste	26,049	0.4 %
Chemical waste	26,018	0.4 %
Common sludges	25,146	0.4 %
Waste batteries and accumulators	14,818	0.2 %
Waste oil	13,518	0.2 %
Dredging spoils	10,860	0.2 %
Textile waste	10,023	0.2 %
Medical and biological waste	6,866	0.1 %
Industrial effluent sludges	5,263	0.1 %
Other (Acids, alkalis and salts; Sludge and liquid waste from waste treatment – secondary waste; Spent solvents; Waste containing PCBs)	10,883	0.2 %
<b>Total</b>	<b>6,003,759</b>	<b>100.00 %</b>

Source: MESD (Cro. abbrev. MINGOR)

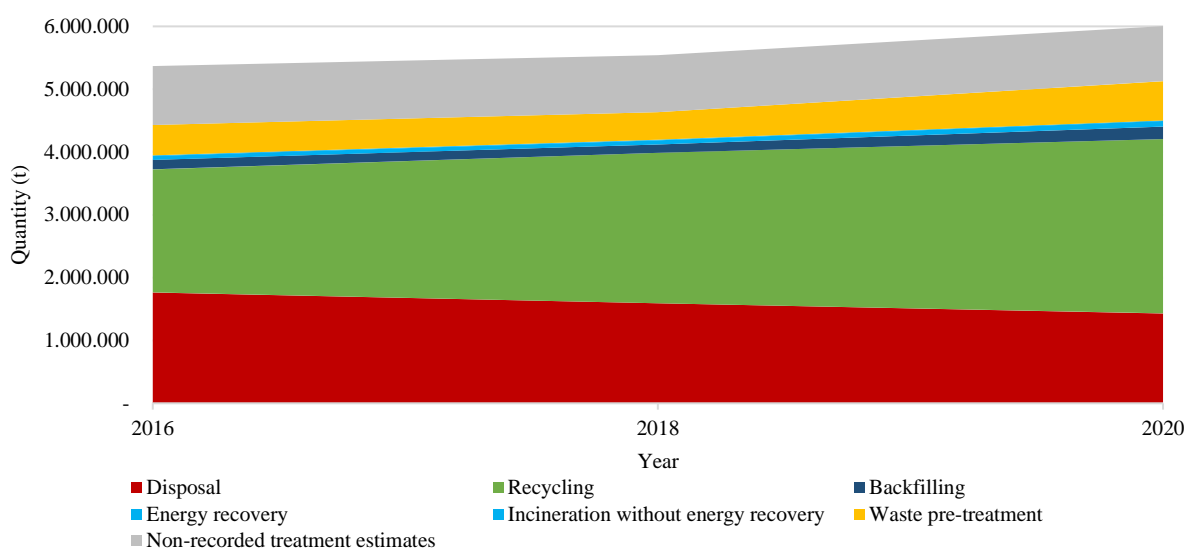
As a result of the increase in waste generation, the quantities of the processed waste are increasing, with a positive shift in the order of waste management hierarchy, showing an increase in the recycling rate of the total amount of waste generated from 36.5 % in 2016 to 46.2 % in 2020, and a reduction in the disposal rate of the total amount of waste generated from 32.9 % to 23.8 % (Table 3. Handling of the total generated waste in the period from 2016 to 2020 according to processing procedures (including quantities exported/shipped outside the Republic of Croatia) ) (Figure 4).

**Table 3.** Handling of the total generated waste in the period from 2016 to 2020 according to processing procedures (including quantities exported/shipped outside the Republic of Croatia)

Year	2016.		2018.		2020.	
	Quantity (t)	Share	Quantity (t)	Share	Quantity (t)	Share
Recycling	1,961,386	36.5 %	2,395,668	43.2 %	2,774,331	46.2 %
Backfilling	148,836	2.8 %	131,084	2.4 %	198,379	3.3 %
Energy recovery	61,576	1.1 %	64,053	1.2 %	89,517	1.5 %
Disposal	1,763,292	32.9 %	1,593,692	28.7 %	1,431,448	23.8 %
Incineration without energy recovery	11,189	0.2 %	10,843	0.2 %	9,753	0.2 %
Assessments for unrecorded waste treatment (construction waste, mining industry waste and municipal waste)	937,311	17.5 %	910,623	16.4 %	877,144	14.6 %

Year	2016.		2018.		2020.	
	Quantity (t)	Share	Quantity (t)	Share	Quantity (t)	Share
Pre-treatment before the final waste treatment <sup>7</sup>	483,363	9.0 %	437,345	7.9 %	623,187	10.4 %
<b>Total:</b>	<b>5,366,953</b>	<b>100.0 %</b>	<b>5,543,310</b>	<b>100.0 %</b>	<b>6,003,759</b>	<b>100.0 %</b>

Source: MESD (Cro. abbrev. MINGOR)



Source: MESD (Cro. abbrev. MINGOR)

**Figure 4.** Waste management activities in the period from 2016 to 2020 according to waste treatment operations (including quantities exported outside the EU and shipped to other EU Member States for processing)

In 2020, 46.2 % of the total waste was recycled, 3.3 % of waste was recovered using the backfilling operation (R5), 1.5 % of waste was recovered into energy (R1). Thus, the recovery rate in 2020 for the total generated waste in the Republic of Croatia amounts to 51 %. The 23.8 % of the waste was disposed of, while a negligible quantity of waste was incinerated without energy recovery (0.2 %). The assessments for unrecorded treatment of waste amount to 14.6 % (construction waste, mining waste and municipal waste).

Not all the generated quantities of waste get treated in the Republic of Croatia. In 2020, waste treatment operators in the Republic of Croatia using the final treatment procedures<sup>8</sup> processed a total amount of 3,605,161 tonnes of waste generated on the territory of the Republic of Croatia, i.e., 60 % of the total amount. These are the final waste treatment operations (mostly recycling and disposal) that are not followed by further waste treatment processes. The remaining quantities of generated waste (2,398,598 tonnes) were processed using the preliminary procedures before their recovery/disposal in the Republic of Croatia, i.e. using specific waste pre-treatment operations (such as dismantling, shredding, blending, repackaging, etc.) for the final treatment of waste for export/shipment or were exported/shipped directly, without prior pre-treatment. A part of the waste

<sup>7</sup> Waste treatment processes: D1- D7, D10, D12; R1-R11

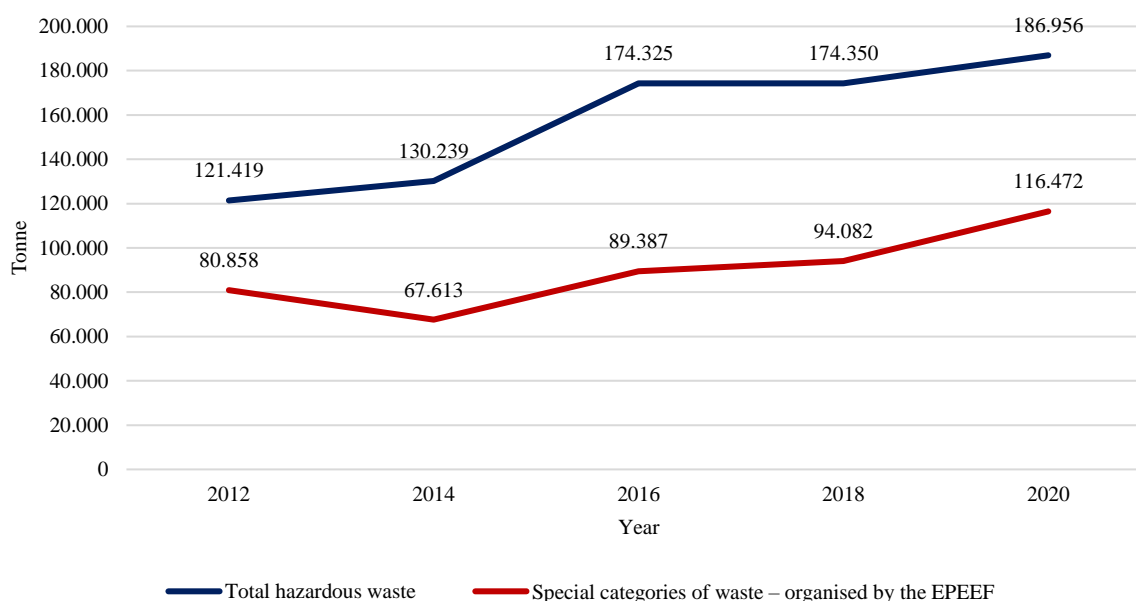
<sup>8</sup> D1-D7, D10, D12, R1-R11

regards the assessed quantities of waste from unrecorded waste treatment procedures, particularly construction waste, mining industry-generated waste and municipal waste.

In 2020, the amount of waste that was exported/shipped outside the country was 898,267 tonnes, including 18,760 tonnes of hazardous waste and 879,507 tonnes of non-hazardous waste. An average of 95 % of waste exported/shipped outside Croatia is materially recycled, from approximately 3 % of waste energy is recovered, while the remaining 2 % of waste is usually incinerated without energy recovery and is disposed of at landfill sites to a lesser extent. For more information on the transboundary shipment of waste in Chapter 2.3.

### 2.2.2. Hazardous waste

Hazardous waste accounts for 3 % of the total waste generated. In the period from 2012 to 2020, the amount of hazardous waste increased by 54 %, and in 2020 it was 186.956 tonnes (Figure 5). The said increase, particularly in the period since 2016 onwards, can be attributed to the improvement of the national system for special categories of waste, which was established and is run by the EPEEF (Cro. abbrev. FZOEU)<sup>9</sup>, which resulted in an increase in the separation of hazardous waste. On average, a part of such special categories of waste in hazardous waste accounts for 59 %.



Source: MESD (Cro. abbrev. MINGOR)

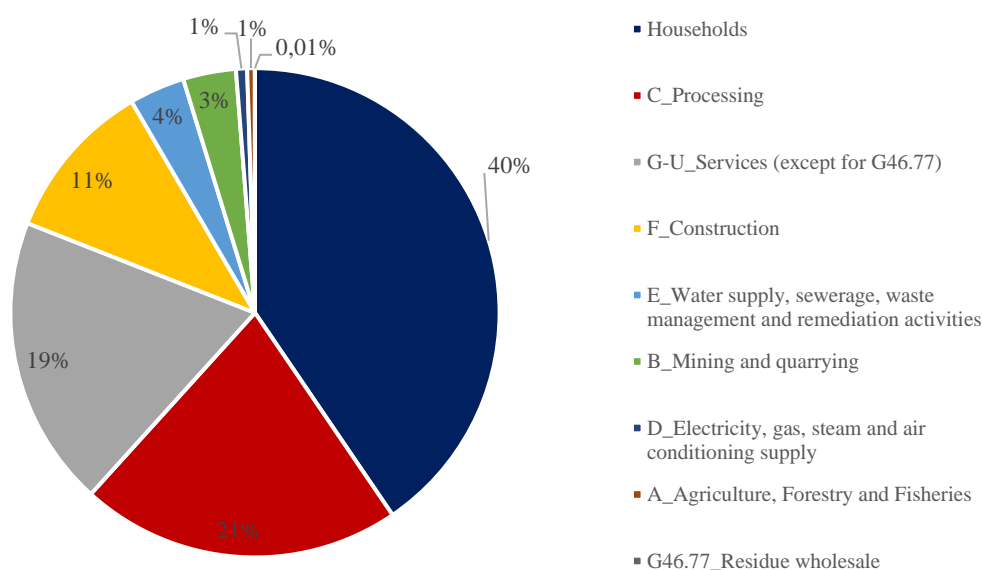
**Figure 5.** Amounts of hazardous waste and special categories of waste in the Republic of Croatia from 2012 to 2020

In addition to the types of hazardous waste which are considered special categories of waste under the scheme of the EPEEF (Cro. abbrev. FZOEU), a significant increase in the quantity of hazardous medical waste was reported as a result of the increased consumption of medical products due to the

<sup>9</sup> Waste lubricating oils, waste batteries and accumulators, end-of-life vehicles, waste electrical and electronic equipment, construction waste containing asbestos (since 2016, the collection of the construction waste containing asbestos has no longer been co-financed by the EPEEF)

COVID-19 pandemic. In 2020, the amount of hazardous medical waste was 5,968 tonnes, representing an increase of 137 % compared to 2012.

In terms of waste origin, the largest proportion of hazardous waste was generated by households (40 %) in 2020. It mostly regards waste electrical and electronic equipment, and end-of-life vehicles. It is followed by waste generated by the processing industry (21 %), with the largest contribution to the metal manufacturing industry and finished metal product manufacturing industry, except for the machinery and equipment, followed by the service industry (19 %) construction industry (11 %) (Figure 6. Composition of economic activities and households in the total hazardous waste in Croatia in 2020).



Source: MESD (Cro. abbrev. MINGOR)

**Figure 6.** Composition of economic activities and households in the total hazardous waste in Croatia in 2020

End-of-life vehicles (28.26 %) and waste electrical and electronic equipment are the most represented in the total quantities of hazardous waste (15.36 %), followed by chemical waste (11.84 %), waste batteries and accumulators (7.81 %), sorting residues (7.28 %) and residual oils (7.23 %) (Table 4) (Figure 7. Composition of specific types of hazardous waste in the total amount of hazardous waste in Croatia in 2020).

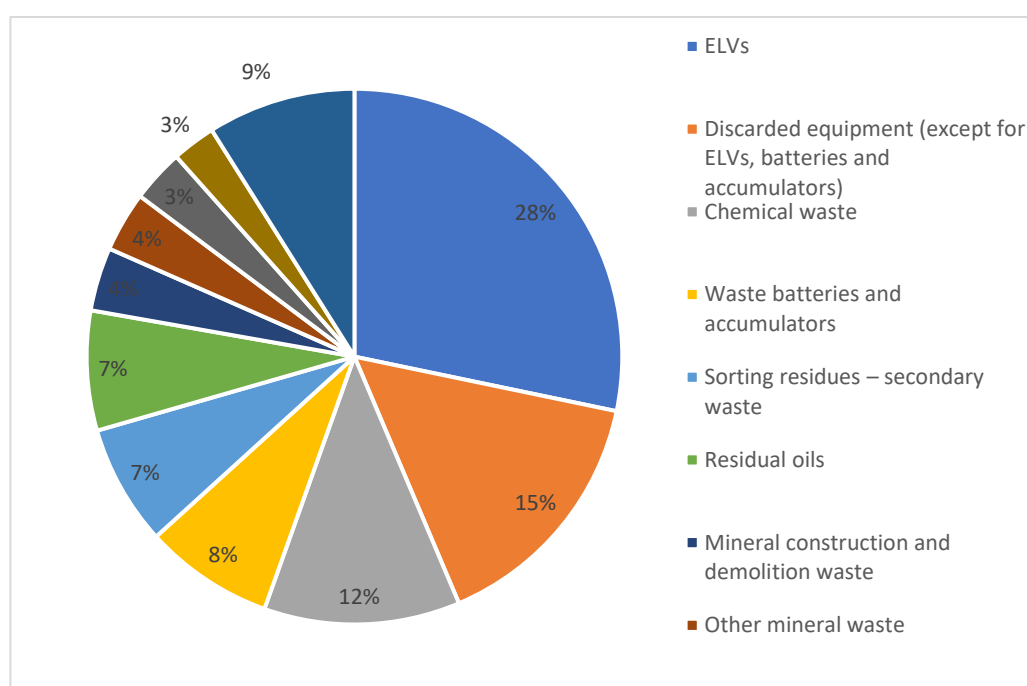
**Table 4.** Quantity and share of waste in the total amount of hazardous waste per waste type (statistical waste category) in 2020

Type of waste <sup>10</sup>	Quantity (t)	Share
End-of-life vehicles	52,842	28.26 %
Discarded equipment (except for discarded vehicles, batteries and accumulators)	28,709	15.36 %
Chemical waste	22,127	11.84 %
Waste batteries and accumulators	14,606	7.81 %
Sorting residues – secondary waste	13,602	7.28 %
Residual oil	13,518	7.23 %
Mineral construction and demolition waste	7,161	3.83 %
Other mineral waste	6,775	3.62 %

<sup>10</sup> Statistical waste categories- Classification of waste according to Regulation (EC) nr. 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics

Type of waste <sup>10</sup>	Quantity (t)	Share
Medical and biological waste	5,968	3.19 %
Soil	4,923	2.63 %
Acids, alkalis and salts	4,407	2.36 %
Sludge and liquid waste from waste treatment – secondary waste	3,839	2.05 %
Combustion residues	2,199	1.18 %
Spent solvents	1,715	0.92 %
Dredging spoils	1,522	0.81 %
Industrial effluent sludges	1,521	0.81 %
Mixed and undifferentiated materials	1,484	0.79 %
Waste containing PCBs	22	0.01 %
Wood waste	15	0.01 %
<b>Total</b>	<b>186,956</b>	<b>100.00 %</b>

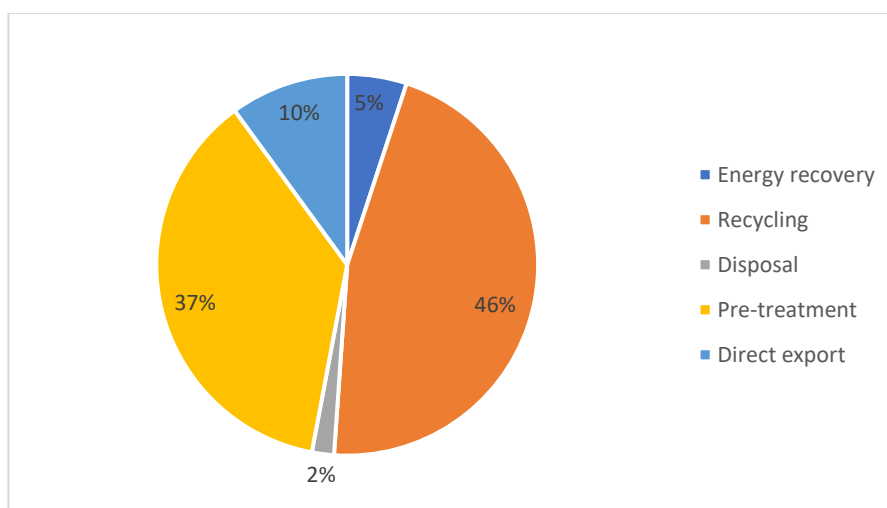
Source: MESD (Cro. abbrev. MINGOR)



Source: MESD (Cro. abbrev. MINGOR)

**Figure 7.** Composition of specific types of hazardous waste in the total amount of hazardous waste in Croatia in 2020

In 2020, in the Republic of Croatia 99,037 tonnes of hazardous waste were processed using final waste treatment procedures - (such as energy recovery, recycling and disposal), with 18,760 tonnes being shipped outside the country for processing. The remaining 69,159 tonnes were processed in Croatia using the waste treatment procedures preceding the recovery/disposal of waste (such as dismantling, shredding, blending, repackaging, etc.) for the final waste treatment procedure to be performed in export (Figure 8).



Source: MESD (Cro. abbrev. MINGOR)

**Figure 8.** Hazardous waste treatment in the Republic of Croatia in 2020

The Table 5. given below shows the quantities and types of waste processed in Croatia in 2020 using final waste treatment procedures. The largest quantities of hazardous waste were processed through recycling, including mostly end-of-life vehicles and waste electrical and electronic equipment. The energy recovery procedure was used to process residual oil and chemical waste, while 3,497 tonnes of waste containing asbestos was disposed of in special landfills designated to receive asbestos known in Croatia as 'cassettes'.

**Table 5.** Quantities of hazardous waste processed using final waste treatment procedures in Croatia in 2020 per type of waste

Type of waste	Energy recovery (t)	Recycling(t)	Disposal (t)	Total (t)
End-of-life vehicles	0	46,757	0	46,757
Waste electrical and electronic equipment	22	28,687	0	28,709
Sorting residues – secondary waste	0	8,310	0	8,310
Residual oil	6,786	167	0	6,953
Chemical waste	1,874	1,655	0	3,530
Other mineral waste	1	0	3,497	3,497
Mineral construction and demolition waste <sup>11</sup>	731	0	0	731
Spent solvents	0	331	0	331
Mixed undifferentiated materials	6	76	0	82
Industrial effluent sludges	19	52	0	71
Wood waste	0	34	0	34
Combustion residues	0	20	0	20
Acids, alkalis and salts	0	11	0	11
<b>Total waste processed using final treatment procedures in Croatia</b>	<b>9,440</b>	<b>86,100</b>	<b>3,497</b>	<b>99,037</b>
<b>Processed using pre-treatment procedures in Croatia (followed by export)</b>				<b>69,159</b>
<b>Directly exported</b>				<b>18,760</b>
<b>Total</b>				<b>186,956</b>

Source: MESD (Cro. abbrev. MINGOR)

<sup>11</sup> Glass, plastics and wood containing or contaminated with hazardous substances



### **2.2.3. Municipal waste**

Municipal waste statistics is predominantly based on the data obtained from the public municipal waste collection service provider (hereinafter referred to as: public service), including data collected from the civic amenity sites (both mobile and stationary ones), retailers' data and data of the waste processors (including landfills) logging annually into the Waste Management Information System<sup>12</sup>. In addition to the aforementioned data, annual data on waste exporters, and the assessment of the amounts of municipal waste for residential areas not covered by public service.

The municipal waste is defined by the Waste Management Act as a mixed municipal waste and separately collected waste from households, including paper and cardboard, glass, plastics, metal, bio-waste, wood, textile, packaging, waste electrical and electronic equipment, waste batteries and accumulators and bulky waste, including mattresses and furniture, as well as mixed municipal waste and separately collected waste from other sources, if that waste is similar in nature and composition to waste generated by households but does not include waste from manufacturing, agriculture, forestry, fishery and aquaculture, septic tanks and sewers, and wastewater treatment plants, including sewage sludge, end-of-life vehicles and construction waste, whereby the issue of division of responsibility for waste management between public and private entities is not affected by the said definition. The aforementioned definition is consistent with Article 3(2)b of Directive 2008/98/EC.

#### **2.2.3.1. Generated municipal waste**

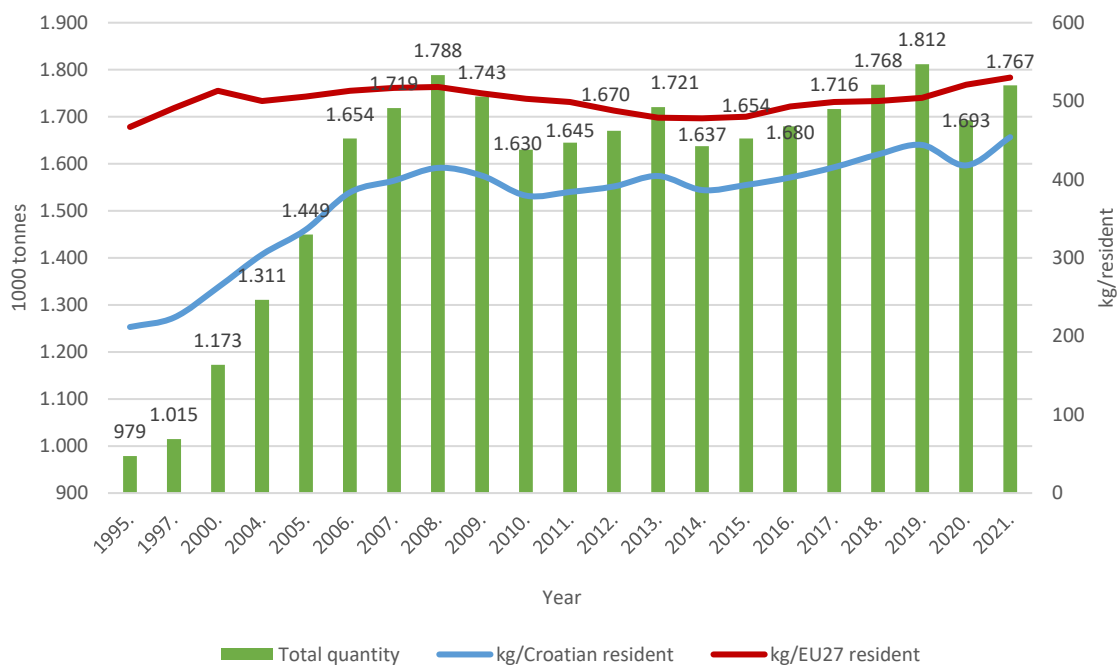
Since 2016, all the municipalities/towns (hereinafter referred to as: Local self-government units) have been covered by the public service operations related to the municipal waste collection. In 2021, public service operations included 99.8 % of residents, i.e., 0.2 % of residents were not included.

In the period from 1995 to 2008, the amount of municipal waste in public of Croatia was increasing, followed by a reduction in the waste generated by 2010 as a result of the economic crisis. From 2011 to 2019, annual quantities of the generated municipal waste were slightly fluctuating and amounted between 1.6 million tonnes and 1.8 million tonnes. In 2020, in the middle of COVID-19 pandemic, due to which there was a significant reduction in services (reduction in working hours, closure of catering facilities, restrictions imposed on cultural activity and events, and consequently a reduction in the number of overnight stays in tourism), the quantities of municipal waste had the same values as the ones recorded in 2014. The easing of pandemic restrictions and the recovery of services following the pandemic in 2021 led to an increase in the amount of municipal waste (1,766,560 t) to the 2018 level (Figure 9).

The annual quantity of municipal waste generated per capita amounted to 454 kg in 2021, representing the largest value since 1995. The increase can be attributed to the use of the Census 2021 data, which resulted in much lower values than the population data estimated by the EUROSTAT that was used in the calculations performed over the previous years. The annual quantity of waste generated per capita in the Republic of Croatia is still significantly lower than the EU27 average that was 505 kg per capita in 2020, according to the latest available data.

---

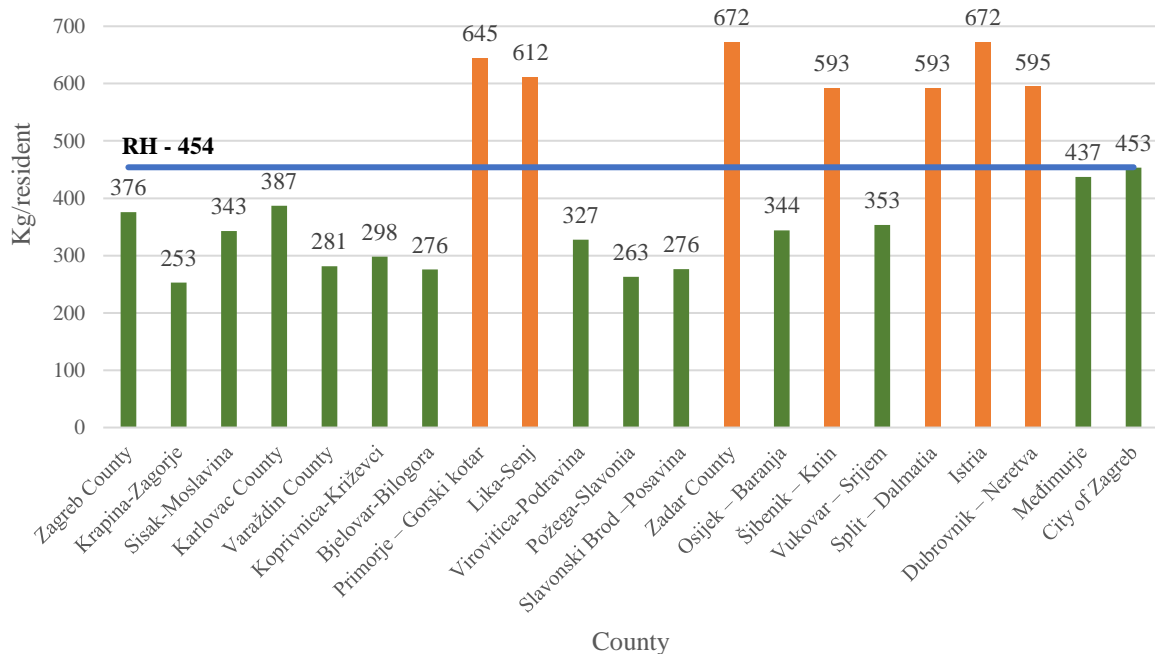
<sup>12</sup> [Environmental Pollution Register, Landfills – Environmental Pollution Form \(Cro. abbrev. OOO\)](#)



Source: MESD (Cro. abbrev. MINGOR)

Figure 9. Annual volume of municipal waste generated in the period from 1995 to 2021 in Croatia

Annual volume of municipal waste generated per capita in 2021 at county level range between 253 kg and 672 kg, with a deviation from the average volume at national level (454 kg) being observed mostly in the coastal counties, which is attributed to the impact of tourism (Figure 10).



Source: MESD (Cro. abbrev. MINGOR)

Figure 10. Annual volume of municipal waste generated per capita in 2021, per county

With the rising number of the booked overnight stays, the volume of municipal waste generated by tourist activity increased by 93 % in the period from 2015 to 2019. In 2020, as a result of a significant decline in the number of overnight stays in tourism that was due to COVID-19 pandemic, there was a significant drop in the volume of municipal waste generated by tourist activity to the values registered before 2015. In 2021, with the rise in the number of overnight stays in tourism, the volume of municipal waste generated by tourist activity increased as well, amounting to 136,512 t (Table 6). Over the successful tourism years (such as 2017, 2018 and 2019), the average proportion of municipal waste generated by tourist activity in the total annual volume of municipal waste amounted to 9.3 %.

**Table 6.** Amount of municipal waste generated by tourist activity from 2015 to 2021

Year	Amount of tourism-generated MW (t) <sup>13</sup>	Share in the total MW (%)
2015	98,960	6.0
2016	139,535	8.3
2017	155,958	9.1
2018	165,251	9.3
2019	171,505	9.5
2020	83,794	5.0
2021	136,512	7.7

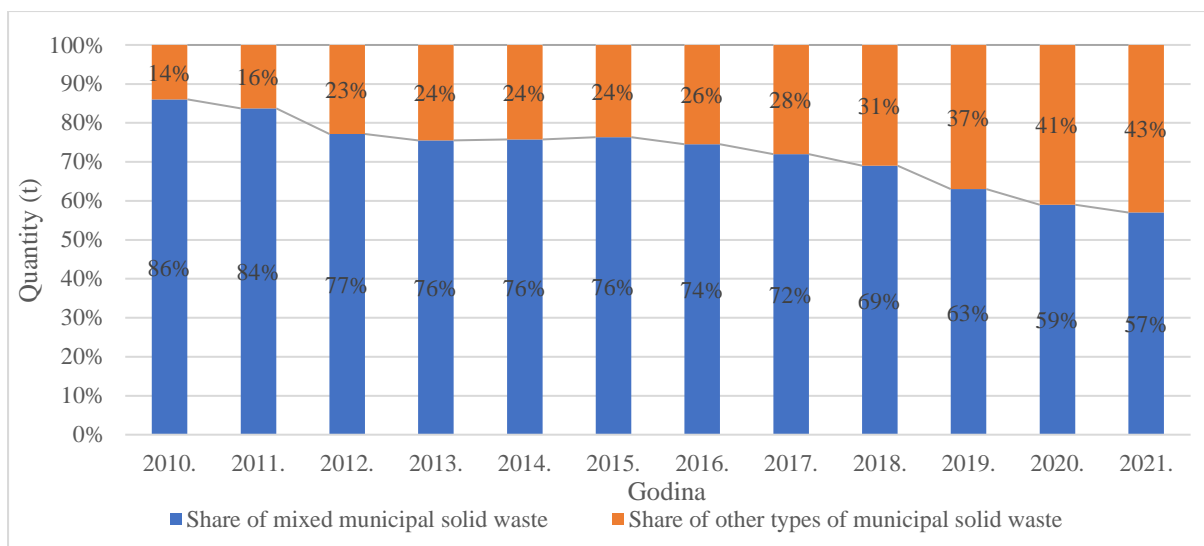
Source: MESD (Cro. abbrev. MINGOR)

### 2.2.3.2. Separate collection of municipal waste

Separate collection of specific types of municipal waste (primarily paper, glass, plastics, metal, bio-waste) is performed through the so-called 'doorstep' collection process, using different types of public space litter bins, trash cans at civic amenity sites, in retail stores and through the established national systems for special categories of waste.

Since 2010, the proportion of the separately collected municipal waste has been increasing. The largest proportion of the separately collected municipal waste was registered in the period from 2017 to 2021, with a 15-percentage-point increase (Figure 11. Composition of separately collected municipal waste and mixed municipal waste in the period from 2010 to 2021 in Croatia ). The abovementioned is the result of continuous investment in the separate municipal waste collection infrastructure, such as doorstep collection trash cans, civic amenity sites, vehicles and equipment intended for separation, as well as improving the effects of raising public awareness on the methods and importance of separate waste collection. The number of local self-government units conducting the separate doorstep waste collection increased from 457 local self-government units (LSGUs) in 2017 to 519 LSGUs in 2021. Therefore, in 2021, the separate doorstep waste collection system was not implemented in 37 LSGUs (7 %).

<sup>13</sup> The volume of waste generated by tourist activity specified using the methodology set out in the *Methodological work on measuring the sustainable development of tourism, Part 2: Manual on sustainable development indicators of tourism*, European Commission, 2006. The eVisitor system (Croatian national tourist check-in and check-out Information system) was used as overnight stay data source.



Source: MESD (Cro. abbrev. MINGOR)

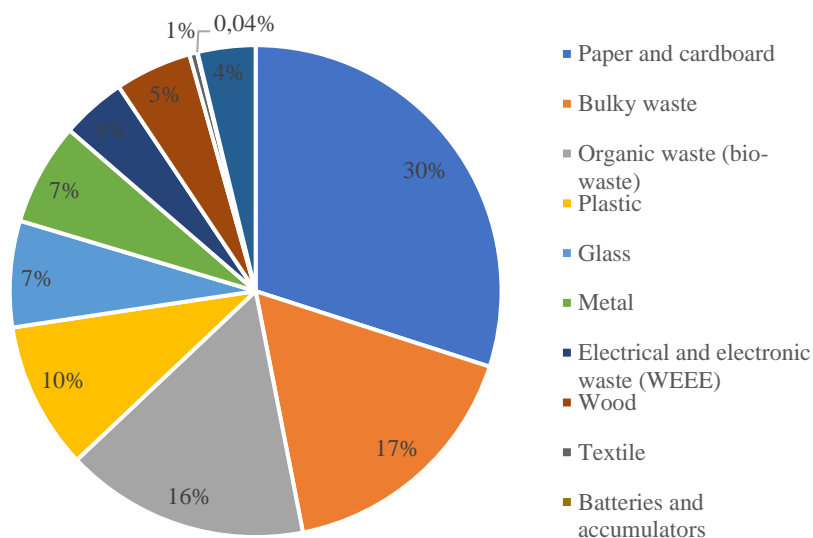
**Figure 11.** Composition of separately collected municipal waste and mixed municipal waste in the period from 2010 to 2021 in Croatia

Despite the significant increase in the number of civic amenity sites (34 in 2015, 348 in 2021), the annual volume of municipal waste separately collected through civic amenity sites is still very low, amounting to 63,173 tonnes in 2021, which represents an increase of just 5 % compared to the previous year.

The total amount of the separately collected municipal waste amounted to 761,683 tonnes in 2021, including only 300,079 tonnes collected through the public service waste collection, with the remaining waste that has not been collected through public service accounting for the recyclable waste generated by the service sector (schools, restaurants, hospitals, etc.), as well as waste collected through the national systems for special categories of waste. Thus, the total waste collection rate for the Republic of Croatia amounted to 43 % in 2021, while the public service separate waste collection rate amounted to only 23 %.

In the light of the foregoing, further considerable investments in information and education activities aimed at promoting public service separate waste collection are required, as well as investments in the construction and equipping of additional civic amenity sites, the acquisition of equipment and waste collection vehicles and vessels.

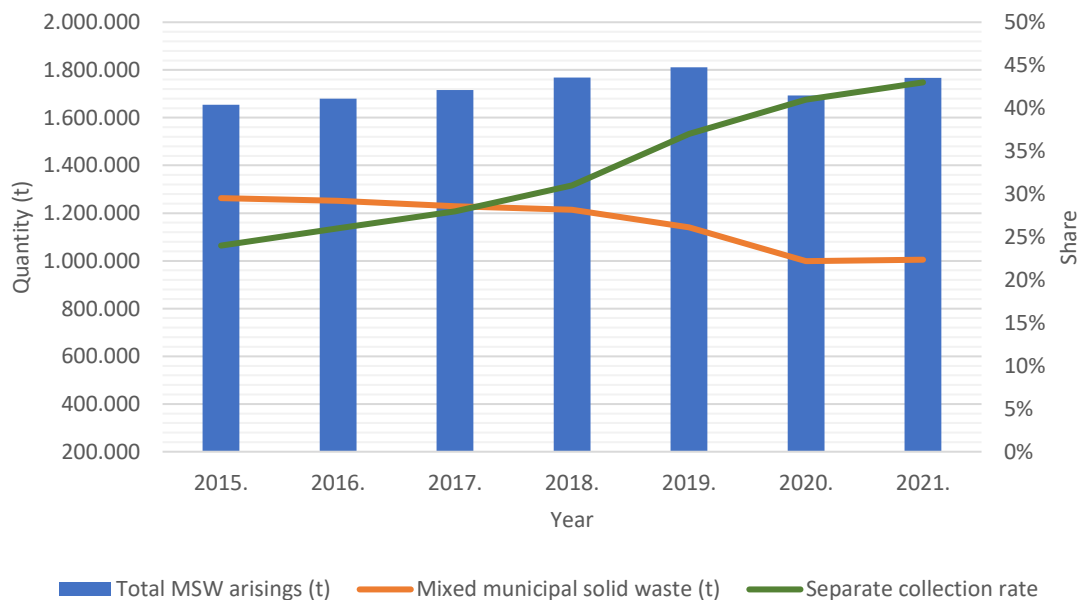
Waste paper and cardboard, bulky waste and bio-waste account for the largest share in the total amount of separately collected municipal waste (Figure 12. Separately collected municipal waste in 2021 per type ).



Source: MESD (Cro. abbrev. MINGOR)

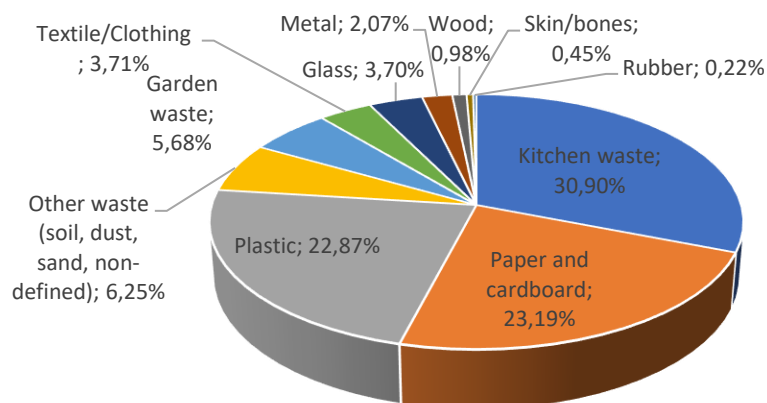
**Figure 12.** Separately collected municipal waste in 2021 per type

The amount of generated mixed municipal waste in 2021 amounted to 1,004,877 tonnes, i.e., 57 % of the total quantity of municipal waste (Figure 13). A correlation has been established between the separation of municipal waste, the implementation of the measures promoting the separate waste collection and the reduction in the mixed municipal waste arisings, i.e., its share in the total amount of the municipal waste generated.



**Figure 13.** Quantities of the mixed municipal waste compared to the total municipal waste arisings and the separate MW collection rate in the period from 2015 to 2021

An estimate of the composition of the mixed municipal waste was made in 2015 as part of the project entitled 'Creating a Unique Methodology for Composition Analysis of Municipal Waste, Defining the Average Composition of Municipal Waste in the Republic of Croatia and Estimating Quantities of Municipal Waste'<sup>14</sup> (Figure 14. Estimated composition of the mixed municipal waste in Croatia in 2015). The composition of waste was determined based on the composition analyses carried out by individual Local (Regional) Self-Government Units (Cro. abbrev. JP(R)S) and Local Self-Government Units (Cro. abbrev. JLS) in the period from 2008 to 2014. Given the fact that the composition of the mixed municipal waste has changed since the said period, a new composition of the mixed municipal waste is to be determined in the upcoming period, and this procedure should be repeated.



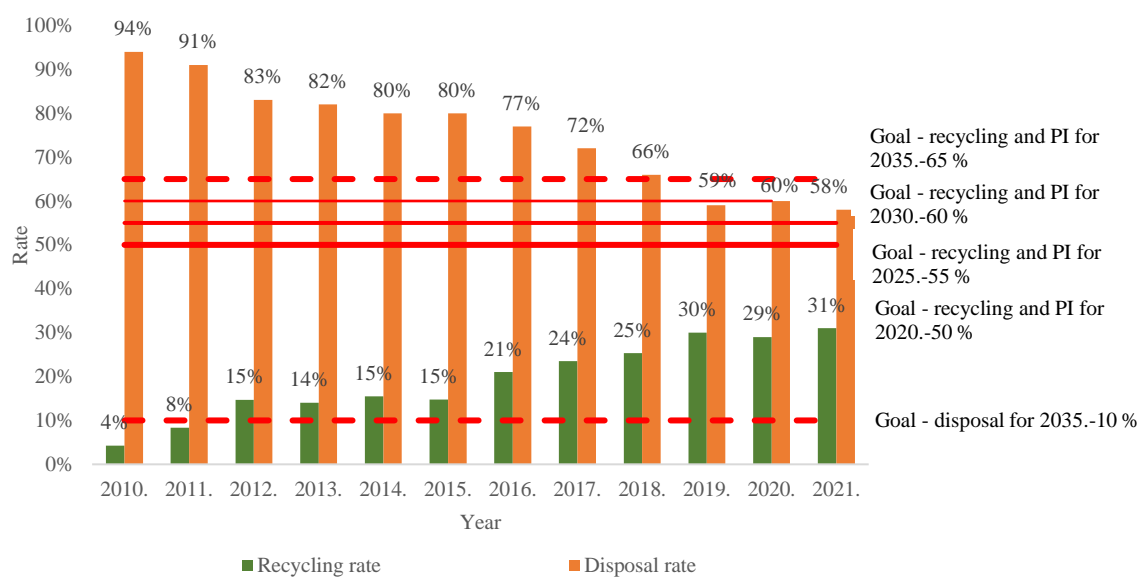
**Figure 14.** Estimated composition of the mixed municipal waste in Croatia in 2015<sup>15</sup>

### 2.2.3.3. Municipal waste management

The volume and composition of the recovered or recycled municipal waste are steadily increasing (Figure 15. Recycling and disposal rates in the period from 2010 to 2021 compared to the set objectives in Croatia ). In 2021, 74 % (560,153 tonnes) of the total volume of separately collected waste was recovered, with the remaining amount of waste being predominantly disposed of at landfill sites (directly or as separately collected non-target material and impurities following the waste treatment operation) or temporarily stored in smaller quantities. Thus, the recovery rate was 32 %. The recycling rate amounted to 31 %, exceeding the 2020 value by 2 percentage points. The EU waste target for 2020 was to reduce the total amount of waste from households and other sources with waste flows similar to the ones generated by households by at least 50 %, including at least paper, metal, plastics and glass and to recover such waste through recycling and the preparation of waste for reuse (R) (Figure 15. Recycling and disposal rates in the period from 2010 to 2021 compared to the set objectives in Croatia ).

<sup>14</sup> Croatian Agency for the Environment and Nature

<sup>15</sup> Methodology used in determining the composition and volume of municipal waste and mixed municipal waste, Croatian Environment Agency (Cro. abbrev. AZO), 2015



Source: MESD (Cro. abbrev. MINGOR)

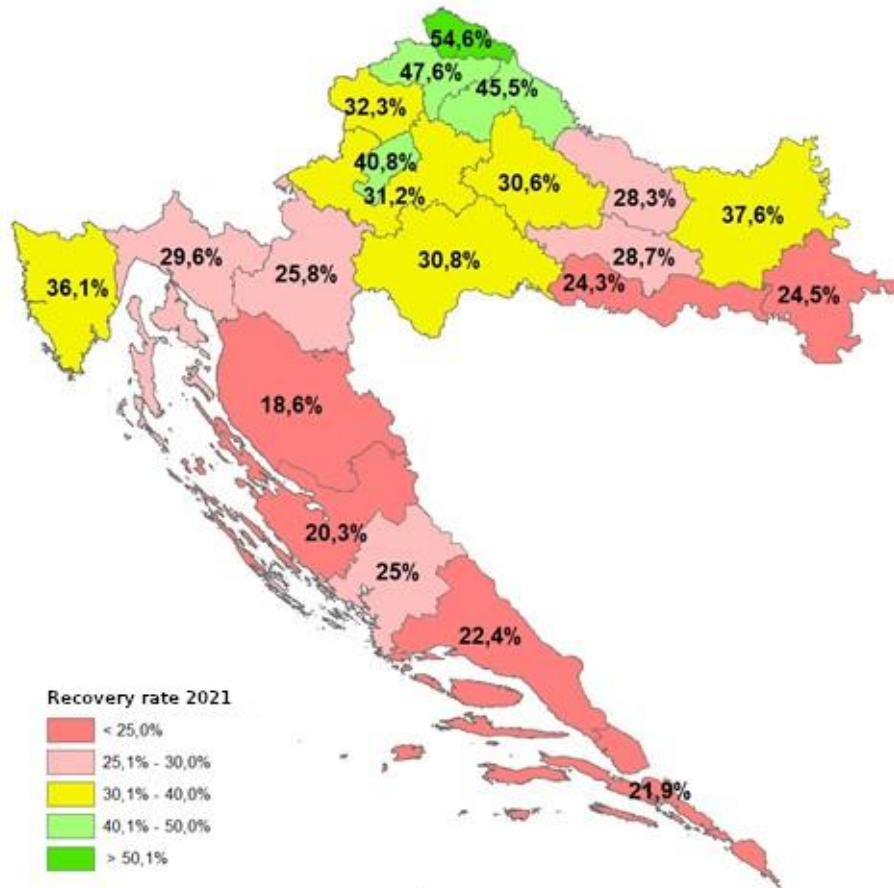
**Figure 15.** Recycling and disposal rates in the period from 2010 to 2021 compared to the set objectives in Croatia

The methodology used to establish the weight of the recycled waste since 2020 is the one set out in the Commission Implementing Decision (EU) 2019/1004 of 7 June 2019 laying down rules for the calculation, verification and reporting of data on waste in accordance with Directive 2008/98/EC of the European Parliament and of the Council and repealing Commission Implementing Decision C(2012) 2384 (notified under document C(2019) 4114). (OG 163, 20.6.2019.)

According to the said methodology, the weight of the recycled municipal waste is calculated as the weight of the input municipal waste processing material including only the volume of municipal waste that during a specific recycling operation is turned into products, material or substances that are not waste, i.e., the quantities that do not include impurities separated from waste which are inadequate for further waste processing. In 2020, the average content of non-target material and impurities separated from the separately collected municipal waste amounted to 14 %, and in 2021 it was 13 %<sup>16</sup>.

The best performing counties in Croatia in terms of the waste recovery rate are the counties in north-western Croatia, the Međimurje County (55 %), the Varaždin County (48%) and the Koprivnica-Križevci County (45%), while the counties with the lowest waste recovery rates are located in the coastal part of Croatia: the Lika-Senj County (19%) and the Zadar County (20 %) (Figure 16. Estimated municipal waste recovery rates by county in 2021).

<sup>16</sup> Report on the municipal waste for 2021, MESD (Cro. abbrev. MINGOR)



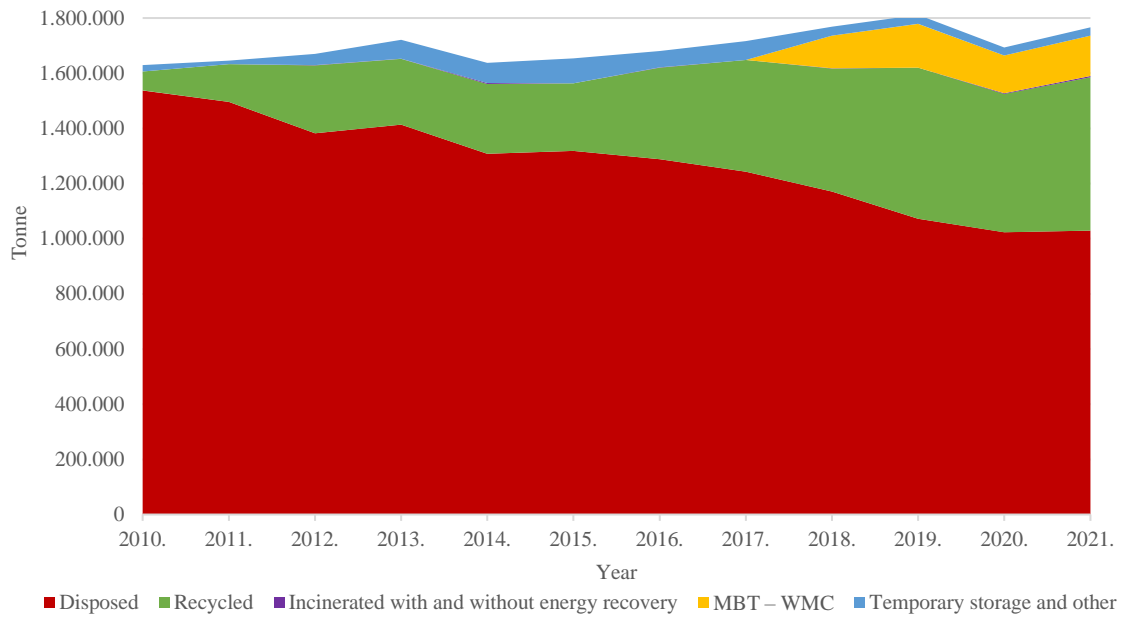
Source: MESD (Cro. abbrev. MINGOR)

**Figure 16.** Estimated municipal waste recovery rates by county in 2021

The increase in the municipal waste recovery rate resulted in the reduction of the amount of municipal waste disposed of at landfill sites. In 2021, a total amount of 1,029,725 tonnes of municipal waste was disposed of, including 4,290 tonnes being disposed of in Bosnia and Herzegovina (Cro. abbrev. BiH). The disposal rate was 58 %.

In addition to 32 % of the recovered municipal waste and 58 % of the MW that was disposed of, the remaining 10 % of waste was used in other waste treatment operations, predominantly the Mechanical Biological Treatment (MBT) plants, with the proportion of other pre-treatment procedures being negligible, such as temporary storage and estimates of the residential areas for which it is not possible to establish the waste treatment processes. Figure 17. shows the waste management system in the period from 2010 to 2021.





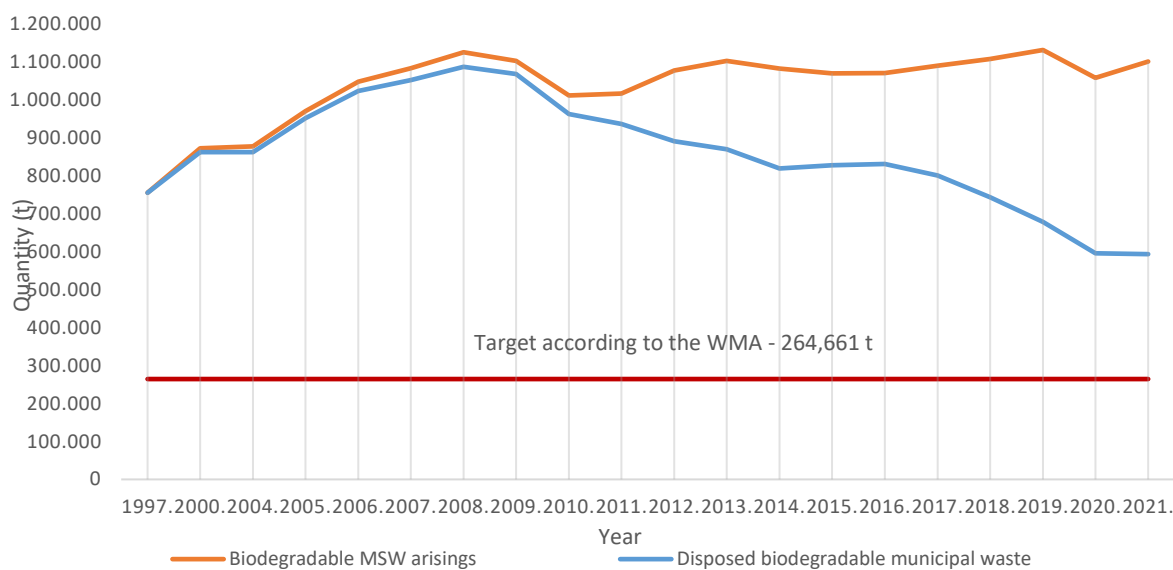
Source: MESD (Cro. abbrev. MINGOR)

**Figure 17.** Municipal waste management in the period from 2010 to 2021 in Croatia

#### 2.2.3.4. Biodegradable municipal waste

Biodegradable waste is any waste or part of waste subject to aerobic or anaerobic digestion, such as food and garden waste, and paper and paperboard. The Waste Management Act sets out the objective according to which the maximum permissible weight of the biodegradable municipal waste the disposal of which in a calendar year may be authorised by any of the waste disposal permit in the Republic of Croatia amounts to 264,661 tonnes, accounting for 35 % of the waste of the biodegradable municipal waste generated in 1997. The aforementioned objective is in accordance with the Directive 1999/31/EC.

In the period from 1997 to 2010, the trend in the amounts of the landfilled biodegradable municipal waste followed the trend in the generation of the biodegradable municipal waste, which resulted in the disconnection between the generated and the landfilled amounts of waste (Figure 18. Generated and landfilled biodegradable municipal waste in the period from 1997 to 2021 with respect to target quantity .), i.e., there is an increase in waste arisings, and a reduction in the amounts of the landfilled biodegradable municipal waste. The said trend is a result in the implementation of the measures concerning the separation of the municipal waste and the increase of the recovery rate.



Source: MESD (Cro. abbrev. MINGOR)

**Figure 18.** Generated and landfilled biodegradable municipal waste in the period from 1997 to 2021 with respect to target quantity

In 2021, 594,107 tonnes of biodegradable municipal waste were landfilled, which exceeded the target value prescribed by the Waste Management Act by 329,446 tonnes. Below is a table showing the quantities of the generated and the landfilled biodegradable municipal waste in the period between 1997 and 2021 (Table 7.).

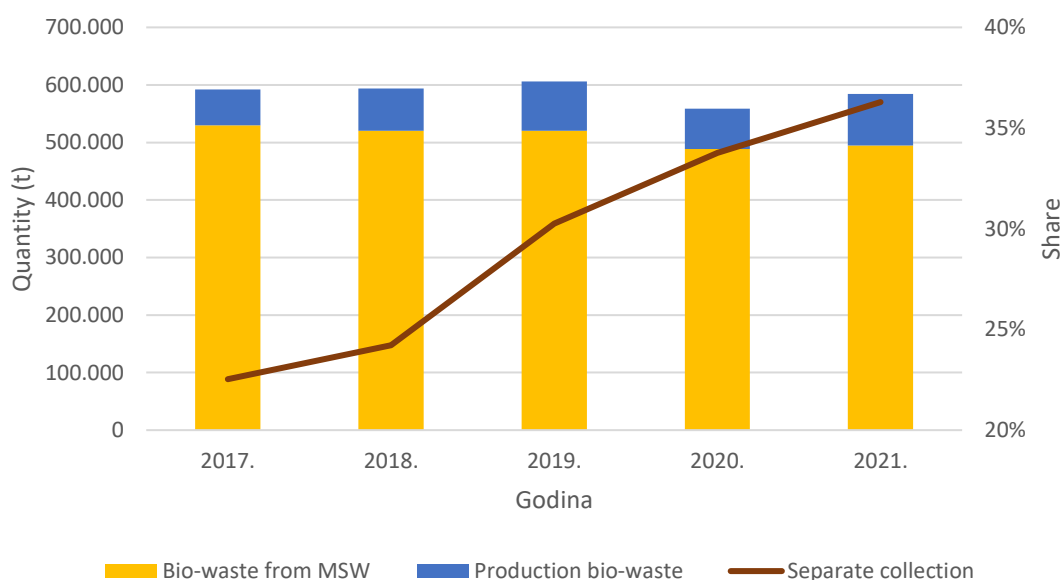
**Table 7.** The amounts of generated and landfilled biodegradable municipal waste in the period from 1997 to 2021

	Generated biodegradable municipal waste (t)	Landfilled biodegradable municipal waste(t)
1997	756,175	756,175
2000	873,538	863,538
2004	878,131	863,131
2005	971,085	952,969
2006	1,048,667	1,024,323
2007	1,084,016	1,053,336
2008	1,126,899	1,088,196
2009	1,104,126	1,068,825
2010	1,012,651	963,889
2011	1,017,519	937,375
2012	1,078,696	892,049
2013	1,103,593	870,434
2014	1,083,596	819,757
2015	1,070,783	828,564
2016	1,071,788	831,977
2017	1,091,066	801,238
2018	1,109,011	744,506
2019	1,132,614	679,080
2020	1,058,703	596,013
2021	1,101,925	594,107

## 2.2.4. Biowaste

Bio-waste is defined as biological degradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and similar waste from food processing plants.

Following the established annual quantities of the generated bio-waste that amounted to 597,467 tonnes on average in the period between 2017 and 2019, in 2020 and 2021, there was a decrease in the quantities of the generated bio-waste, amounting to 558,872 tonnes and 584,536 tonnes, respectively (Figure 19) as a result of the reduction in the amounts of the generated mixed municipal waste. The said decrease was caused by the reduced economic activity due to the COVID-19 pandemic, and partly as a result of the implementation of education and information activities aimed at the prevention of waste and distribution of home composting bins. By the end of 2021, 66,629 composting bins were distributed on the territory of 111 local self-government units (20 %). Moreover, progress has been made in the separation of bio-waste. In the period between 2017 and 2021, the bio-waste separation rate increased by 13 percentage points, i.e., it rose from 23 % in 2017 to 36 % in 2021. Despite a significant rise in the separation rate, the reached rate is still very low, so the aforementioned activities should be intensified.



Source: MESD (Cro. abbrev. MINGOR)

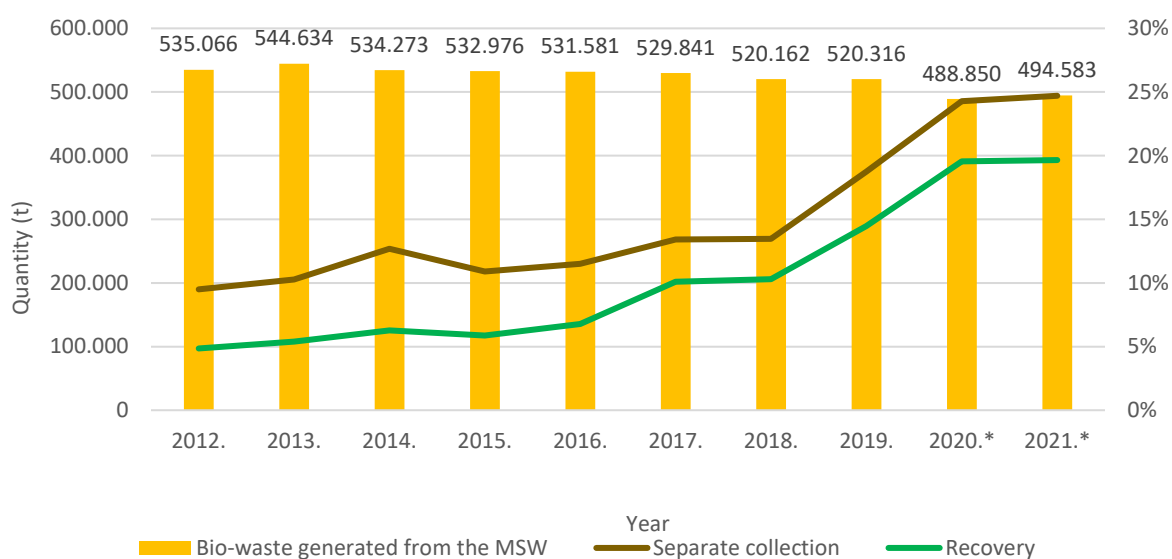
**Figure 19.** Amount of generated bio-waste and share of the separate collection in the period from 2017 to 2021

In the total generated quantity of bio-waste, bio-waste from municipal waste constitutes a significant proportion of approximately 87 %. In the period between 2012 and 2019, the municipal solid bio-waste amounted to approx. 530,000 tonnes, with a drop in the total quantities in 2020 and 2021 to the average value of 490,000 tonnes, accounting for 7.5 % of the amount of municipal solid bio-waste.

In 2021, 494,583 tonnes of bio-waste were generated. The separation was carried out in all the counties, but on the territory of only 215 local self-government units (Cro. abbrev. JLS) (39 % of all the LSGUs). It represents an increase of 23 LSGUs with respect to the previous year (192 LSGUs). The amount of 122,175 tonnes of bio-waste from municipal waste was collected separately, accounting for 25 % of the generated waste, which represents an increase of 1 percentage point compared to the year 2020.

The aforementioned municipal waste collection rate obtained through the on-site separate collection is very low, as well as the number of the LSGUs conducting a separation of municipal waste and MW fractions. Further investment in the infrastructure for the separation and treatment of bio-waste is required. Alongside the establishment of the bio-waste processing system, more intensive education activities related to the importance of the separate bio-waste collection should be conducted.

Approximately 20 % of the generated bio-waste was recovered (mostly through composting and anaerobic digestion) from the municipal waste (97,198 tonnes), which equals the previous year's share (Figure 20. Generated municipal bio-waste and its management in the period from 2012 to 2021) .



\*Recovered quantities, without impurities and non-target material

Source: MESD (Cro. abbrev. MINGOR)

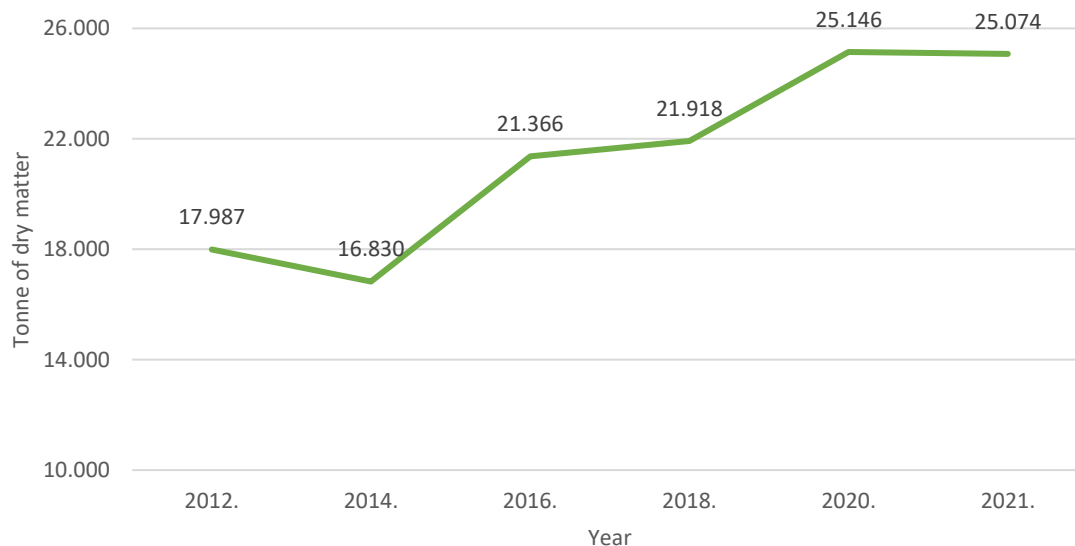
**Figure 20.** Generated municipal bio-waste and its management in the period from 2012 to 2021

It is estimated that in 328,847 tonnes of bio-waste from municipal waste ended up in landfills in 2021 (as a separately collected bio-waste and as a component of municipal waste), accounting for approx. 66 % of the generated quantity of bio-waste. The remaining quantities were mostly processed at Waste Management Centres (WMCs) as components of the mixed municipal solid waste using mechanical biological treatment processes, while a small portion of it was temporarily stored.

### 2.2.5. Sludge from municipal waste water treatment plants

In the period from 2012 to 2021, the quantities of residual sludge<sup>17</sup> produced by municipal sewage treatment plants increased by 39 %, that is, from 17,987 tonnes of dry matter in 2012 to 25,074 tonnes of dry matter in 2021 (Figure 21). This increase can be attributed to the construction of waste supply and sewage systems, including municipal waste water treatment facilities. In 2021, 63 % of the total amount of sludge from the municipal waste water treatment facilities was produced by the municipal sewage treatment system of the City of Zagreb.

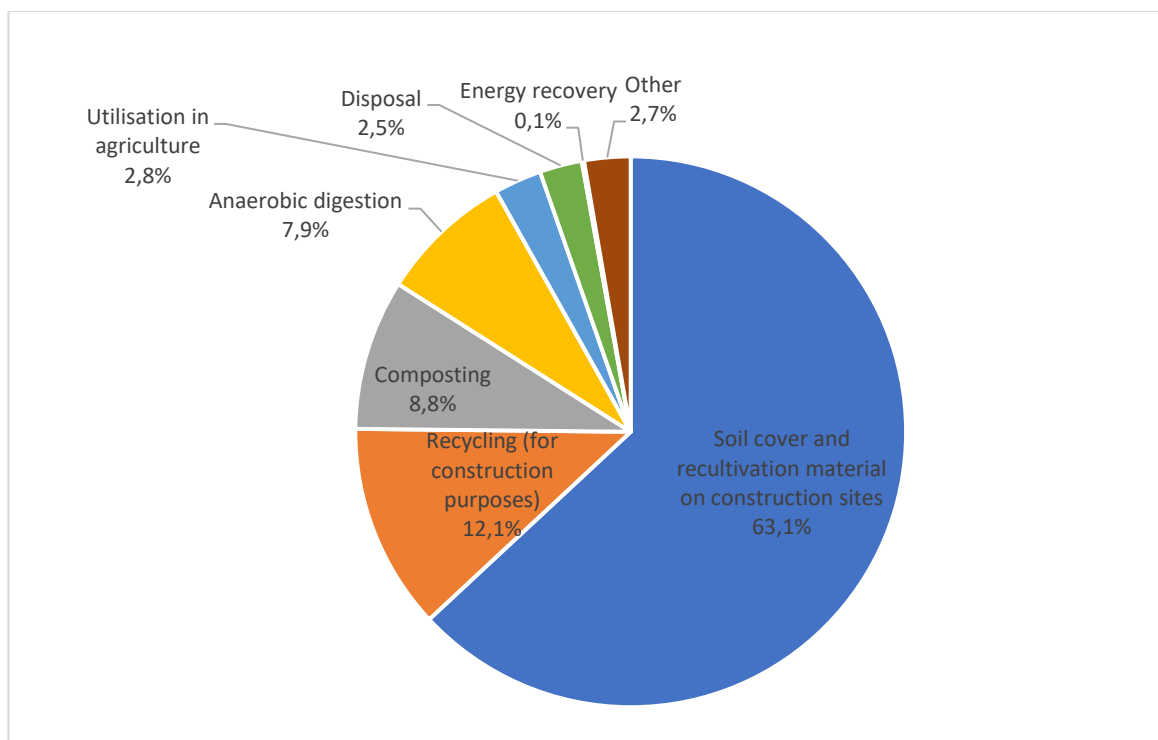
<sup>17</sup> EWC code: 19 08 05 – sludges from treatment of urban waste water, Waste Catalogue, Appendix X. of the Waste Management Regulation (Official Gazette nr. 106/22))



**Figure 21.** Generated amount of sludge from municipal waste water treatment plants from 2012 to 2021

In the period from 2012 to 2020, the largest quantity of this type of sludge was predominantly stored at waste water treatment facility sites and disposed of in waste landfills.

In 2021, approx. 63 % (15,815 tonnes of dry matter) of the sludge from municipal waste water treatment facilities was used, after mixing with soil and stones, as a cover and remediation material in landfills. Some 12 % (3,034 tonnes of dry matter) was recycled by mixing it with a specific ash content for the purpose of obtaining a stabilised material for further use in construction or for other purposes. Some 9 % (2,216 tonnes of dry matter) of sludge was processed at composting facilities, while around 8 % (1,972 tonnes of dry matter) was used in biogas plants and approx. 3 % (698 tonnes of dry matter) of the generated volume of sludge was used in agriculture. Approximately 2 % (625 tonnes of dry matter) of generated sludge ended up in landfills, and only 0.1 % (32 tonnes of dry matter) was recovered for energy purposes. The remaining quantities of generated sludge (less than 3 %, 682 tonnes of dry matter) was temporarily stored at municipal waste water treatment facility sites (Figure 22. Handling the sludge from municipal waste water treatment plants in 2021).



Source: MESD (Cro. abbrev. MINGOR)

**Figure 22.** Handling the sludge from municipal waste water treatment plants in 2021

In the period from 2015 to 2018, the quantities of treated sludge from municipal and industrial waste water used in agriculture were on the rise, but there has been a 62 % decrease in the period from 2019 to 2021 compared to 2018. In 2021, the amount of sludge from municipal sewage plants accounted for 85 % of the total sludge used in agriculture. The decrease in the use of sludge in agriculture can be attributed to the enactment of the Regulation on the Protection of Agricultural Land from Pollution (Official Gazette No. 71/19), which, pursuant to Article 6, prohibits the use of sludge on food contact surfaces and Directive (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products and amending Regulation (EC) No. 1069/2009 and (EC) No. 1107/2009 and repealing Regulation (EC) No. 2003/2003 (OG 170, 25.6.2029.), which bans the use of aerobically treated sludge in agriculture as a fertiliser.

### 2.2.6. Marine litter

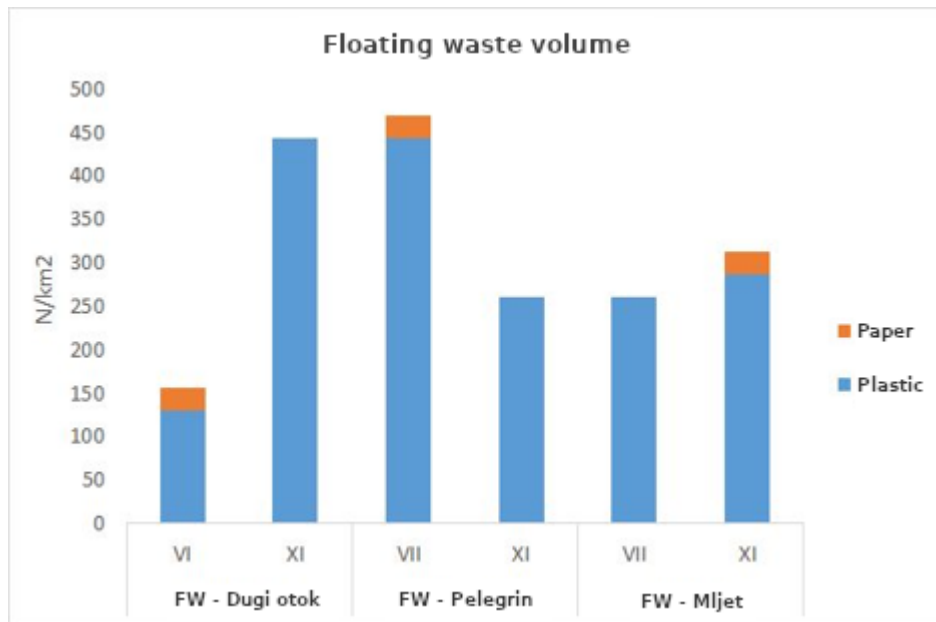
Marine litter represents one of the fastest-growing global threats to marine ecosystems, posing environmental and economic impacts. A large portion of marine litter is plastic which, due to its durability, poses the greatest danger to marine life, the environment, and human health. Waste finds its way into the sea as a result of human activity on land or at sea, as well as due to deficiencies and shortcomings in waste management systems. Through irresponsible behaviour, waste enters the marine environment and appears as marine litter floating on the sea surface, in the water column, on the seabed or washed ashore. It is estimated that some 80 % of marine litter gets into the sea from human activities on land, such as municipal waste from unregulated landfills, through the run-off of rainwater into the sea and the discharge of stormwater during storms or periods of heavy rainfall, through public drains and sewers, as a result of alluvial deposits and as by-products of extensive and uncontrolled tourist activities. Some 20 % of marine litter ends up in the sea as a result of irresponsible behaviour and activities in maritime transportation (such as nautical tourism) and the fishing industry. What exacerbates the problem of the steady increase in plastic waste is the fact that, as the most

common type of waste disposed of in nature, it does not decompose over time, but breaks down into tiny plastic particles, known as microplastics. Microplastics poses an extreme and far-reaching threat to the environment and living organisms, as it can potentially enter the food chain. It is estimated that as much as 80 % of the total waste in the Mediterranean consists of microplastics, which results from the degradation and fragmentation of plastic waste already present in the sea. The issue of preventing and reducing the disposal of litter into the sea and the marine ecosystems should form an integral and indispensable part of waste management on land. Preventing and reducing the input of marine litter into the sea and marine ecosystems includes the strengthening of the waste management system on land in the Republic of Croatia, which requires the implementation and improvement of the sustainable waste management system, as well as the activities aimed at waste prevention, focusing on coastal and island-specific aspects of waste management, particularly in relation to reducing the use of disposable (single-use) plastics.

In Croatia, systematic monitoring and observation of marine waste has been conducted since mid-2017, and a model tracking all the components of marine litter has been implemented, including the one washed ashore, the one floating on the sea surface or on the seabed, microplastics in beach sediment, on the sea surface or ingested by marine organisms, in the context of the Decision adopting the Action Programme of the Strategy for the Management of Marine Environment and Coastal Area: Monitoring and Observation System for Permanent Assessment of the State of the Adriatic Sea (2021 – 2026) (Official Gazette No. 28/2021). All of the set parameters have been monitored at required locations by implementing the methodology specific to the type of waste which has been observed/monitored, encompassing the assessment and analysis of the state of the relevant indicators.

In 2018, during the monitoring of the volume and composition of the macro litter washed ashore, at the specific sites (including the beach in the Town of Nin, the Bay of Stončica on the Island of Vis, and the one in the village of Prapratno, located on the Pelješac Peninsula near the Town of Ston) a total of 1,889 different pieces of marine litter were collected, classified, and removed. In all the surveyed areas, the majority of recorded items were made of synthetic polymers (with plastics accounting for 98 % of all the recorded items). The second most common category included items made of wood (1.6 %), glass/ceramics (1 %), metal (1 %), rubber (0.6 %), textile (0.4 %) and paper (0.3 %). Only 0.1 % of the total number of collected items were classified as unidentified and/or as chemicals.

In 2020, surveys were conducted on three different sites (including the Hvar Channel and the islands of Mljet and Dugi otok) for the purpose of the floating marine litter monitoring, Plastics was the most prevalent floating litter category, both on individual sites and in the overall composition of marine litter (95.89 % - 100 %). Items ranging in size from 2.5-10 cm predominated. The overall composition of different solid waste categories on the three sites monitored in 2020 is shown in Figure 23. Overall composition of different categories of solid waste on water surface according to sampling season during monitoring in 2020.

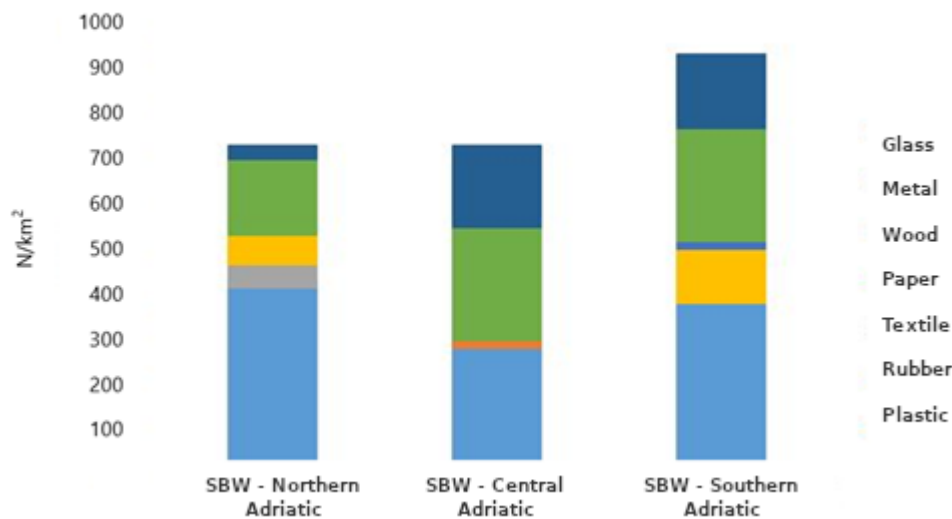


Source: IOF (Cro. abbrev. IOR), MESD (Cro. abbrev. MINGOR)

**Figure 23.** Overall composition of different categories of solid waste on water surface according to sampling season during monitoring in 2020

Monitoring of the waste deposited on the seabed was conducted in 2020 on the three different sites (Northern Adriatic, Central Adriatic and Southern Adriatic).

Figure 24. Density of waste (unit weight per km<sup>2</sup>) in the seabed in 2020 by waste category shows the density of waste (unit weight per km<sup>2</sup>) in the seabed in 2020 by waste category.



Source: IOF (Cro. abbrev. IOR), MESD (Cro. abbrev. MINGOR)

**Figure 24.** Density of waste (unit weight per km<sup>2</sup>) in the seabed in 2020 by waste category

Samples of microdebris/microplastics from beach sediment were collected in 2018 from the four sites along the eastern coast of the Adriatic Sea: the beach in Nin, Zaglav Beach on the Island of Vis, the Neretva River delta and the site in the village of Prapratno, located on the Pelješac Peninsula. A total of 85 pieces of debris larger than 5 mm were collected from the four surveyed sediment samples,



including 53 pieces of plastic waste, 27 pieces of glass and ceramics, three pieces of metal and two pieces of textile. Considering the beaches of Prapratno and Zaglav are located on the southern coast of the Pelješac Peninsula and the Island of Vis, respectively, and taking into consideration the fact that they are exposed to a more intensive influx of waste from marine currents and southern winds, resulting in a higher concentration of microplastic particles in the sediment, as well as a different composition compared to the sites of the beach in Nin and the Neretva River delta. A total of 167 particles of microplastics ranging from 1 to 5 mm in size were recorded. The predominant types of waste found on the sites were angular plastic fragments (50 – 56 %), while plastic films and filaments were also present.

Samples of microplastics from the sea surface were collected from 2017 to 2020 along the three following transects: in the Hvar Channel, along the southern coast of the Island of Mljet and along the southern coast of the island of Dugi otok. Mostly uniform concentrations of particles containing less than 50,000 N/km<sup>2</sup> were found at all the locations. An exceptionally high concentration of microplastics (84,615 N/km<sup>2</sup>) was observed in September 2018 on the southern coast of the Island of Mljet, and another one in June 2019 in the Hvar Channel (208,854 N/km<sup>2</sup>). The composition of microplastics varied between the years observed in terms of the proportion of individual particles. In overall terms, fragments were the most prevalent category of microplastics, with their percentage ranging between 29 and 92 %. Their proportion was the most significant in September 2017 and on all locations (80 - 92 %), with the smallest percentage of plastic films being recorded at the same time (< 8 %). Over the remaining sampling periods, the prevalence in the total number of particles varied between fragments and films, the proportion of which was between 17 and 58 %. However, the largest proportion of films was recorded in July 2020 (> 50 %). Filaments belong to the third category of microplastics found in almost all the samples, with their proportion ranging between 1 and 27 %.

Given that these are relatively new indicators, the ecological status cannot be determined because environmental quality classes have not been established, and knowledge about this indicator is still very limited. One of the main shortcomings in the assessment of the environmental impact is the lack of an established system of threshold values, which is evident at the EU level, as well. Moreover, since systematic monitoring of the marine litter only began in 2017, it is not possible to assess its status due to the lack of a longer dataset. Consequently, quantitative targets indicating such a state in which the quantities and properties of marine litter do not harm the marine or coastal environment cannot be proposed, nor can the achievement of a good environmental status with respect to marine litter be assessed.

### **2.2.7. Special categories of waste**

*In addition to the data contained in the Waste Management Information System, the data obtained from the Environmental Protection and Energy Efficiency Fund (Cro. abbrev. FZOEU) was also used for the analysis of the waste management status for specific waste categories. The data was collected through the records of the extended producer responsibility system.*

The Waste Management Act defines special categories of waste as waste streams that have special management requirements. The following types of waste have been declared as special categories of waste:

1. Waste textile and footwear
2. Packaging waste
3. Waste tyres

4. Waste oil
5. Waste batteries and accumulators
6. End-of-life vehicles
7. Construction waste and waste containing asbestos
8. Medical waste
9. Waste electrical and electronic equipment
10. Waste from the titanium dioxide production
11. Waste polychlorinated biphenyls and polychlorinated terphenyls
12. Disposable (single-use) plastics and fishing gear containing plastics.

For six of the special categories of waste (packaging waste, waste tyres, waste oil, waste batteries and accumulators, end-of-life vehicles, waste electronic and electrical equipment) a system of extended producer responsibility has been established in the form of a fee charged to manufacturers for placing products on the market in the Republic of Croatia, from which, at the end of the product's lifecycle, a specific waste category is generated with a separate waste collection and processing system established for it.

Following the establishment of the extended producer responsibility system, there has been a rapid development and a significant growth in the collected and processed quantities of special categories of waste.<sup>18</sup> Since 2015, there has been a stagnation in the amounts collected and recovered for all the special categories of waste, except for the end-of-life vehicles with a steady and significant growth in the collected amounts by 2020. Over 2020 and 2021, the stagnation was partly caused by the COVID-19 pandemic, which resulted in a decline in economic activity, but it could also indicate the reaching a maximum within the existing capacities and the system's operation modes.

The establishment of a circular economy framework has set ambitious targets for specific special categories of waste (such as packaging waste, construction waste, waste batteries and accumulators, waste electrical and electronic equipment and end-of-life vehicles) in terms of waste collection and/or recovery/recycling, which requires the improvement of the existing separate waste collection system, as well as the encouraging of new advanced technologies related to waste collection, recovery and recycling. This includes the providing of more efficient separate waste collection models, promoting the expansion and modernisation of the existing waste recovery/recycling facilities, as well as the construction of new facilities for the categories of waste and materials for which there are no processing plants at the moment.

The amounts of the special categories of waste from 2015 to 2021 are shown in Table 8.

**Table 8.** Amounts of special category waste collected in the period from 2015 to 2021

Special waste category	Collected						
	2015.	2016.	2017.	2018.	2019.	2020.	2021.
Waste textile and footwear (t)	8,761	9,921	10,264	10,363	12,061	10,213	12,826
Packaging waste (t)	140,441	136,628	140,672	142,807	152,682	152,160	156,227
Waste tyres (t)	18,717	19,052	21,017	21,671	25,949	25,066	26,022

<sup>18</sup> The introduction of extended producer responsibility systems started in 2005

Collected							
Special waste category	2015.	2016.	2017.	2018.	2019.	2020.	2021.
Waste oil and lubricants (t)	5,390	7,033	6,407	6,415	6,729	6,710	7,016
Waste oil - edible (t)	759	825	762	869	906	596	736
Waste portable batteries and accumulators (t)	98	337	476	525	651	596	737
End-of-life vehicles (t)	16,690	18,495	22,523	29,920	44,000	50,918	36,679
Construction waste (t)*	1,189,316	1,226,073	1,225,263	1,243,642	1,365,066	1,399,193	1,634,257
Construction waste containing asbestos (t) <sup>19</sup>	10,765	6,251	1,990	2,827	2,525	3,497	4,099
Medical waste (t)	4,232	4,569	4,960	5,262	5,483	7,014	8,215
Waste electrical and electronic equipment (t)	23,758	38,815	36,434	41,523	40,400	40,792	35,477
Waste PCBs (t) <sup>20</sup>	48	12	62	4	12	8	7

\*) Data refers to the estimated waste arisings

Source: EPEEF (Cro. abbrev. FZOEU), MESD (Cro. abbrev. MINGOR)

### 2.2.7.1. Textile and footwear waste

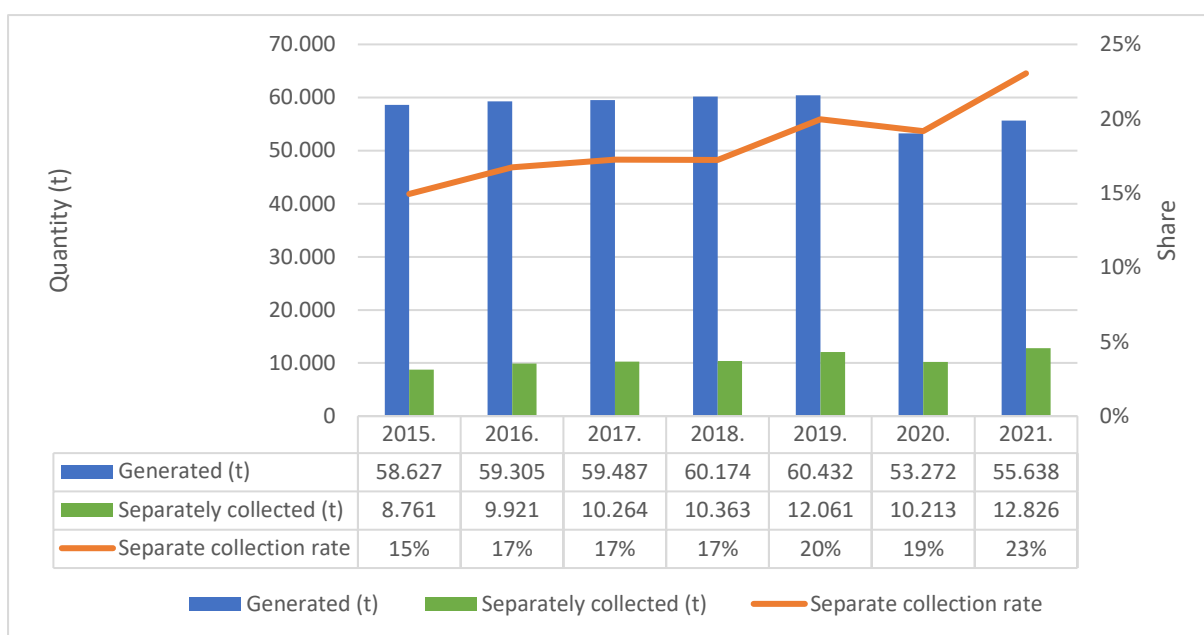
In the period from 2015 to 2019, there has been a steady increase in the total quantities of generated textile and footwear waste. In 2020, due to a drop in economic activity caused by the COVID-19 pandemics, the total amount of generated textile and footwear waste decreased by 12 % compared to 2019. In 2021, the amount of the textile waste arisings has increased further, although it has not reached the 2015 level yet. The estimated total quantity of the textile and footwear waste generated in 2021 amounted to 55,638 tonnes (Figure 25).

The amount of separately collected textile and footwear waste in the period from 2015 to 2021 has been on the rise, as well, except for the year 2020. The separate waste collection rate for the observed time period has increased by 8 percentage points.

In 2021, 12,826 tonnes of textile and footwear waste were separately collected, accounting for 23 % of the total amount generated.

<sup>19</sup> Data is based on the reporting of waste disposed of in special cells intended for waste containing asbestos, known in Croatia as 'cassettes'.

<sup>20</sup> Data on waste PCB refers to the equipment containing PCB (such as transformers and capacitors) that was disposed of, as well as to any waste material or liquid containing or contaminated with PCB.



**Figure 25.** Generated and separately collected textile and footwear waste in the period from 2010 to 2021

A total of 37,281 tonnes of waste ended up in the mixed municipal waste, 5,163 tonnes in bulky waste and 368 tonnes in end-of-life vehicles (Table 9). Only 2 % of textile and footwear waste was separated from the complex waste categories and sent to recycling facilities, while the remaining waste ended up in landfills and MBT plants as part of the bulky waste and the mixed municipal waste.

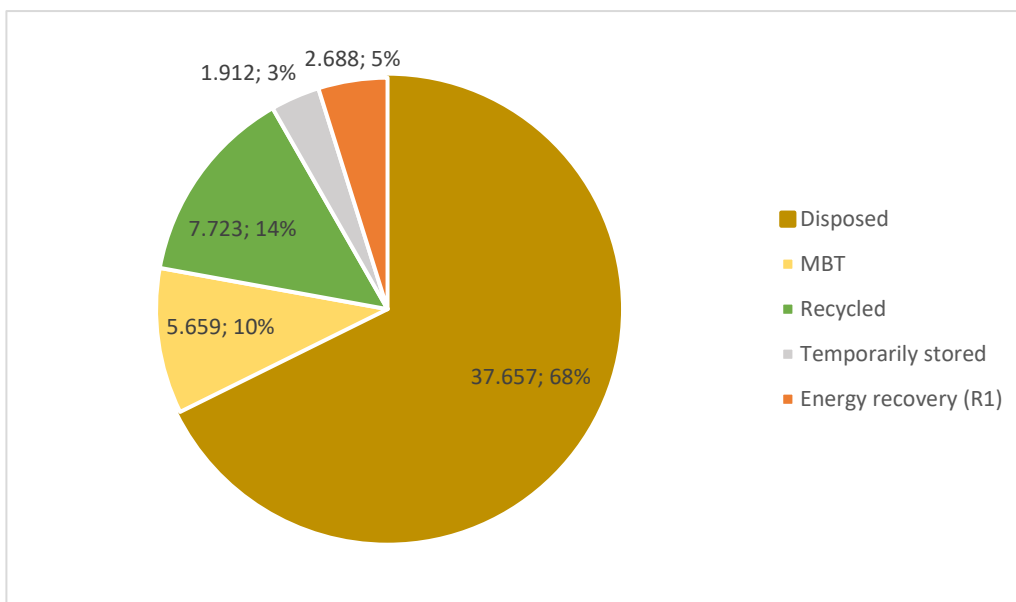
**Table 9. Estimated total quantity of the generated textile and footwear waste in 2021**

Origin	Quantity (t)
Separately collected	12,826
Part of the mixed municipal waste	37,281
Part of the bulky waste	5,163
Part of the waste containing end-of-life vehicles	368
<b>Total waste arisings</b>	<b>55,638</b>

In 2021, 75 % (9,558 tonnes) of the total quantity of the separately collected textile and footwear waste was processed in the Republic of Croatia, mostly through the sorting and recyclable waste pre-treatment operations (60 %), 7 % of waste was incinerated with the recovery of energy, 15 % of waste was disposed of in landfills, and 19 % was temporarily stored. Approximately 25 % (3,268 tonnes) of separately collected textile and footwear waste was exported, predominantly for the purpose of incineration with the recovery of energy, and a smaller proportion was exported for the purpose of recycling.

Waste processors in Croatia imported 2,317 tonnes of textile and footwear waste from other countries for the purpose of processing.

Figure 26. shows an overview of textile and footwear waste processing in 2021.



**Figure 26.** Treatment of total quantities of textile and footwear waste arisings in 2021

In 2021, 159 companies owned a textile and footwear waste treatment permit. The majority of them were utility companies the permits of which were obtained for almost all the types of municipal waste, including the textile and footwear waste<sup>21</sup>. The permits applied mostly to waste collection and storage, and the ones which applied to recovery processes (R) predominantly included waste sorting or pre-treatment processes with reference to further use or recovery procedures (in Croatia or abroad).

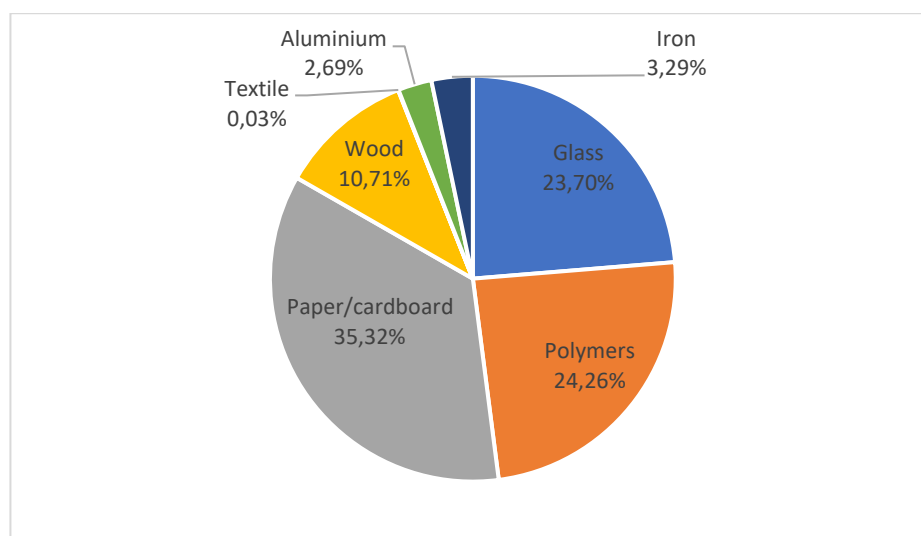
<sup>21</sup> Key number of waste from the Waste Catalogue ([https://narodne-novine.nn.hr/clanci/sluzbeni/2022\\_09\\_106\\_1552.html](https://narodne-novine.nn.hr/clanci/sluzbeni/2022_09_106_1552.html)) 10 and 20 01 11

Catalogue ([https://narodne-novine.nn.hr/clanci/sluzbeni/2022\\_09\\_106\\_1552.html](https://narodne-novine.nn.hr/clanci/sluzbeni/2022_09_106_1552.html))

### 2.2.7.2. Packaging waste

An overview of the quantities of packaging placed on the market from 2015 (215,534 tonnes) to 2019 (301,099 tonnes) shows an upward trend, with a reduction in the quantity of packaging waste in 2020 (267,234 tonnes) by 11 % with respect to the previous year as a result of a reduction in economic activity due to the COVID 19 pandemic. The amount of 291,630 tonnes of the packaging placed on the market in 2021 indicates the return of the upward trend, although it did not exceed the 2019 levels.

The most common packaging materials placed on the market in 2021 included paper/paperboard, with a share of 35.32 %, followed by plastics with a share of 24.26 %, and glass with a share of 23.70 % (Figure 27. Composition of packaging placed on the market in 2021 by type of material ).



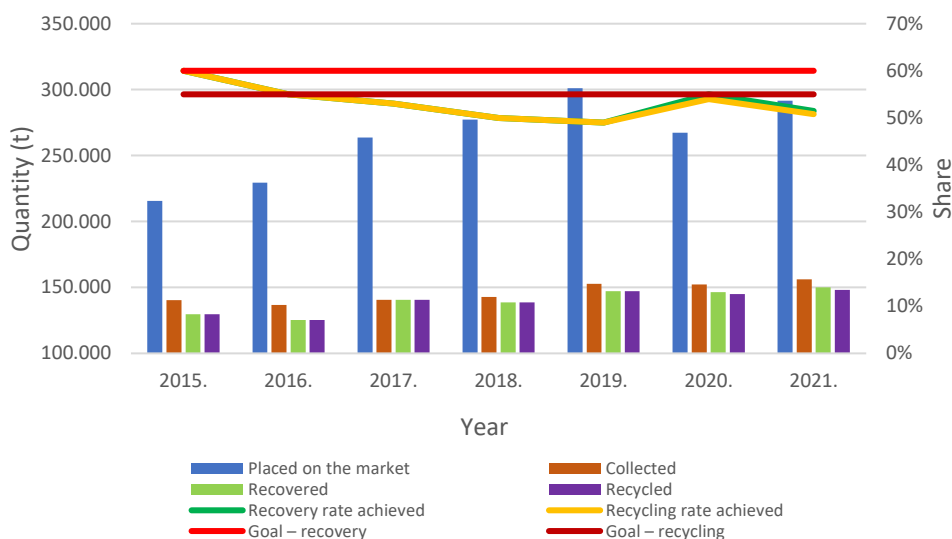
*\*multi-layer (composite packaging), other packaging materials*

Source: EPEEF (Cro. abbrev. FZOEU), MESD (Cro. abbrev. MINGOR), 2021

**Figure 27.** Composition of packaging placed on the market in 2021 by type of material

In the period from 2015 to 2018, the amounts of the collected packaging waste and of the packaging recovered/recycled by the Environmental Protection and Energy Efficiency Fund (EPEEF, Cro. abbrev. FZOEU) are slowly growing, with a stagnation recorded in the period from 2019 to 2021.

In 2021, a total amount of 156,227 tonnes of packaging waste was collected by the Environmental Protection and Energy Efficiency Fund (EPEEF, Cro. abbrev. FZOEU), accounting for 54 % of the amount placed on the market. Approximately 150,029 tonnes were recovered from the total amount of collected packaging, and 148,191 tonnes were recycled. The recovery and recycling rate amounting to 51 % shows that the targets of 60 % for recovery and 55 % for recycling have not been achieved (Figure 28).



Source: EPEEF (Cro. abbrev. FZOEU), MESD (Cro. abbrev. MINGOR), 2021

**Figure 28.** Amount of packaging placed on the market, quantities of collected, recovered and recycled packaging waste within the EPEEF (Cro. abbrev. FZOEU) scheme, and waste recycling and recovery rate in the period from 2015 to 2021

However, individual targets of the recycling rate in 2021 have been achieved for packaging waste made of cardboard/paper, polymer and wood, and for the glass packaging waste the value is approaching the set target. For metal packaging waste, the recycling rate is still very low (Table 10. Achieved recycling rates per packaging material for the period from 2015 to 2021, showing the set objectives ).

**Table 10.** Achieved recycling rates per packaging material for the period from 2015 to 2021, showing the set objectives

Vrsta ambalažnog otpada	CILJ	2015.	2016.	2017.	2018.	2019.	2020.	2021.
CARDBOARD/PAPER	60 %	89 %	82 %	84 %	70 %	74 %	91 %	74 %
GLASS	60 %	65 %	56 %	57 %	61 %	51 %	54 %	55 %
AL/FE	50 %	14 %	16 %	16 %	20 %	19 %	18 %	25 %
POLYMERS	23 %	46 %	41 %	37 %	37 %	36 %	34 %	34 %
WOOD	15 %	3 %	3 %	3 %	4 %	3 %	4 %	16 %

Source: EPEEF (Cro. abbrev. FZOEU), MESD (Cro. abbrev. MINGOR), 2021

Currently, the packaging waste management system does not adequately cover all the types of packaging waste. Thus, the packaging contaminated by hazardous substances is not part of the existing extended producer responsibility system run by the Environmental Protection and Energy Efficiency Fund (Cro. abbrev. FZOEU), with the lack of processing capacity for multi-layer (composite) packaging.

#### 2.2.7.2.1. Returnable (reusable) packaging

Considering that the use of returnable (reusable) packaging represents the best means of reducing the amount of packaging waste, it is necessary to encourage the product placement and use of

returnable packaging as much as possible. Reusable packaging primarily includes beverage packaging and further consumer education is required regarding the advantages of the use of returnable packaging through the measures aimed at raising awareness about the use of returnable packaging and promoting the activities of the industry that produces and sells the products in reusable packaging through different incentives that are to be defined in the upcoming period.

Thus, in the period from 2017 to 2021, some 4.5 % of reusable packaging was placed on the market compared to the total amount of packaging, varying between 2.69 and 7.55 % (Table 11. Share of reusable packaging placed on the market from 2017 to 2021).

The planned measures need to ensure that in the upcoming planning period at least 5 % of the total amount of products placed on the market are sold in reusable packaging.

**Table 11.** Share of reusable packaging placed on the market from 2017 to 2021

Year	Total amount of packaging placed on the market (tonnes)	Reusable packaging (tonnes)	Share of reusable packaging compared to the total amount of packaging placed on the market
2017	263,678	9,649	3.66 %
2018	277,164	9,705	3.50 %
2019	301,099	22,736	7.55 %
2020	267,234	14,965	5.60 %
2021	291,630	7,853	2.69 %
<b>Total</b>	<b>1,400,806</b>	<b>64,909</b>	<b>4.63 %</b>

#### 2.2.7.2.2. Plastic carrier bags

Pursuant to the provisions of the Regulation amending the Regulation on packaging and packaging waste (Official Gazette No. 116/17) transposing the provisions of Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags (OG 115, 6.5.2015.), since 2018 the obligation has been imposed on plastic carrier bags manufacturers to report the EPEEF (Cro. abbrev. FZOEU) on the annual quantities of plastic carrier bags placed on the market in Croatia by category (Table 12).

The mandatory charge for 15-50 micron plastic carrier bags came into effect in Croatia on January 1<sup>st</sup>, 2019, and the ban on their marketing in Croatia entered into force on January 1<sup>st</sup>, 2022. The said measures caused a decrease in the consumption of plastic carrier bags compared to 2019 in the categories subject to measures aimed at reducing the consumption of such bags (Figure 29). In comparison with 2020, there has been an increase in the consumption, but 2020 cannot be considered a reference year due to the general decrease in consumption caused by the COVID-19 pandemic.

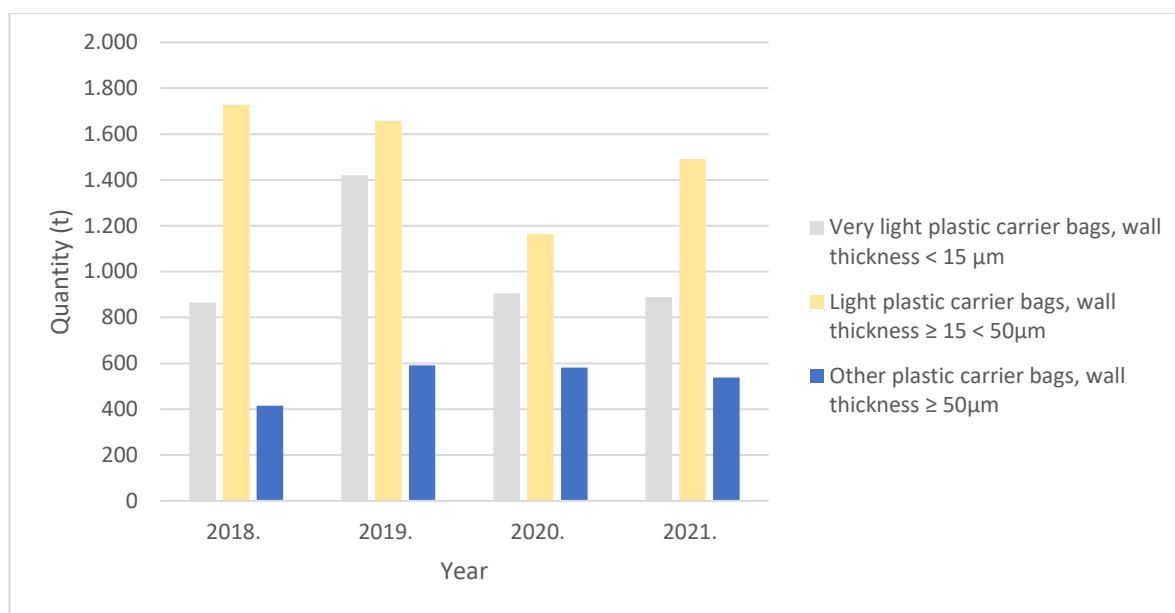
**Table 12.** Amount of plastic carrier bags placed on the market of the Republic of Croatia in the period from 2018 to 2021 by category

Plastic carrier bag category	2018 (t)	2019 (t)	2020 (t)	2021 (t)
Very lightweight plastic carrier bags, wall thickness < 15 µm	865	1,420	906	888



Lightweight plastic carrier bags, wall thickness $\geq 15 < 50 \mu\text{m}$	1,728	1,658	1,163	1,490
Other plastic carrier bags, wall thickness $\geq 50 \mu\text{m}$	415	591	581	538
Total:	3,008	3,668	2,650	2,916

Source: EPEEF



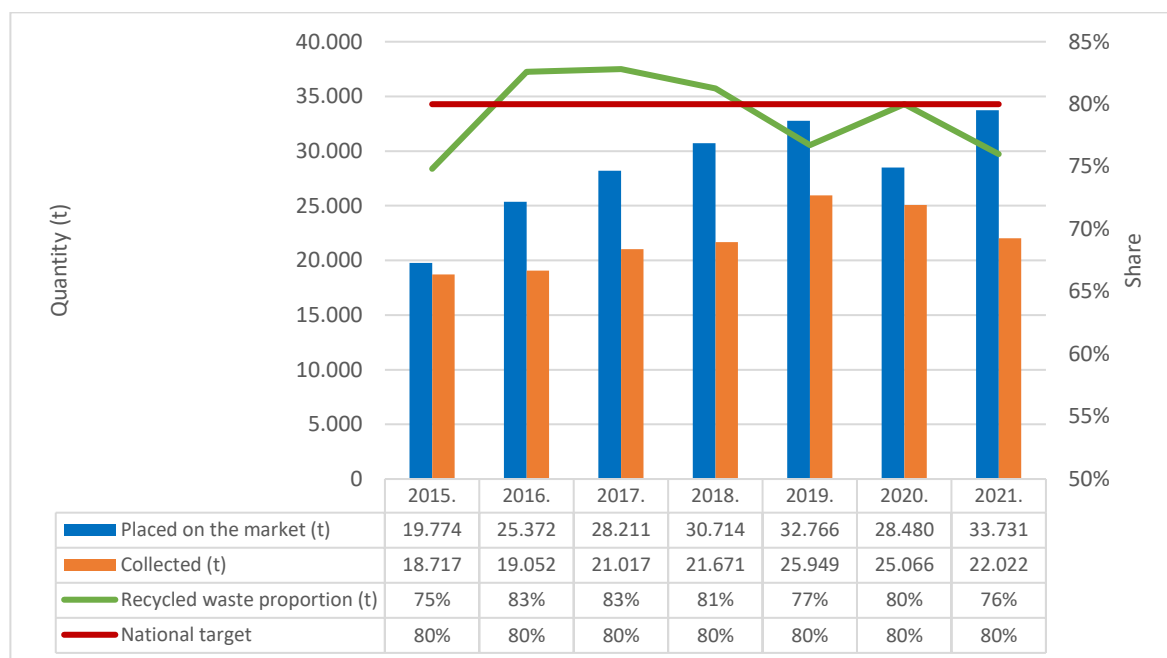
**Figure 29.** Amount of plastic carrier bags placed on the market in Croatia in the period from 2018 to 2021 by category

### 2.2.7.3. Waste tyres

From 2015 to 2021, the amount of tyres placed on the market increased by 71 %, with the exception of 2020, when a decrease to the 2017 level was recorded as a result of a reduced economic activity due to the COVID-19 pandemic. In 2021, a total of 33,731 tonnes of tyres were placed on the market (Figure 30).

During the observed period, there has also been an increase in the amount of collected and recovered tyres. In 2021, the EPEEF collected 26,022 tonnes of waste tyres, with 20,848 tonnes (19,899 tonnes accounting for material recovery and 949 tonnes accounting for energy recovery). Since 76 % of the weight of the separately collected waste tyres was subject to material recovery, in 2021 the Republic of Croatia approached its national annual target set out in the Waste Management Act (ZGO), which requires ensuring the recycling of at least 80 % of the weight of separately collected waste tyres. The failure to meet the target was observed in 2019, characterised by a significant increase in the quantities of tyres placed on the market compared to previous years, as in 2021. Despite this, for the period from 2016 onwards, we can conclude that the waste tyre management system has been successfully established and efficient. The Decision amending the fees in the waste management of waste tyres and end-of-life vehicles (Official Gazette No. 40/15 and 57/20) also contributed to this, as

it reduced the fees paid by the manufacturers and importers of tyres and vehicles with tyres to the EPEEF, while increasing the fees paid by the EPEEF to waste tyre haulers for the purpose of waste tyre management.



**Figure 30.** Amount of tyres placed on the market and quantities of refuse tyres collected and recovered using the EPEEF (Cro. abbrev. FZOEU) system in Croatia in the period from 2015 to 2021

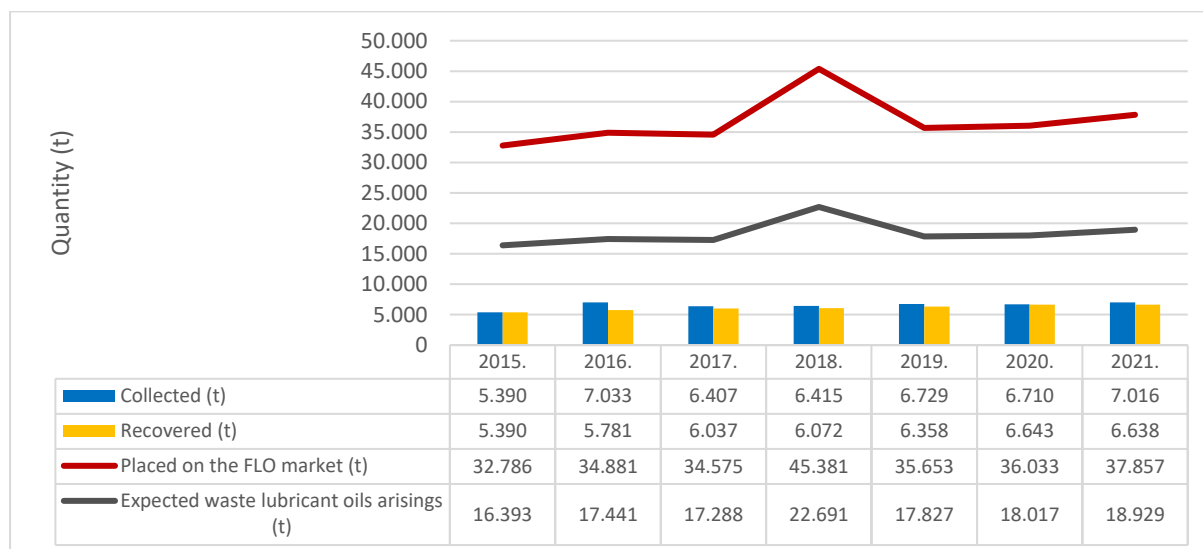
The existing waste tyre management system in the Republic of Croatia shows good results and meets the set targets related to waste tyre management, ensuring a systematic collection of refuse tyres, the processing of all the separately collected waste tyres and the recycling of at least 80 % of the weight of the separately collected waste tyres in Croatia in the calendar year. In the upcoming period, the extension of the existing system is envisaged by introducing other types of tyres into the system, such as bicycle tyres, motorcycle tyres, stroller tyres, etc. The equipment and infrastructure necessary for the collection and processing of waste tyres are sufficient for the needs of the Republic of Croatia, and it is estimated that they will continue to meet the system requirements in the upcoming period regardless of the potential extension for the purpose of introducing new types of tyres.

#### 2.2.7.4. Waste oil

The data collected for the period from 2015 to 2021 shows a slight increase in the amount of fresh lubricating oil placed on the market of the Republic of Croatia (by 15 %), with a more significant increase observed in 2018. According to EPEEF data, 37,857 tonnes of fresh lubricating oils were placed on the Croatian market in 2021. It is estimated that 18,929 tonnes of waste lubricating oils were generated from that quantity (Figure 31).

When looking at the amounts of waste lubricating oils collected through the EPEEF scheme, we can see that they have increased by 30 % in the observed time period. The obtained data on the amount of collected waste lubricating oils suggests that 9,516 tonnes (7,016 tonnes + 2,500 tonnes) were

collected in 2021, including 7,016 tonnes (37 % of the estimated waste oil arisings) collected through the EPEEF scheme and 2,500 tonnes of waste lubricants being collected outside the EPEEF waste collection system.



**Figure 31.** Amount of lubricating oils placed on the market, estimated quantities of generated waste lubricants and quantities of waste lubricants collected and recovered through the EPEEF (Cro. abbrev. FZOEU) system in the period from 2015 to 2021

It is estimated that approximately 50,000 tonnes of edible oil<sup>22</sup> are placed on the market of the Republic of Croatia each year. In the period from 2015 to 2019, there was an increase in the amount of waste edible oil collected through the EPEEF scheme of 19 %, i.e., 759 tonnes per 906 tonnes. During 2020, 596 tonnes of waste edible oil was collected, which is 34 % less compared to 2019. This is caused by a reduced activity of the service industry due to the COVID-19 pandemic. However, in 2021, despite the increase with respect to the year 2020, the collected amount did not exceed the 2015 level.

Outside the EPEEF scheme, an additional significant amount of collected waste edible oil was registered, resulting in the total amount of the collected edible oil amounting to 6,509 tonnes in 2021, with the insignificant amount of 38 tonnes being collected as part of the public waste collection service (such as doorstep collection and civic amenity sites).

Approximately 32 % of the collected edible oil is processed at material recovery facilities in Croatia, with the rest of it being exported/shipped outside Croatia for the purpose of material recovery.

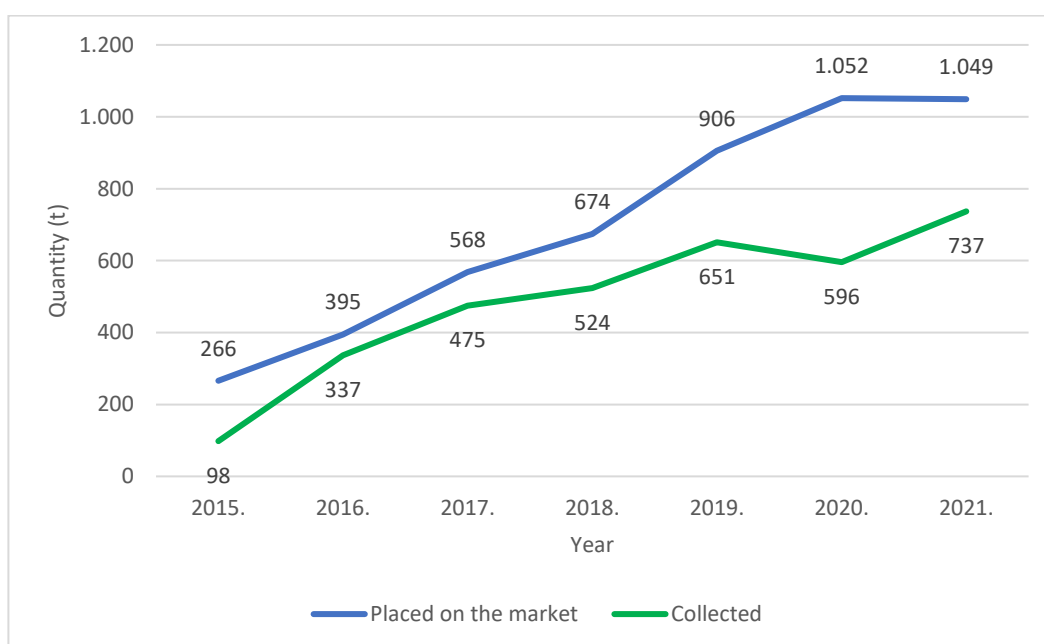
The existing waste oil management system must be improved and the equipment, facilities and the adequate capacities for waste oil treatment provided for in order to ensure that waste oil is collected separately and are recovered through regeneration or alternative recycling processes providing an equal or even better positive impact on the environment than regeneration, and that waste oil of different type is not mixed with the waste or substances of the same type or with different types of waste or substances if such mixing prevents its regeneration or other recycling operations.

<sup>22</sup> Waste Management Strategy of the Republic of Croatia (Official Gazette No. 130/05)

### 2.2.7.5. Waste batteries and accumulators

Some 19,951 tonnes of batteries and accumulators were placed on the market in Croatia in 2021, with 1,049 tonnes accounting for portable batteries (5 %), 2,520 tonnes relating to industrial batteries (13 %) and 16,382 tonnes relating to automotive jump starters (82 %), representing a 108 % increase compared to 2015 (Figure 32).

Looking at the amounts of portable batteries, we can conclude that in the past two years there has been an upward trend in waste portable batteries that have been collected, with a decrease in the amount of the portable batteries that have been placed on the market.



Source: EPEEF (Cro. abbrev. FZOEU), Data processed by: MESD (Cro. abbrev. MINGOR)

**Figure 32.** Amount of portable batteries and accumulators placed on the market that were collected through the EPEEF scheme from 2015 to 2021

In the period from 2015 to 2021, the targets set for the collection rate of waste portable batteries and accumulators were achieved. The high waste battery and accumulator collection rate in 2016 and 2017 is most likely due to an insufficient data quality to a certain degree that has improved significantly since 2018 through education of the entities subject to data reporting<sup>23</sup>.

***In 2021, the waste battery and accumulator collection rate amounted to 74 %, accounting for 29 percentage points more than the target set by the Waste Management Act (Cro. abbrev. ZGO). Accordingly, the annual waste battery and accumulator separation rate must be at least 45 % of the***

<sup>23</sup> The entities (importers/manufacturers) subject to annual reporting on the portable batteries and accumulators placed on the market to the EPEEF, used to report some of the portable batteries as jump starters, while the haulers recorded them correctly as portable batteries. Inaccurate reporting is a result of different interpretations of the Regulation, as the batteries and accumulators used in scooters, quads and similar vehicles must be reported as jump starters, not as portable batteries.

average annual quantity of such products placed on the market in the past three years (

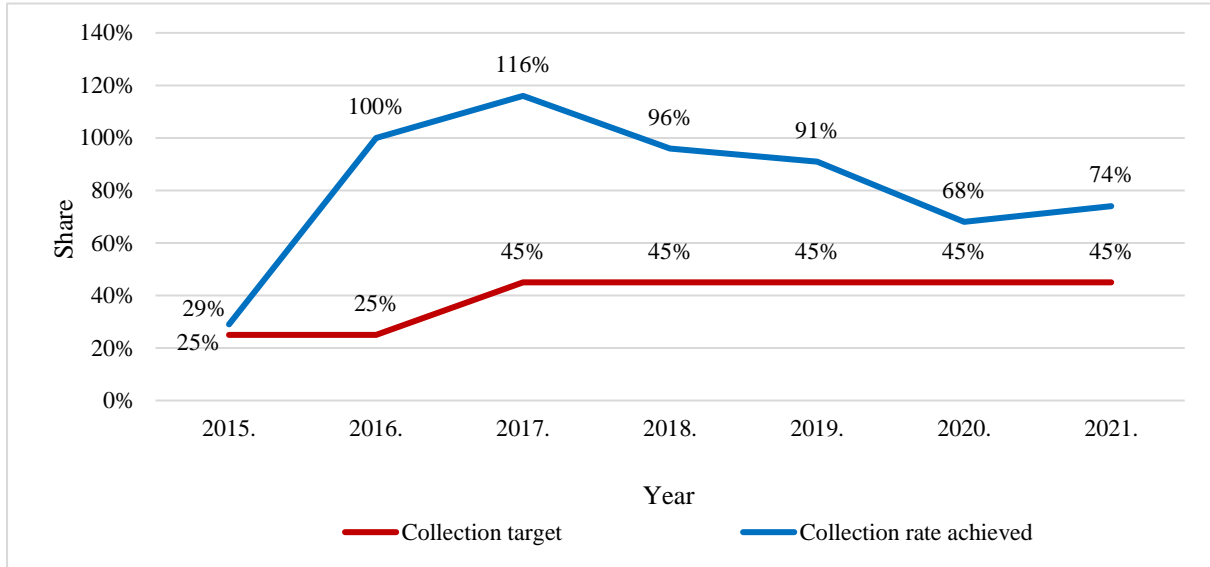


Figure 33. Collection rate of waste portable batteries and accumulators in terms of the set objectives in the period from 2015 to 2021).

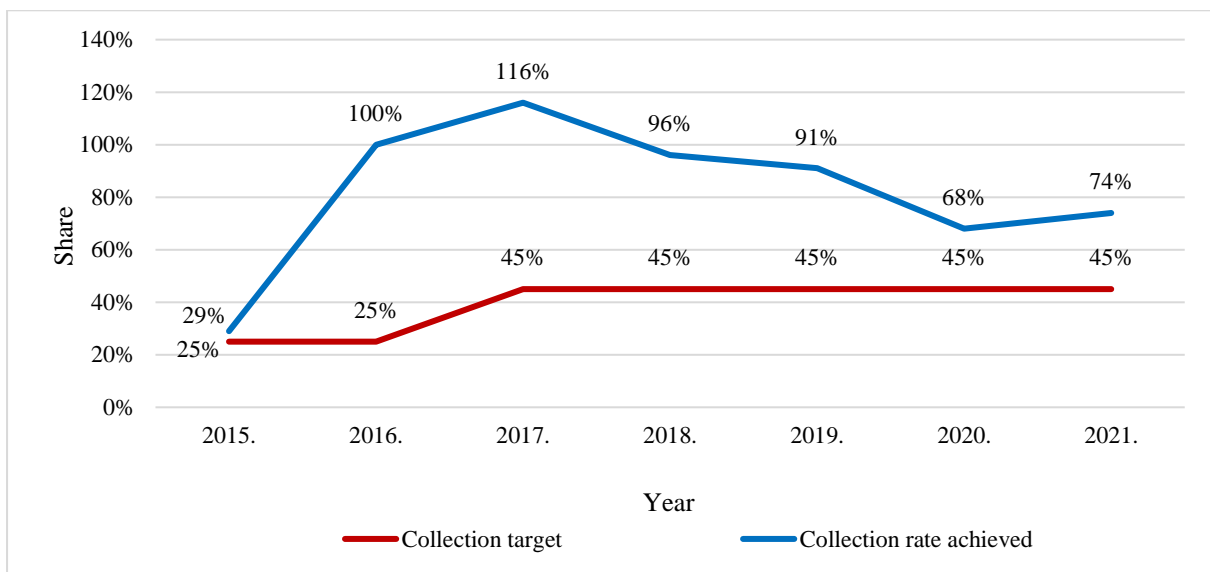


Figure 33. Collection rate of waste portable batteries and accumulators in terms of the set objectives in the period from 2015 to 2021

**The recycling efficiency targets (Pb-65 %, Ni-Cd-75 % and other batteries: -50 %) are monitored for lead acid batteries, nickel-cadmium batteries and other types of batteries, and in 2021 the recycling efficiency rate for waste lead acid batteries amounted to 83 %, for nickel-cadmium batteries it**

**accounted for 79 %, and for other types of batteries it was 86 %.** (

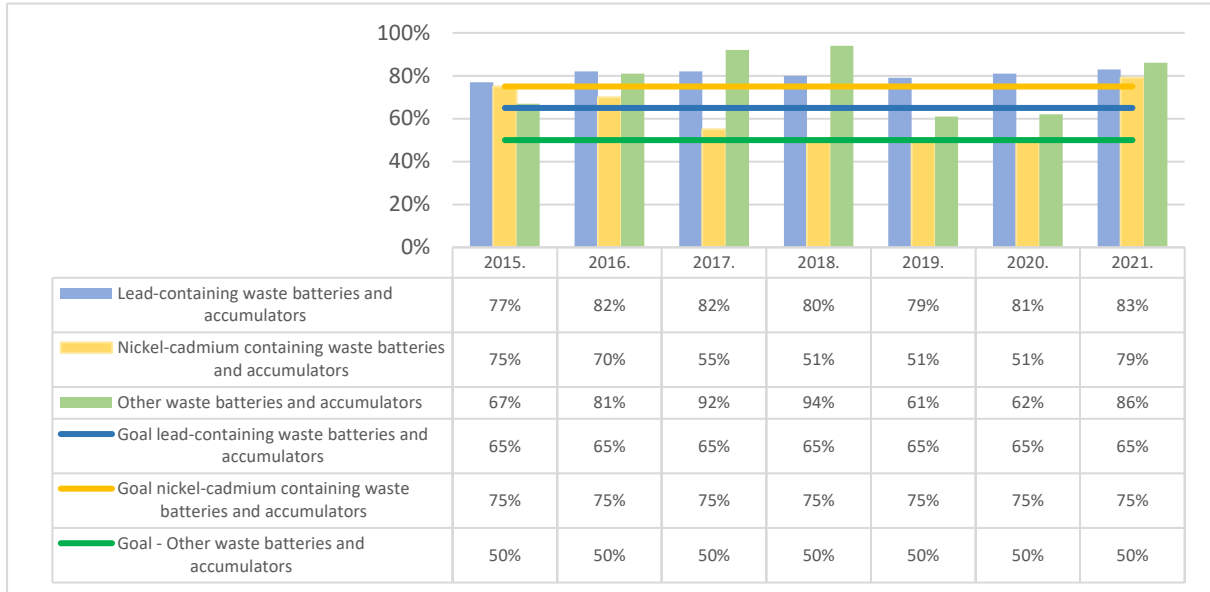
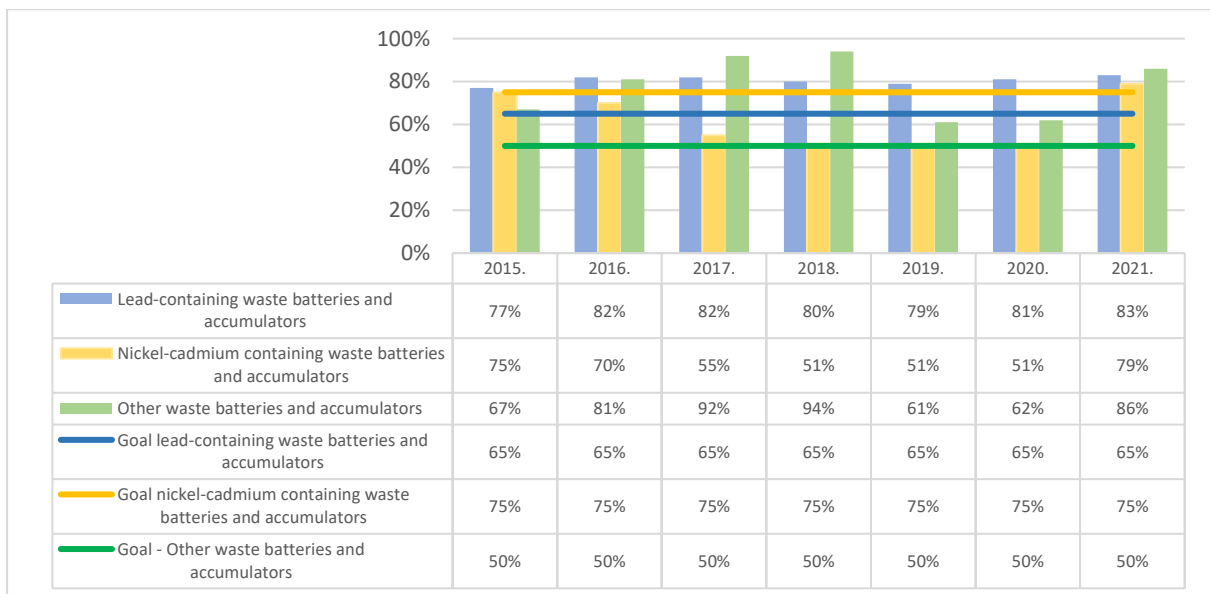


Figure 34. The recycling efficiency of portable batteries and accumulators in terms of the targets set from 2016 to 2021).



**Figure 34.** The recycling efficiency of portable batteries and accumulators in terms of the targets set from 2016 to 2021

In the upcoming period, an analysis of the existing situation is planned, as well as the adoption of measures aimed at improving the existing waste collection system, particularly in terms of transportation and storage of batteries, waste batteries and accumulators containing lithium. The measures aim to encourage the recovery and/or recycling of waste batteries and accumulators, considering that only lead batteries and accumulators are treated in the Republic of Croatia, while the other types of waste batteries and accumulators are exported for the purpose of processing. The equipment and capacities necessary for the collection of waste batteries and accumulators are

sufficient for the purposes of the Republic of Croatia. It is estimated that it will meet the needs of the system in the upcoming period, while new plants must be built for the purpose of processing of waste batteries and accumulators.

### 2.2.7.6. End-of-life vehicles

*In the period from 2015 to 2020, there has been a rise in the amount of collected and processed end-of-life vehicles that in 2020 exceeded three times the 2015 levels (*

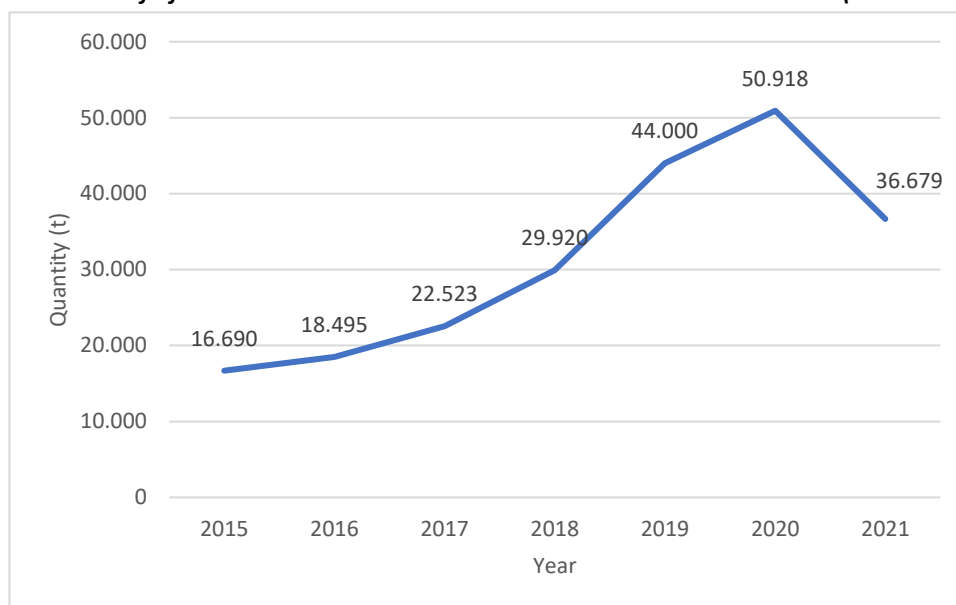
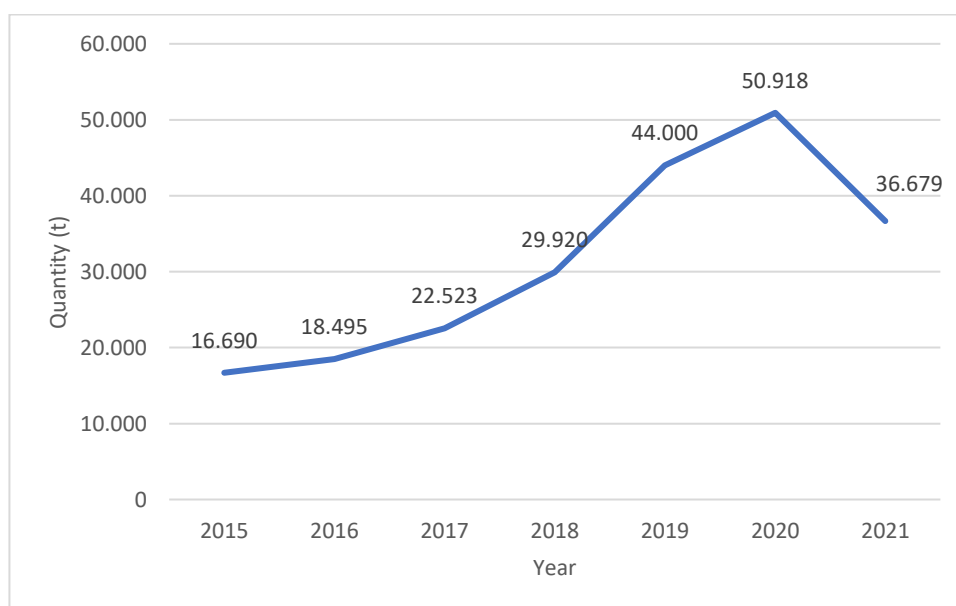


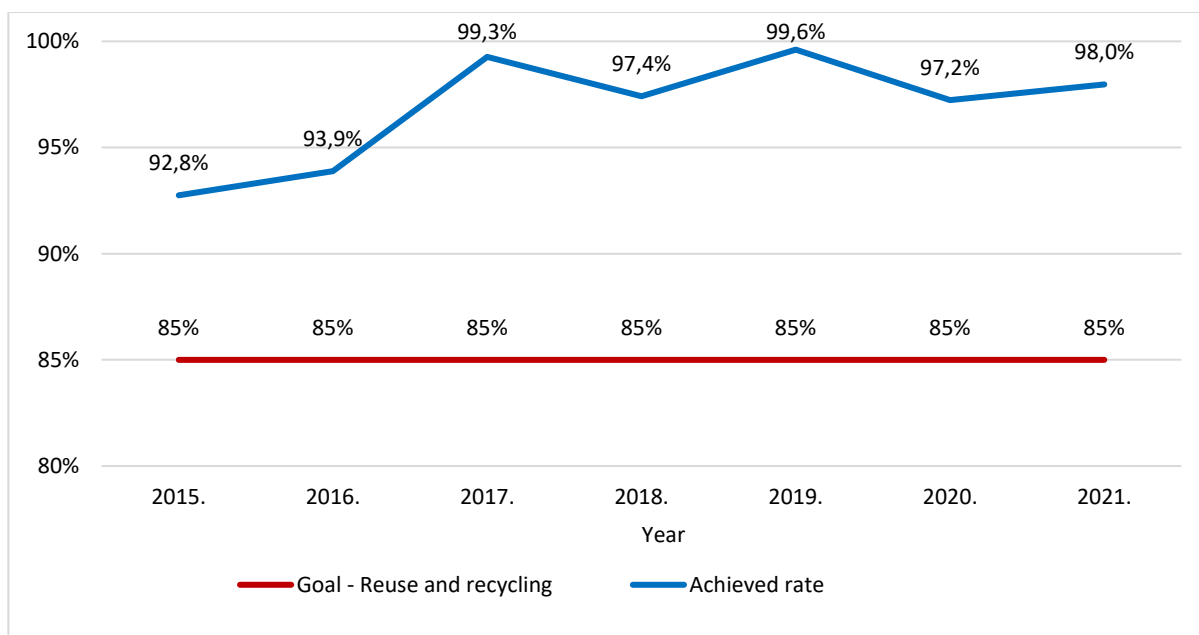
Figure 35. Amount of collected ELV vehicles in the period from 2015 to 2021 Amount of collected ELV vehicles in the period from 2015 to 2021). In 2021, 36,679 tonnes of end-of-life vehicles were collected, which is 28 % less than the previous year. All the quantities of end-of-life vehicles are processed in Croatia.



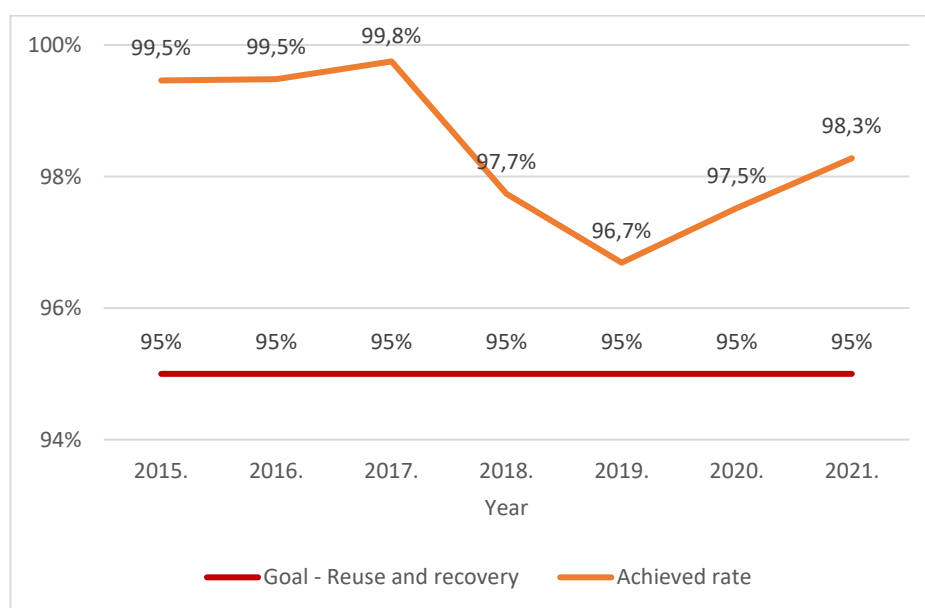
**Figure 35.** Amount of collected ELV vehicles in the period from 2015 to 2021 Amount of collected ELV vehicles in the period from 2015 to 2021

During the observed period, the increase in the collected and processed end-of-life vehicles is the result of the adoption of the Decision on Modifications to the Fees in the ELV vehicles and Tyres Management Systems amending the fee paid to the holders of ELV vehicles upon handing them over to the authorised collectors.

The prescribed targets for reuse/recovery (95 %) and reuse/recycling (85 %) are constantly being met. In 2021, the ELV vehicle reuse and recycling rate amounted to 97.97 %, while the reuse and recovery rate for all the end-of-life vehicles handed over for the purpose of processing was 98.3 % (Figure 36) (Figure 37).



**Figure 36.** Reuse and recycling rate of ELV vehicles in Croatia from 2015 to 2021





**Figure 37.** Reuse and recovery rate of ELV vehicles in Croatia from 2017 to 2021

The existing ELV management system in Croatia shows good results and meets the required ELV management targets, which include achieving the reuse and recovery rate amounting to at least 95 % and the reuse and recycling rate of at least 85 % of the average weight of the end-of-life vehicle handed over for processing. According to the ongoing revision of Directive 2000/53/EC, the existing system may be expanded in the upcoming period by introducing other types of vehicles, such as scooters, motorcycles, medium-size passenger and freight vehicles, etc. In addition to this, the EU legislative measures are intended to increase the number of ELVs handed over for processing purposes each year. The equipment and capacities of ELV collection and processing plants are currently sufficient for the purposes of the Republic of Croatia, while the assessment of future capacity and equipment requirements will be conducted after the revised EU regulations enter into force.

#### **2.2.7.7. Construction waste and waste containing asbestos**

Statistical data for the construction industry in the period from 2015 to 2021 indicate a recovery of the industry following the economic crisis, with a continuous increase in the value and scope of construction activities. The construction industry generates approx. 36 % of the total waste volume at EU level.

The European Commission included the construction industry in the Circular Economy Action Plan 2020<sup>24</sup> as one of the seven key industries with a high circularity potential. The Waste Management Act (Cro. abbrev. ZGO) classified construction waste as a special waste category, originating from construction and demolition activities. Annual quantities of the generated construction waste have been estimated since 2015 based on the results of a statistical survey conducted as part of the project entitled 'Improving the Flow and Quality of Data on Construction and Demolition Waste, Exploration and Exploitation of Mineral Resources in the Republic of Croatia' (Croatian Agency for Environment and Nature, 2016/2017), including data entered into the Waste Management Information System.

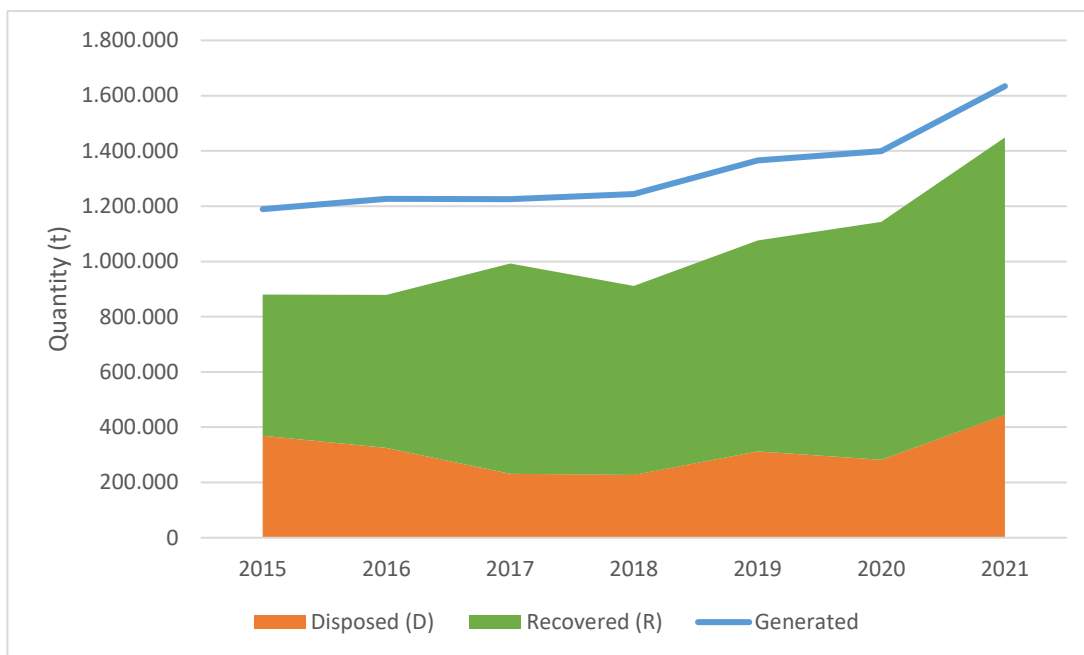
The period from 2015 to 2021 saw an increase in the quantity of construction waste by 37.5 %. For 2021, the total quantity of generated construction waste has been estimated to 1,634,257 tonnes. The largest proportion in the generated construction waste includes soil, stone and dredging spoils (41.4 %), and metals and their alloys (20.3 %). They are followed by concrete, bricks, shingle/tiles and ceramics (13.8 %), mixed construction and demolition waste (13.1 %) and bituminous mixtures, that is, the old bitumen (asphalt) (9.6 %). Other types of waste account for 1.8 % of the total waste amount.

Processed waste accounts for 88.9 % of the total estimated volume of construction waste, with the remaining amount of 11.1 % of the waste for which the waste management method remained unknown.

In 2021, a total amount of 1,453,917 tonnes of construction waste were processed, accounting for 89 % of the estimated waste arisings. Waste recovery (R) operations were used (excluding landfilling) for the purpose of processing 52.6 % (860,293 t) of the construction waste, with the landfilling activities performed for the processing of 8.8 % (143,523 t) of waste, 27.2 % (445,072 t) of waste was processed through disposal (D), amounting to 0.3 % (5,029,6 t) of the construction waste generated. For the remaining proportion of 11.1 % (180,340,1 t) of construction waste the waste management method remained unknown (Figure 38).

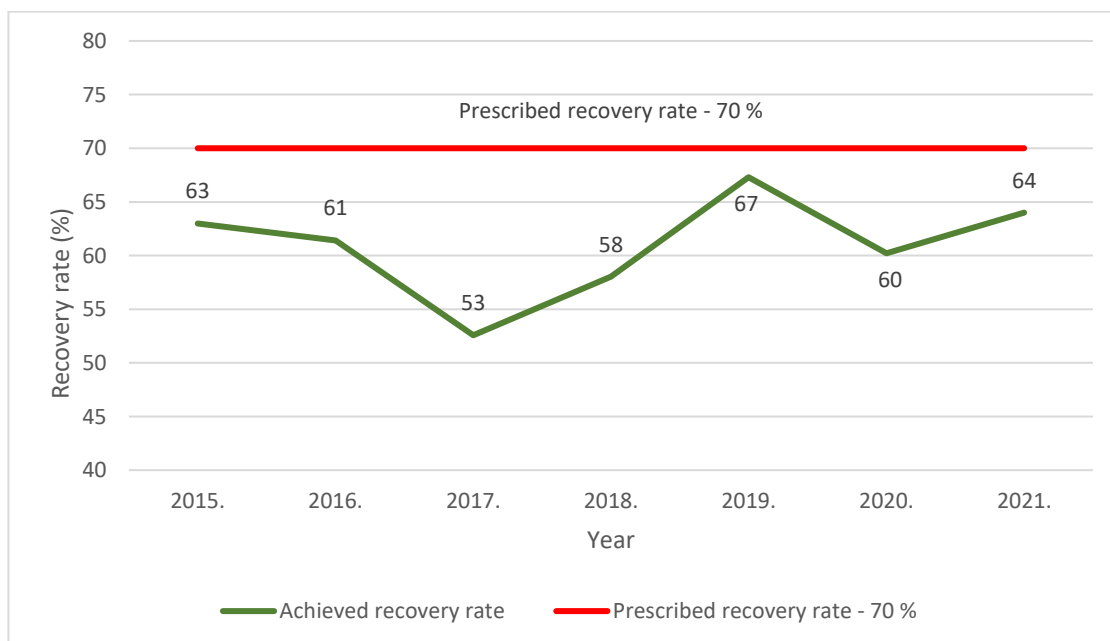
---

<sup>24</sup> <https://eur-lex.europa.eu/legal-content/HR/TXT/HTML/?uri=CELEX:52020DC0098&from=DA>



**Figure 38.** Construction waste management in the period from 2015 to 2021

The Waste Management Act (ZGO) laid down the target construction waste recovery rate according to which at least 70 % of the non-hazardous construction weight classified under the EWC code 17 05 04 – soil and stones other than those mentioned in 17 05 03, must be recovered through recycling, preparation for reuse and other material recovery processes, including landfilling, where waste is used as a substitute for other types of material. The construction waste recovery rate for the Republic of Croatia in 2021 amounted to 64 %, accounting for a 4-percentage-point increase compared to the previous year (2020) (Figure 39).

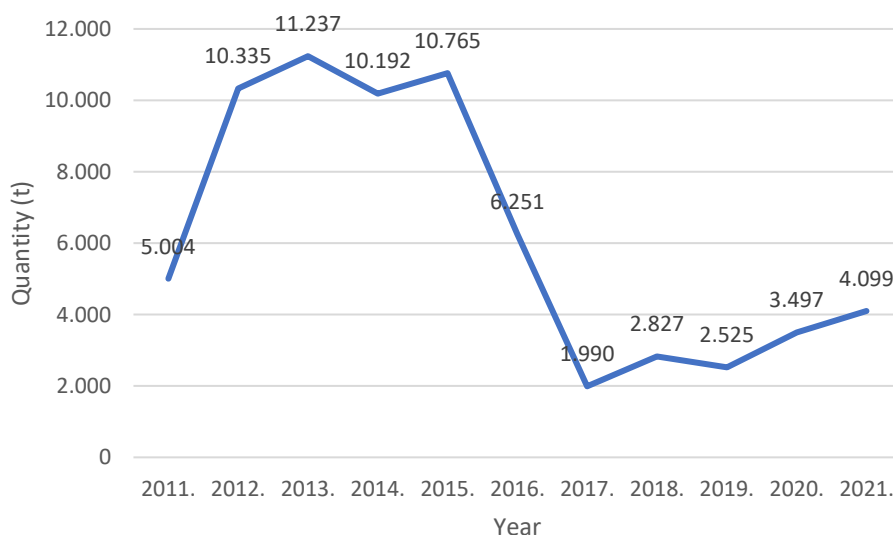


**Figure 39.** Construction waste recovery goal achievement for the period from 2015 to 2021

The reduced recovery rate in 2020, compared to 2019, can be explained by additional waste predominantly generated during the earthquake in Zagreb in 2020 that was still stored and awaiting processing at that time, the impact of the COVID-19 pandemic on the reduction in the amount of metal waste used in construction that was exported/shipped for recycling and used for the operation of recycling plants (larger quantities were stored in warehouses), as well as the improvement in the quality of data entered into the Waste Management Information System. The mineral construction waste generated during the earthquake in the Sisak-Moslavina County did not affect the calculation of the 2021 rate and it was processed for reuse. It was not declared as waste, but was rather regarded as a reusable material contributing to waste prevention.

### 2.2.7.7.1. Construction waste containing asbestos

By 2016, significant quantities of the collected and processed construction waste containing asbestos were observed, after which they decreased considerably. The reason for the said decrease is the lack of co-financing of waste collection for this type of waste by the EPEEF (Cro. abbrev. FZOEU) after 2016, that was fully funded by the EPEEF at the time as a public service. In the period from 2012 to 2015, when the organised system reached its maximum, the annual quantity of construction waste disposed of in special asbestos landfills, known as cells or cassettes, amounted to 10,632 tonnes on average. Since 2017, the quantity of construction waste containing asbestos that was disposed of in appropriate landfill facilities has increased, but is still far away from the amount collected through the EPEEF (FZOEU) scheme (Figure 40). Insignificant quantities of construction waste containing asbestos were exported abroad in the period from 2013 to 2020. In 2021, this type of waste was not exported.



Source: MESD (Cro. abbrev. MINGOR)

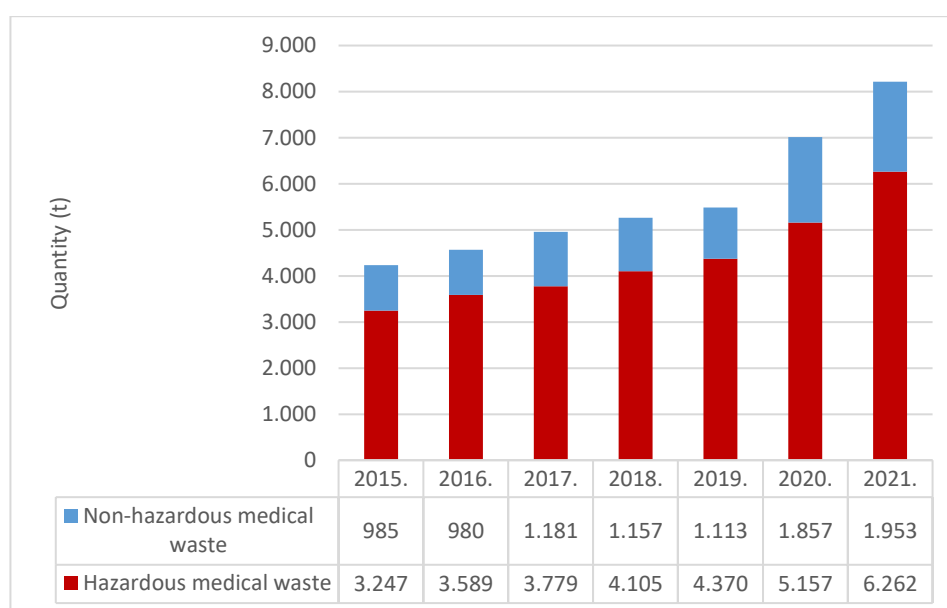
**Figure 40.** Amount of construction waste containing asbestos disposed of in 'cassettes' in the period from 2011 to 2021

In 2021, a total amount of 4,099 tonnes of construction waste containing asbestos were disposed of in six asbestos landfills, known in Croatia as 'cassettes' which are located in six Croatian counties. Civic amenity sites received construction waste containing asbestos, as well. The residents handed over approx. 1,140 tonnes of construction waste containing asbestos through 60 civic amenity sites.

### 2.2.7.8. Medical waste

In the period from 2015 to 2019, an annual increase in the generated medical waste, amounting to approx. 8 %. A more significant increase compared to the previous year (a 28 % increase) was observed in 2020, when 6,866 tonnes were generated, and in 2021 there was a 17 % increase, accounting for 8,215 tonnes generated (Figure 41). In 2020 and 2021, the increase in medical waste was attributed to the rise in the consumption of medical products due to the COVID-19 pandemic.

The major increase in medical waste arisings regards health care waste, diagnostic waste, waste from treatment or prevention of diseases in human beings, particularly waste the collection and disposal of which are subject to special requirements (EWC code 18 01 03\*) and waste the collection and disposal of which is not subject to special requirements for the purpose of preventing infections – such as dressings, plaster casts, linen, disposable protective clothing, gauzes, diapers, etc. (EWC code 18 01 04).



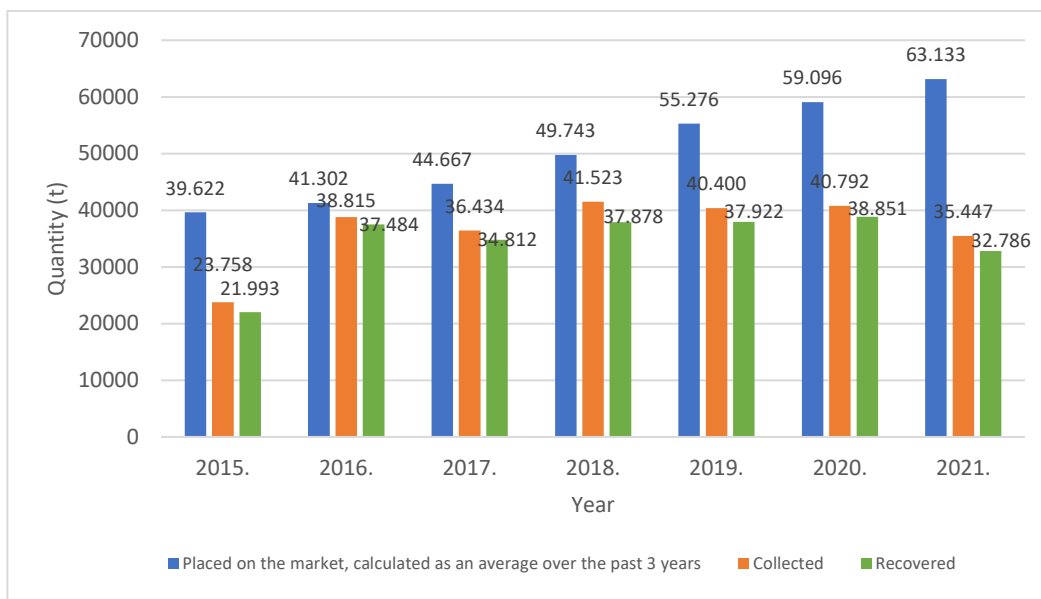
Source: MESD (Cro. abbrev. MINGOR)

**Figure 41.** Generated medical waste (HCW) in the period from 2015 to 2021

In 2021, 32 % of the generated medical waste was processed through final waste treatment procedures in the Republic of Croatia, 66 % of the waste underwent pre-treatment through sterilisation and was exported to other countries for the purpose of the final processing, with 2 % of medical waste being directly exported without undergoing pre-treatment (predominantly energy recovery).

### 2.2.7.9. Waste Electrical and Electronic Equipment

In the period from 2015 to 2021, the amount of electrical and electronic equipment placed on the market is steadily growing, while the amount of the collected and recovered electrical and economic waste stagnated until 2020, particularly in the period from 2018 to 2020, with a decrease in the collected amount of EEE waste recorded in 2021 by 13 % with respect to the previous year (**Pogreška! Izvor reference nije pronađen.**). Almost all the recovered quantities of EEE waste have been recycled.

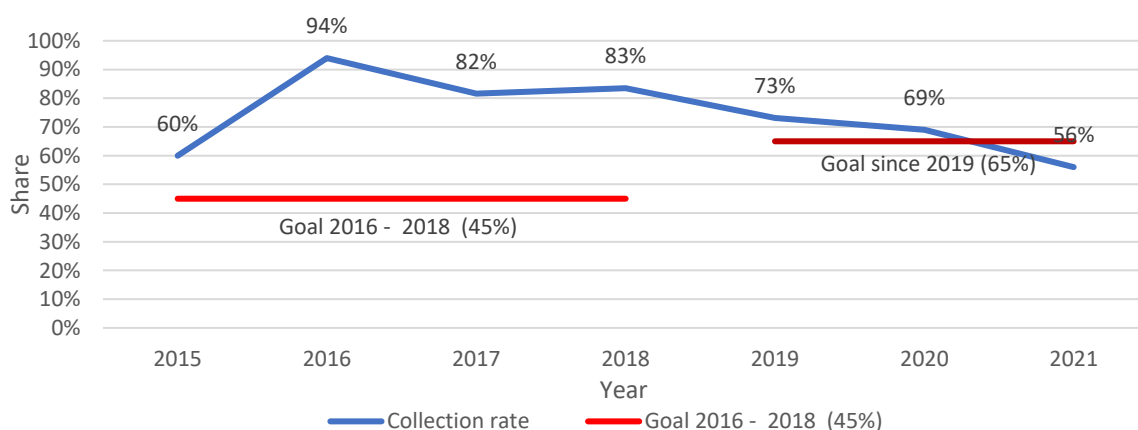


Source: EPEEF (Cro. abbrev. FZOEU), MESD (Cro. abbrev. MINGOR), 2021

**Figure 42.** Generated EEE waste quantities (expressed as an average of quantities placed on the market in the last three years), collected and recovered quantities in the period from 2015 to 2021 (t)

The EU target related to the WEEE collection was modified twice in the observed period, amounting to 45 % of the WEEE placed on the market in the period from 2016 to 2018. Since 2019, it has amounted to 65 % of the average EEE weight placed on the market in the past three years, accounting for 85 % of the WEEE produced on the territory of the Republic of Croatia.

In the observed period, the collection target has been achieved for all the years, except for 2021, when the collection rate was 56 %, accounting for 13 percentage points less than the rate achieved the previous year (Figure 43) and 9 percentage points less than the required target.



Source: EPEEF (Cro. abbrev. FZOEU), MESD (Cro. abbrev. MINGOR)

**Figure 43.** Achieved EEE waste collection rates for the period from 2015 to 2021, showing the set targets

Minimum recovery and recycling targets applicable since August 15th, 2018 range between 75 % and 85 % for recovery and between 55 % and 80 % for recycling, depending on the electrical and electric equipment category. In the said years over the observed period, the minimum recovery and recycling targets have been achieved which are applied by EEE category (Table 13. Recovery and recycling rates in 2021 per EEE waste category in relation to set targets ).

**Table 13. Recovery and recycling rates in 2021 per EEE waste category in relation to set targets**

CATEGORY	Collected (t)	Recovered (t)	Recycled (t)	Recovery rate	Recycling rate	Recovery target	Recycling target
Heat exchange equipment	6,396	6,201	6,057	97 %	95 %	85 %	80 %
Computer screens and monitors (P>100 cm <sup>2</sup> )	9,965	8,827	8,827	89 %	89 %	80 %	70 %
Light bulbs	84	75	75	89 %	89 %	80 %	80 %
Large equipment (d>50 cm)	14,328	13,546	13,533	95 %	94 %	85 %	80 %
Small equipment (d<50 cm)	2,593	2,286	2,286	88 %	88 %	75 %	55 %
Small IT and communication equipment (d<50 cm)	2,110	1,851	1,851	88 %	88 %	75 %	55 %

Source: EPEEF (Cro. abbrev. FZOEU), MESD (Cro. abbrev. MINGOR)

The existing e-waste management ensures compliance with the required e-waste management targets, i.e., the achievement of the annual WEEE separation rate amounting to at least 65 % compared to the amount of electrical and electronic equipment placed on the market and the rate amounting to at least 75 - 85 % for recovery and 55 - 80 % for the preparation for reuse and recycling. The equipment and capacities necessary for the collection and treatment of e-waste are sufficient for the purposes of the Republic of Croatia. It is estimated that they will meet the needs of the system in the upcoming period, regardless of the expected increase in the quantity of the e-waste to be used in e-waste recycling facilities.

#### **2.2.7.10. Waste from the titanium dioxide production**

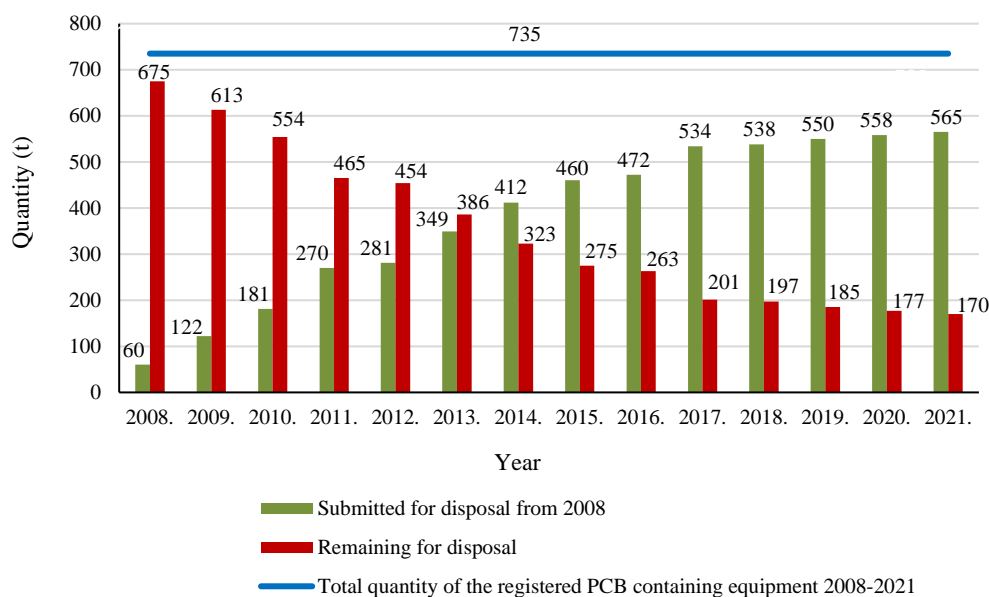
There is no record of waste generated by the titanium dioxide production in the Republic of Croatia.

#### **2.2.7.11. Waste containing polychlorinated biphenyls (PCBs) and polychlorinated terphenyls (PCTs)**

In the period from 2008 to 2021, 172 holders with 735 tonnes of PCB containing equipment (transformers and capacitors) were registered. The said amount included 565 tonnes (77 %) that were disposed of by the end of 2021, with 170 tonnes (23 %) of PCB containing equipment that is yet to be disposed of.

In the said period, 76 tonnes of waste items, material and liquids containing or contaminated with PCBs were disposed of. The entire quantity of such waste is processed and disposed of abroad.

In the period from 2008 to 2020, there was an evident upward trend in the amount of disposed equipment containing PCBs. However, from 2017 to 2021, the increase occurred at a slower pace due to the fact that the majority of the equipment to be disposed of was owned by the companies that went bankrupt or were revoked (Figure 44).



Source: MESD (Cro. abbrev. MINGOR)

**Figure 44.** Total amount of the disposed PCB waste and PCB waste to be disposed of in the period from 2008 to 2021

#### 2.2.7.12. Disposable (single-use) plastics and fishing gear containing plastics

The quantities of disposable plastic waste have not been monitored so far, so they could not be assessed.

Within the project of the Ministry of Economy and Sustainable Development (Cro. abbrev. MINGOR) entitled 'The Improvement of Data on Plastic Waste in Croatia' (HRPWD) which is co-financed by the European Union, a method has been developed and initial data on the selected plastic products have been collected for the purpose of preparation for reporting in accordance with the requirements of Directive 2019/904, which calls for the establishment of the new data monitoring system.

As part of the HRPWD project, the total quantity of generated plastic waste was estimated at 306,030 t, including the share of plastics in the mixed municipal waste. The estimated average plastic content in the mixed municipal waste was 16 %, accounting for 163,795 t in 2021. Therefore, the largest share in the total quantity of plastic waste is residual plastic which is part of the mixed municipal waste (53.5 %). The rest (46.5 % or 142,235 t) is separately collected plastic waste, primarily containing plastic packaging.

When considering total plastic waste, including the plastic waste which is part of the mixed municipal waste, the largest content amounting to 46.8 % has been disposed of in landfills. Energy recovery accounts for 4.9 % of plastic waste, material recovery (recycling) accounts for 21.1 %, and other recovery processes, including sorting, make up 24.0 %. The remaining 3.2 % of waste is allocated to other disposal methods, storage, etc.

Based on the research conducted by the Ministry of Economy and Sustainable Development (Cro. abbrev. MINGOR), the total amount of fishing gear containing plastic which is used in marine fishing and was placed on the market in 2021 was estimated at 590 t, with the plastic content of 60 %. The amount of discarded fishing gear containing plastic generated by fishing activities is estimated at 223 t per year, with a plastic content amounting to 66 %.

The amount of filters from tobacco products placed on the market in 2021 was estimated at 1,400 t.

While 22 % of the local self-government units have the analysis of the composition of waste generated by emptying bins/containers or removing discarded waste from public areas at their disposal (22 % of the total number of local self-government units), only 3 % of the LSGUs have data on waste originating from disposable (single-use) plastic products listed in the Appendix III List E of the Waste Management Act, the removing of which from the environment should be encouraged.

In the upcoming period, it is necessary to set up a regulatory framework, as well as to specify and introduce legislative measures aimed at achieving a permanent and ambitious reduction in the consumption of disposable plastic food and drink containers. This includes establishing extended producer responsibility schemes for the products not covered by the existing EPR scheme for packaging, including the facilities and equipment for efficient waste management of these products, and laying down measures aimed at raising consumer awareness on the negative impact of discarding or improperly disposing of single-use plastic products on the environment. Measures should also be implemented informing the consumers on the availability of alternative products that can be reused, recycling systems and different possibilities in terms of waste management for disposable plastic products.

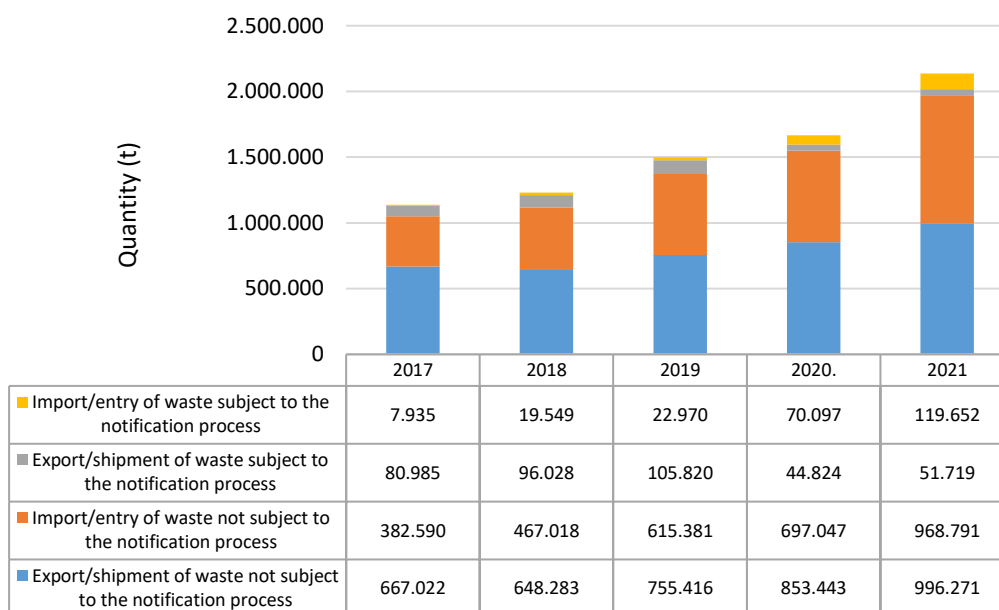
Furthermore, a legal framework must be introduced in the upcoming period with the purpose of establishing the extended producer responsibility system for fishing gear containing plastic, including the equipment and plants for efficient waste management of such gear, and measures must be enacted aimed at raising consumer awareness on the negative impact of such gear and its improper handling and discarding on the environment. Measures aimed at informing consumers on the availability of reusable alternatives, recycling systems and different possibilities in terms of waste management of fishing gear containing plastic should also be adopted. Additionally, a minimum annual collection rate for recyclable waste from fishing gear containing plastic should be established.

### **2.3. Transboundary shipment of waste**

Transboundary shipment of waste in the Republic of Croatia has been monitored systematically since 2004, with the import/entry of waste subject to the prior written notification and consent procedure (hereinafter referred to as the notification procedure) was completely forbidden in Croatia until Croatia's accession and full EU membership.

With the development of the global economy, research conducted at the EU level indicates a global trend of increasing amounts of waste in transboundary shipment of waste, with Croatia being no exception, which can be seen from the data on cross-border waste shipment for the period from 2017 to 2021 (Figure 45.) There is a significant increase in the total transboundary waste shipments for the recent five-year period (from 2017 to 2021) (Figure 45). The highest annual increase in the total transboundary waste shipment of as much as 28 % compared to the previous year was recorded in 2021. Data for 2020 indicates that issues related to the COVID-19 pandemic have not have a negative impact on the general trend.

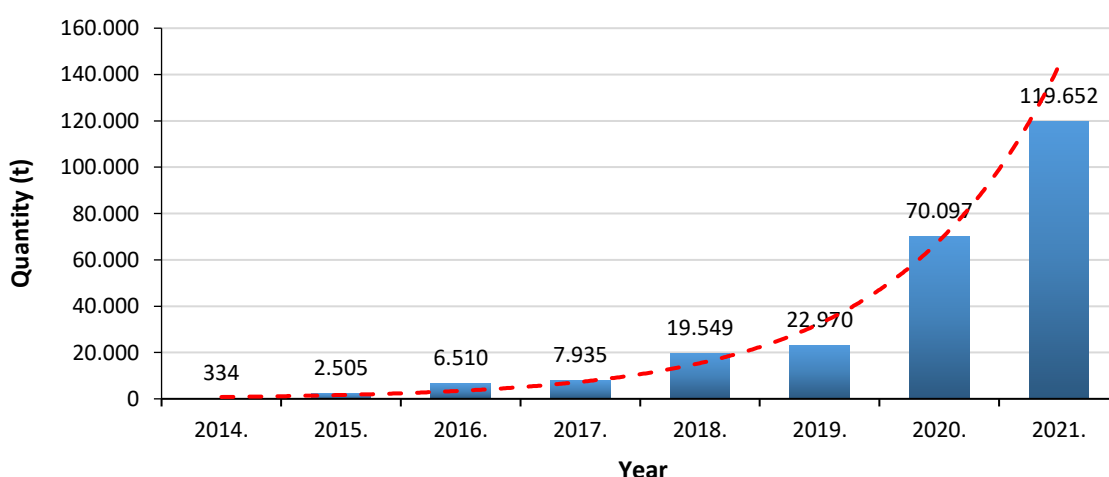




Source: MESD (Cro. abbrev. MINGOR)

**Figure 45.** Transboundary shipment of waste in Croatia in the period from 2017 to 2021

The import/entry of waste subject to the notification procedure in Croatia was completely forbidden until the Croatia's accession to the EU, followed by the consent for the waste intended for recovery in accordance with the provisions of Directive (EC) no. 1013/2006 of the European Parliament and of the Council of June 14th, 2006 on waste shipments (SL L 190, 14.6.2006.). It was implemented for the first time in 2014, when 334 tonnes of lead-containing batteries were imported/introduced, with the quantities increasing exponentially since then. The largest increase in imported/introduced quantities was recorded in 2020, when 70,097 tonnes of waste were imported/introduced, accounting for over three times the quantity obtained the previous year (22,970 tonnes) and approx. 210 times more than in 2014. In 2021, the imported/introduced waste subject to the notification procedure increased by additional 71 % with respect to the previous year (Figure 46).



Source: MESD (Cro. abbrev. MINGOR)

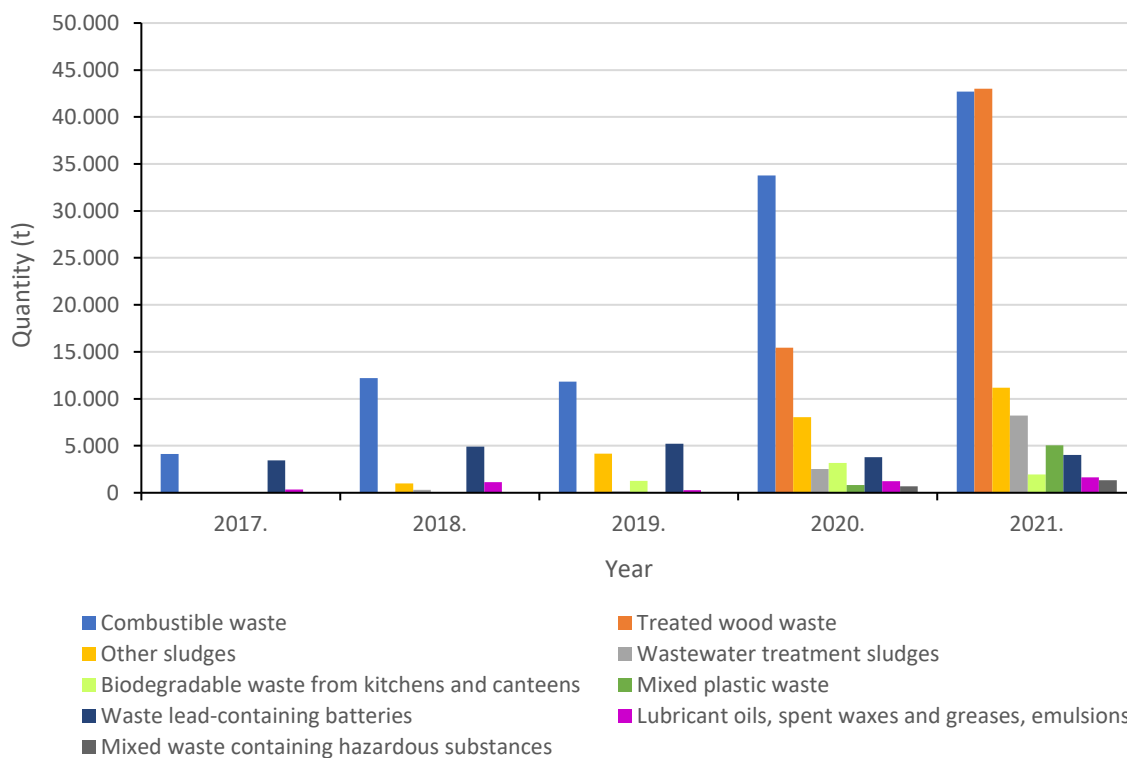
**Figure 46.** Import/entry of waste subject to the notification procedure from 2014 to 2021

Such an increase is due to the previous importers who are also recyclers of such waste, who started importing/introducing such waste for their own needs on a larger scale after the ban. Moreover, there

is a growing number of plants that have obtained a permit for waste recovery, thus increasing the capacities of the waste recovery facilities and the possibilities of waste import (introduction). As in previous reference years, the import/entry of non-hazardous waste subject to the notification procedure exceeds significantly the import of hazardous waste, with the largest quantities of such waste being imported from Italy, Austria and Slovenia.

By far the largest quantities of all types of waste subject to the notification procedure which is imported/introduced to Croatia are the quantities of waste-derived fuel for energy recovery in the cement industry. In the period from 2015, when this type of waste was imported for the first time, until 2019, the waste-derived fuel accounted for 52 – 65 % in the total quantity of imported waste subject to the notification procedure, while in 2020 and 2021, although the imported quantities continue to rise, the percentage of this type of waste in the total amount of the imported waste has decreased (48 % in 2020 and 36 % in 2021), with a significant increase in the share of processed wood waste used in the wood processing industry (22 % in 2020 and 36 % in 2021). Although the import of waste subject to the notification procedure is increasing rapidly each year, both in terms of the quantity and waste type, there has been a significant increase in the import of sludges not containing hazardous substances, mainly intended for biogas plants and to a lesser degree for energy recovery in the cement industry (991 t in 2018 and 10,181 t in 2021), as well as sludges generated from the municipal waste water treatment plants and intended for energy recovery in the cement industry (296 t in 2018 and 8,209 t in 2021).

As for the hazardous waste, since the lifting on the ban on the import/entry of such waste to Croatia, there has been annual import/entry of waste lead-containing batteries intended for recycling, and since 2016 the quantities of waste mineral oils intended for energy recovery in the cement industry have increased. In the recent years, smaller, but growing quantities of other types of hazardous waste have been imported/introduced for the same purpose, predominantly including mixed solid and liquid waste generated by the mechanical waste treatment, liquid and solid waste fuel containing hazardous substances, and specific types of sludge containing hazardous substances (Figure 47).



Source: MESD (Cro. abbrev. MINGOR)

**Figure 47.** Variations in the amount of various types of imported/introduced waste subject to the notification procedure from 2014 to 2021

Since the granting of the R1 status of the plant with the previous consent to import/introduce waste subject to the notification procedure has been provided by law, only one company has submitted the application and acquired the R1 status, valid until January 2nd, 2025. As of the end of 2021, the status has not been used.

From 2015, the import/shipment of waste subject to the notification procedure showed a slight increase until 2019, when 105,820 tonnes were exported, representing the highest amount recorded since the export of such waste has been monitored. However, during 2020, a significant decline in the amount of waste subject to the notification procedure was observed due to Hungary's ban on the import/entry of sludge from the treatment of municipal waste water treatment plants, which, starting in 2016, has been exported from Croatia to Hungary on a large scale. In 2019, this type of waste accounted for as much as 56 % of the total waste shipped/exported subject to the notification procedure. Before and after this period, sludge generated by the municipal wastewater processing was exported/shipped in small quantities or not at all. In addition to sludge, between 2017 and 2020, the most exported/shipped waste types were fuel waste and other waste generated by waste treatment, such as a mixture of waste obtained from the mechanical treatment of waste containing hazardous substances, liquid fuel waste containing hazardous substances and mixed waste containing at least one type of hazardous waste, processed wood waste, lead-acid batteries and lead-acid battery plates.

The share of hazardous waste in the total amount of exported/shipped waste subject to the notification procedure during the period of intensive export/shipment of sludge from the processing of municipal waste water until 2019 ranged between 20 % and 25 %, while in 2020 and 2021 it

exceeded 40 %. Hazardous waste was predominantly shipped to Austria, Slovenia and Germany, while the non-hazardous waste subject to the notification procedure was shipped/exported to Hungary, Austria and Bosnia and Herzegovina.

Comparing data on cross-border shipments of waste subject to the notification procedure, it is evident that during 2020 and 2021, the same types of waste, both non-hazardous (refuse-derived fuel, wood processing waste) and hazardous (waste lead-acid accumulators, lead batteries, lead grids, accumulator plates, etc.) were predominantly exported/shipped and imported/introduced (Table 14. Correlation table of the amount of waste subject to the notification procedure, which was imported/introduced and exported/shipped out of the country during 2020 and 2021).

**Table 14.** Correlation table of the amount of waste subject to the notification procedure, which was imported/introduced and exported/shipped out of the country during 2020 and 2021

	2020.		2021.	
	Export (t)	Import (t)	Export (t)	Import (t)
Refuse-generated fuel (RDF)	10,811	33,775	15,306	42,711
Wood processing residues	13,957	15,447	10,768	43,003
Waste lead-acid accumulators, lead-acid batteries, lead grids and accumulator plates	5,435	3,803	6,540	4,031

Source: MESD (Cro. abbrev. MINGOR)

In addition to being both a country of origin and a country of destination, the Republic of Croatia often appears in the cross-border shipment of waste as a transit country, as well. In the past few years, the number of issued transit permits for waste subject to the notification procedure being transported through Croatia is approx. 70 each year. These approvals primarily concern the transit of combustible waste intended for energy recovery from EU member states to be used in cement plants in Bosnia and Herzegovina and Hungary, though to a lesser extent, as well as the transit of different types of hazardous waste from the Western Balkans for recovery and disposal in EU member states. During 2021, in accordance with the new EU legislation regulating the transboundary shipment of plastic waste, several approvals were issued granting the transit of this type of waste from the EU to Serbia.

As for the volume of transboundary shipments of waste not falling under the notification procedure, they continue to rise in the period from 2017 to 2021, with a slight decline in the exported/shipped quantities during 2018. Therefore, in the afore-mentioned five-year period, the import/entry of transboundary shipments increased 2.5 times (from 382,590 t in 2017 to 968,791 t in 2021), and the export/shipment increased 1.5 times (from 667,022 t in 2017 to 996,271 t in 2021).

Throughout the entire observation period, the largest quantities of the imported/introduced waste not falling under the notification procedure consisted of metal waste, waste from thermal processes (slag), waste paper and cardboard, accounting for an average of 85 % of the total imported quantity. The majority of such waste, just over 60 % is imported/entered to Croatia from neighbouring countries such as Bosnia and Herzegovina, Slovenia and Hungary each year. In the past 5 years, between 5 % and 9 % of the total volume were imported/shipped to Croatia for the recovery procedures R12 and R13, with the rest being used in energy and material recovery processes.

Furthermore, in the observation period, the largest quantities of exported/shipped waste not falling under the notification procedure consisted of metal (64-72 %), and paper and cardboard waste (18-23 %). Waste plastic, glass and wood, as well as waste from thermal processes, were exported/shipped

abroad to a significant extent, while other types of waste were exported/shipped abroad in very small quantities. Almost 90 % of the total amount was exported/shipped to Turkey, Slovenia, Italy, Hungary and Austria. At the beginning of the observation period, almost a quarter of the waste not falling under the notification procedure was exported/shipped for recovery procedures R12 and R13, but over the years the percentage has decreased, amounting to just over 8 % in 2021.

Similarly, as is the case with the waste falling under the notification procedure, the same types of waste not falling under the notification procedure were mostly exported/shipped abroad (Table 15).

**Table 15.** Correlation table of the amount of waste not subject to the notification procedure, which was imported/introduced and exported/shipped out of the country from 2017 to 2021

	2017.		2018.		2019.		2020.		2021.	
	Export /shipping (t)	Import /entry (t)	Export / shipping (t)	Import /entry (t)	Export shipping (t)	Import /entry (t)	Export / shipping (t)	Import /entry (t)	Export / shipping (t)	Import /entry(t)
Metal waste	444,253	66,720	412,833	147,617	500,965	91,448	612,107	243,148	699,898	409,993
Paper and cardboard waste	150,446	154,295	147,625	145,355	173,546	147,569	154,660	149,025	182,743	184,504

Source: MESD (Cro. abbrev. MINGOR)

In addition to this, as part of the accession of the Republic of Croatia to the OECD, it was established that the ban on the shipping of mixed municipal waste to Croatia laid down in the Waste Management Act for the purpose of energy recovery is permanent. The ban on the shipping of the mixed municipal waste for the purpose of recovery can be an acceptable instrument within the OECD if it is temporary.

## 2.4. The existing waste management facilities, devices and systems

### 2.4.1. Waste management facilities and devices

Pursuant to the provisions of the Waste Management Act, a waste management facility is a facility designed for waste collection, including a waste storage facility, a transfer station and a recycling yard, a waste processing facility, including a landfill, a waste management centre and a construction waste recycling area.

#### 2.4.1.1. Recycling yards

A recycling yard is a supervised closed space designed for separation and temporary storage of smaller quantities of hazardous municipal waste. Recyclable municipal waste and other specified types of waste. In order to ensure the availability of the hazardous municipal and other municipal waste separation service, the Waste Management Act prescribes the obligation for local self-government units to establish a minimum number of recycling yards or mobile recycling plants in accordance with the conditions defined in Article 84. of the WMA <sup>25</sup>. The person in charge of the recycling yard is

<sup>25</sup> The executive body of the local self-government unit or the City of Zagreb, is required to:

- provide access to a mobile recycling plant on the territory of the local self-government unit with 3,000 residents or fewer, where there are no recycling yards

required to accept the hazardous municipal waste, paper waste, wood, metal, glass, plastic, textile and bulky waste handed in by the user of the waste falling under the household waste category on the territory of the specific local self-government unit providing the recycling yard service free of charge.

As a result of investing in the separate waste collection system, which included the construction of recycling yards, there has been a significant increase in the number of recycling yards entered in the Register of Recycling Yards or in the Register of Waste Transporters, Waste Brokers, Waste Dealers and Civic Amenity Sites <sup>26</sup> in the period from 2015 onwards. In 2015, there were 34 registered civic amenity sites and 376 of them in 2021.

By August 2022, a total amount of 417 recycling yards were registered, including 246 stationary and 171 mobile recycling yards, located on the territory of 397 local self-government units, accounting for 71 % of the existing local self-government units. The distribution of civic amenity sites by county is shown in Figure 48.

.

---

- provide at least one recycling yard or mobile recycling plant on the territory of the local self-government unit with 3,000 residents or more, and an additional recycling yard for every subsequent 25,000 residents

- provide at least four recycling yards on the territory of the local self-government unit with 100,000 residents or more, and an additional recycling yard for every subsequent 30,000 residents. Exceptionally, the executive body of the City of Zagreb is required to enable the operation of at least one recycling yard for each neighbourhood

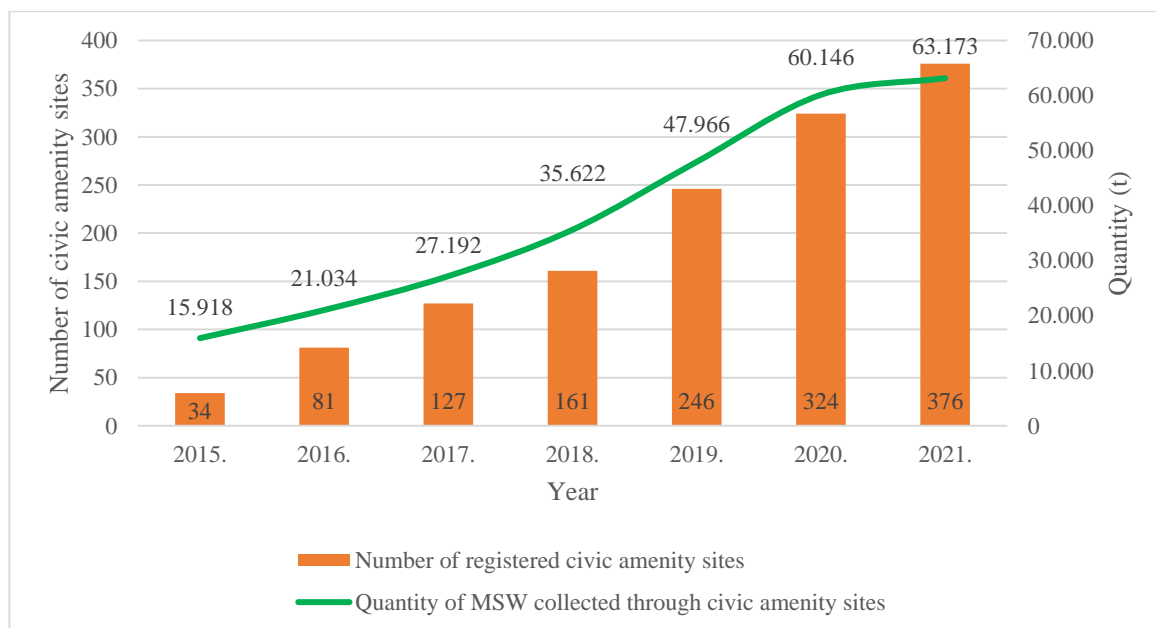
- provide access to a mobile recycling plant at least once in twenty days in the settlements where the recycling yard is located and on the territory of each city council districts.

<sup>26</sup> With the entry into force of the Waste Management Act in July 2021, the Register of Waste transporters, Waste brokers, Waste dealers and Civic Amenity Sites was established, and the Register of Civic Amenity Sites became invalid. The competence for the registration shifted from the Ministry of Economy and Sustainable Development (MINGOR) to the competent administrative authorities of the local (regional) self-government unit or the City of Zagreb.



**Figure 48.** Number of civic amenity sites recorded by August 2022

The previous investments in civic amenity sites have fulfilled their purpose, but the quantities separately collected through recycling centres are still insufficient (Figure 49), accounting for only 8 % of the separately collected municipal waste.



Source: MESD (Cro. abbrev. MINGOR)

**Figure 49.** Number of registered civic amenity sites and reported amounts of municipal waste collected through civic amenity sites from 2015 to 2021

In order to provide valuable types of recyclable waste, further construction is required, particularly in the areas with significant seasonal increase in municipal waste (such as coastal and island municipalities and self-government units).

#### 2.4.1.2. Biological waste treatment facilities

In 2021, 14 composting facilities had permits for waste management with a total capacity of 144,547 t/year (Table 16. List of composting facilities with the corresponding capacities available in 2021). The construction of the 6 additional composting plants with a total capacity of 21,620 tonnes/year (Table 17. New composting facilities construction projects being implemented ) is being co-financed, and the two existing composting facilities (in Prelog and Koprivnica) already received co-financing for capacity expansion in the previous planning period. Compared to 2016, when there were 11 composting facilities with a capacity of 103,397 t/year, we cannot say there has been a significant progress in the construction of waste composting facilities, so further efforts and investments are necessary for them to be established.

**Table 16.** List of composting facilities with the corresponding capacities available in 2021

County	Facility location	Capacity (t/year)
City of Zagreb	Zagreb, Žitnjak	37,5
	Zagreb, Markuševac	10,000
	Zagreb, Jakuševac	32,000
Koprivnica-Križevci	Imbriovec	10,770
	Herešin (Koprivnica)	9,000
Međimurje	Totovec (Čakovec)	6,140
	Prelog	7,200
	Mursko Središće	1,700
Osijek-Baranja	Osijek	4,499
Primorje-Gorski Kotar	Krk	2,000
Sisak-Moslavina	Stručec (Popovača)	27,000
	Crnac (Sisak)	2,700
Varaždin County	Trnovec Bartolovečki (Varaždin)	1,500
Zagreb County	Kloštar Ivanić	30,000
<b>Total:</b>	<b>14</b>	<b>144,547</b>

Source: MESD (Cro. abbrev. MINGOR)

**Table 17.** New composting facilities construction projects being implemented

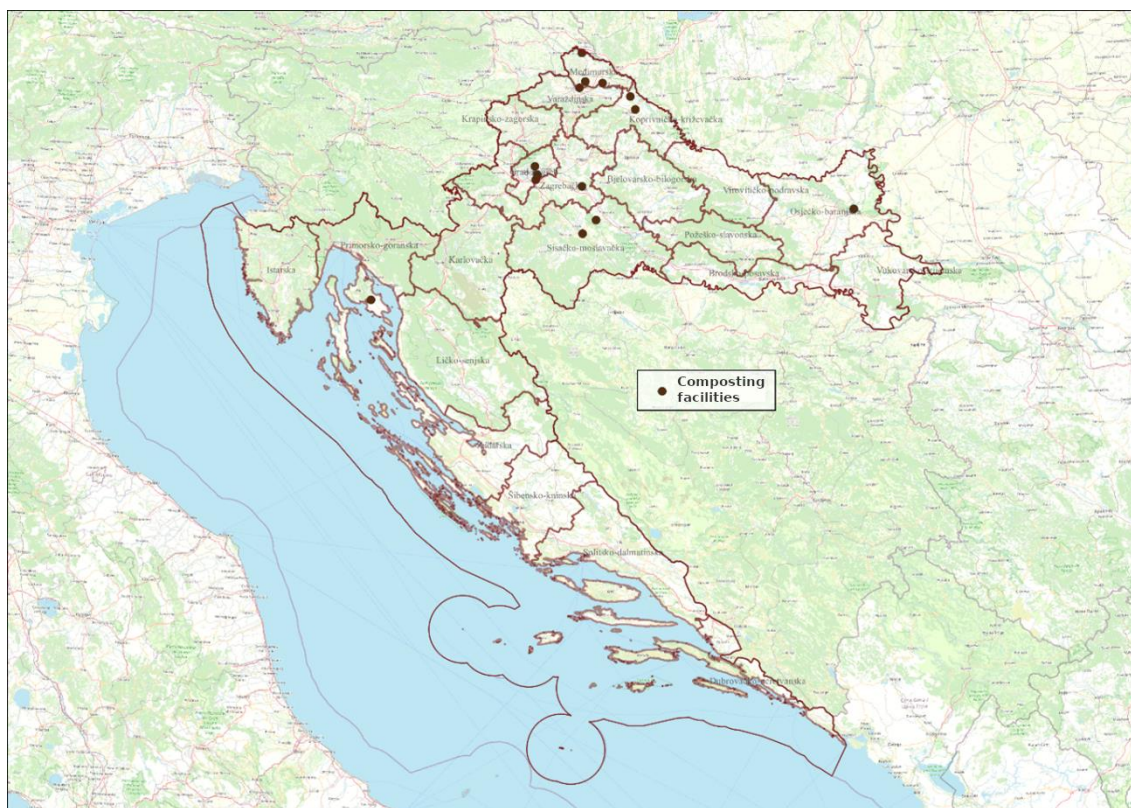
Nr.	County	Waste collection service user	Planned capacity (t/y)
1	Dubrovnik-Neretva	ČISTOĆA METKOVIĆ JSC, utility services, METKOVIĆ	5,720
2	Koprivnica-Križevci	KOMUNALNE USLUGE ĐURĐEVAC JSC, utility services, ĐURĐEVAC	3,000
3	Požega-Slavonia	KOMUNALAC POŽEGA JSC, utility services, POŽEGA	1,000
4	Bjelovarsko-Bilogora	KOMUNALAC JSC, utility services, BJELOVAR	4,000
5	Varaždin County	Clip Bio Plus LTD, for services, VARAŽDIN	2,500
6	Slavonski Brod-Posavina	KOMUNALAC LTD, for utility services, Slavonski Brod	5,400
<b>Total</b>			<b>21,620</b>

Note: The list includes only the EU co-financed composting facilities (April 2023).

Source: MESD (Cro. abbrev. MINGOR)



The majority of composting facilities that are currently available are located on the territory of Central and North-Western Croatia (Figure 50).

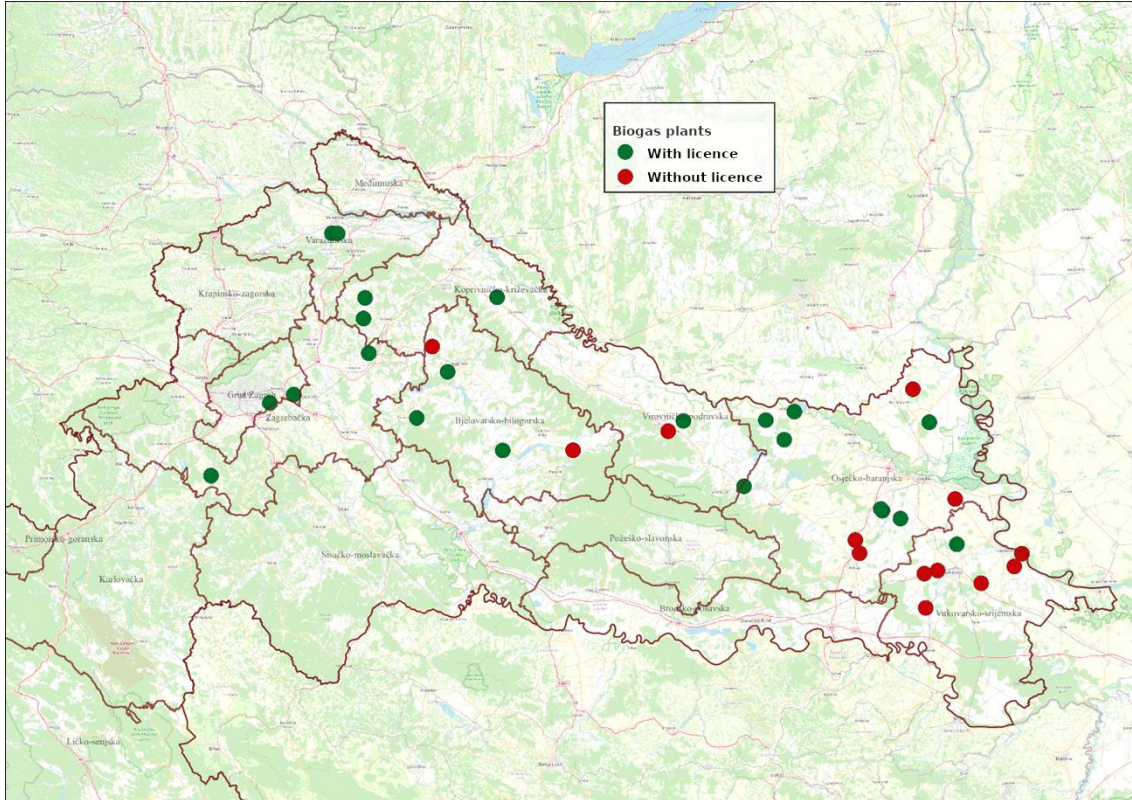


**Figure 50.** Overview of composting facilities in the Republic of Croatia in 2021

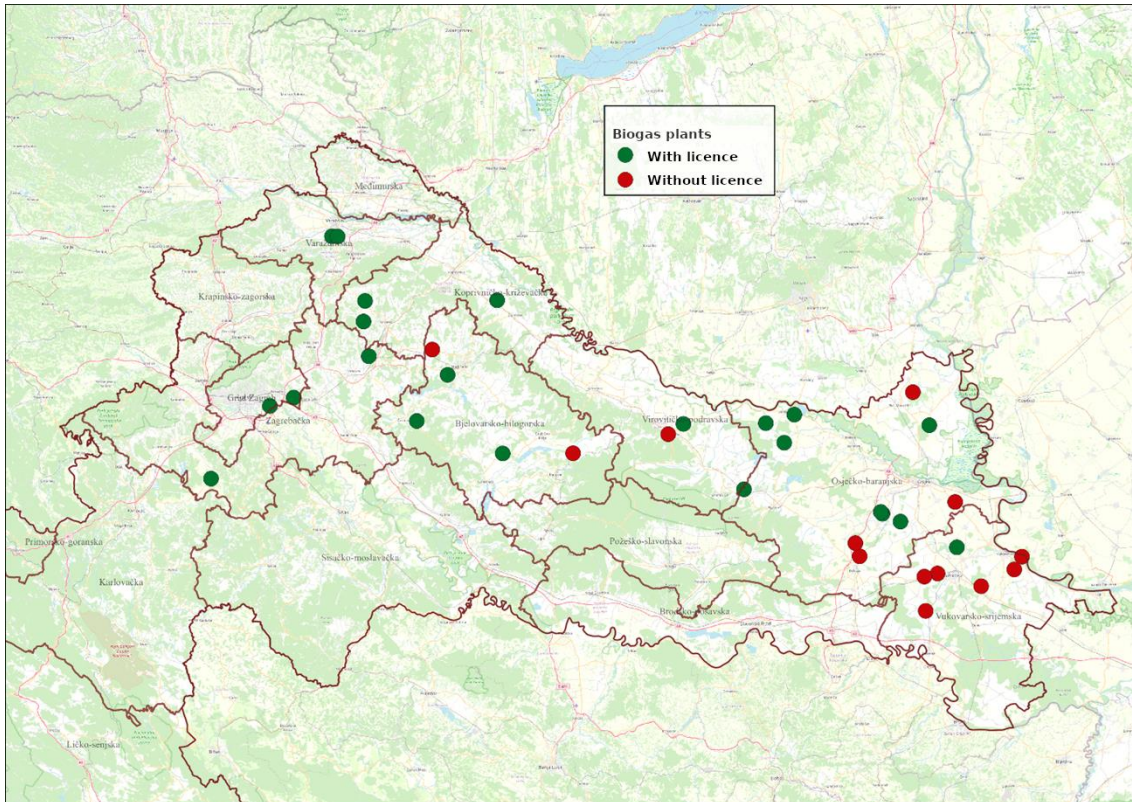
The facilities used for anaerobic biological waste treatment in 2021 included 22 biogas plants, with the total processing capacity of the said facilities according to permits amounting to 839,808 tonnes per year. In addition to the aforementioned, the Ministry of Economy and Sustainable Development (MINGOR) has been monitoring the additional biogas plants listed in the Biogas Plant Register, operating under the authorisation issued by the Ministry of Agriculture, accounting for a total of 35 biogas plants with a total capacity of 1,800,487 tonnes per year in Croatia.

Compared to the 2016 data, when there were 11 biogas plants (including 6 biogas plants with a waste management licence) with a total capacity of 234,800 t/y, a significant increase is evident. However, it is worth mentioning that the current total capacity of biogas plants is almost entirely intended for the treatment of manure and plant material from agriculture. The available capacities are minimally used for the treatment of organic waste and sludges (sludges from effluent treatment, sludges from the biological treatment of industrial waste water, sludges from the municipal waste water treatment). In 2021, approx. 80,000 tonnes of bio-waste and 28,000 tonnes of sludge were processed at biogas plants.

**The majority of anaerobic digestion plant capacities are located in Eastern and Central Croatia (Figure 51)**



**Figure 51. Overview of biogas plants in Croatia in 2021**



*Figure 51. Overview of biogas plants in Croatia in 2021*

### **2.4.1.3. Other materials recovery facilities**

#### **2.4.1.3.1. Sorting facilities**

When performing the analysis of the existing capacities for the sorting of separately collected waste, data on the capacities from the Environmental pollution register (Cro. abbrev. ROO) were used for the companies that accepted significant quantities of sorted waste in 2021 for the operation R12 (Exchange of waste for submission to any of the operations numbered R 1 – R 11) for the following EWC codes: 15 01 01, 15 01 02, 15 01 04, 15 01 05, 15 01 06, 20 01 01, 20 01 39 and 20 01 40. Capacities recorded in the Environmental pollution register (ROO) were increased by the capacities of sorting facilities under construction through the Operational programme entitled 'Competitiveness and Cohesion 2014 – 2020'.

Considering the envisaged further development of the municipal waste separation system with the purpose of meeting the objectives under Directive 2008/98/EC, it is necessary to anticipate the construction of additional sorting facilities.

In 2021, the existing capacities of the separately collected waste sorting plant amounted to 211,800 tonnes/year at the national level. The existing capacities for the municipal waste separation, as well as the required capacities for each county are shown in Table 32 (for Scenario nr. 1) and Table 33 (for Scenario nr. 2).

#### **2.4.1.3.2. Crushers and construction waste recovery plants**

When performing the analysis of the existing capacities for the recovery of construction waste, data on the capacities from the Environmental pollution register (Cro. abbrev. ROO) were used for the

companies that accepted sorted waste for the operation R5 (Recycling/reclamation of other inorganic waste materials). The capacities registered in the Environmental pollution register (ROO) were increased by the capacities of crushers/plants under construction/procurement through the Operational programme entitled 'Competitiveness and Cohesion 2014 – 2020'.

In 2021, the existing capacities of crushers and construction waste recovery plants amounted to 5,662,222 tonnes/year at the national level. The existing capacities for construction waste recovery and the required capacities for individual counties are shown in Table 50.

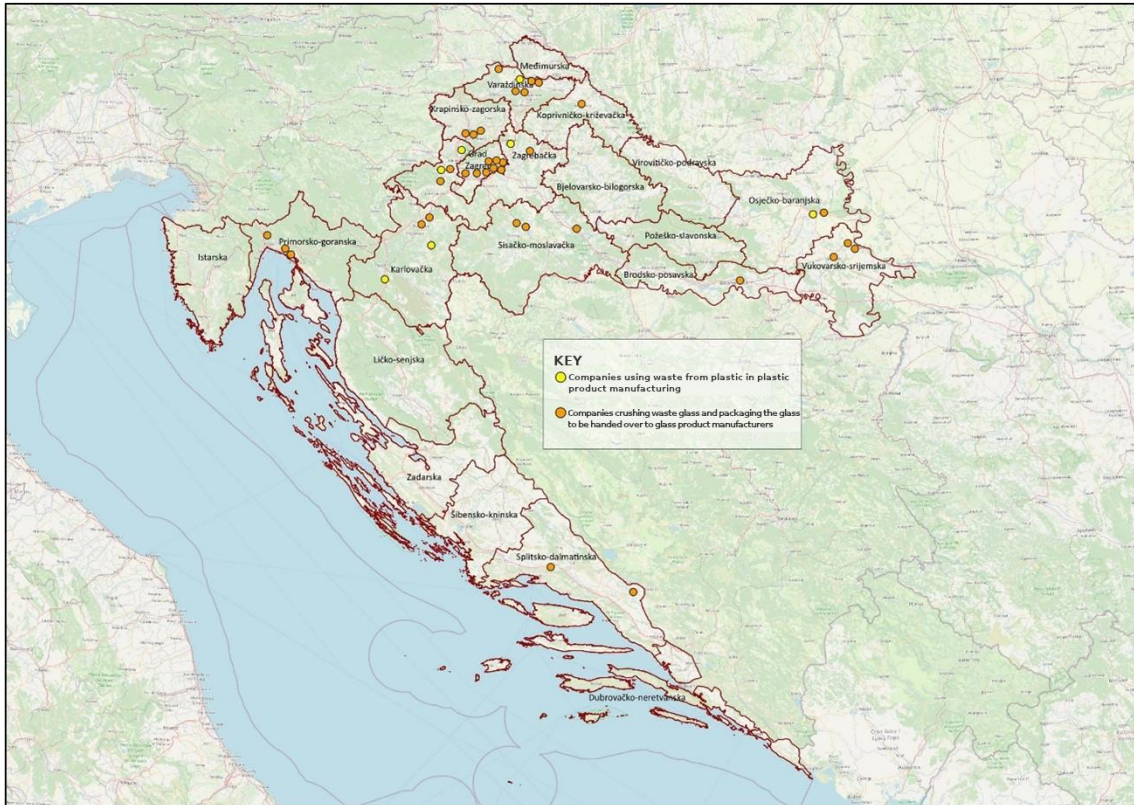
#### **2.4.1.3.3. Recycling plants**

When performing the analysis of the existing capacities of waste recycling plants, data were used on the allowed capacities listed in waste management surveys which are part of waste management permits contained in the Register of Waste Management Permits and Certificates, which is available to the public (<http://regdoz.azo.hr/>), conducted by the Ministry of Economy and Sustainable Development (Cro. abbrev. MINGOR). The said database provides a comprehensive overview of valid waste management licences.

Waste for which the analysis of the existing capacities was conducted is the following: waste electrical and electronic equipment (WEEE), waste batteries and accumulators, end-of-life vehicles, waste paper, waste plastic and waste glass.

Although the licences issued for one of the recovery operations (R3, R4, R5) were taken into consideration, they were issued predominantly for waste pre-treatment operations, such as waste recycling pre-treatment operations (sorting, shredding, baling, etc.), that was evident from the description of the technological process provided in the survey, and in such cases the said capacities were not taken into account.

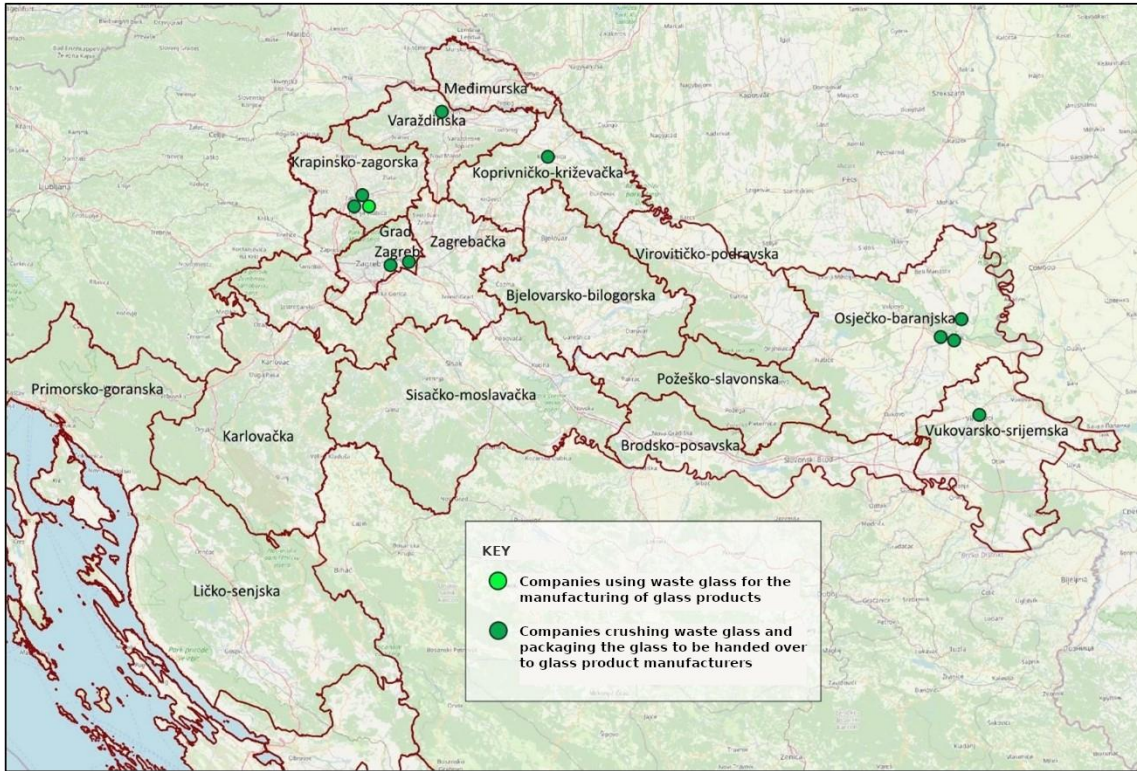
According to the provided data, there were 42 plastic recovery facilities registered in October 2022, including 7 facilities that use plastic waste to manufacture plastic products, while the others produced granules that are resold to plastic product manufacturers (Figure 52).



**Figure 52.** Plastic material recovery plant location

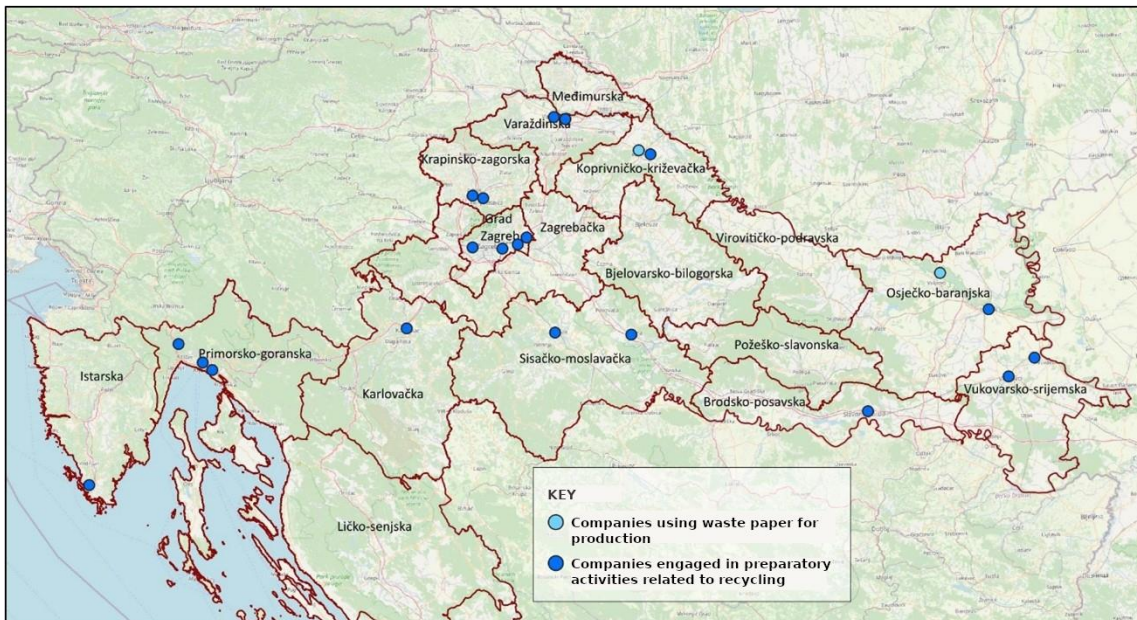
According to the provided data, the total capacity for plastic recycling is 64,248 tonnes/year.

In October 2022, the total glass recycling capacity amounted to 131,400 tonnes/year. Although there are 11 glass recycling facilities registered (Figure 53) Figure 53, all the facilities, except for one of them, are related to the ones where waste glass is crushed and repackaged, and then resold to glass product manufacturers. Although the said companies have acquired the R5 waste treatment licence, these cannot be considered waste recycling capacities.



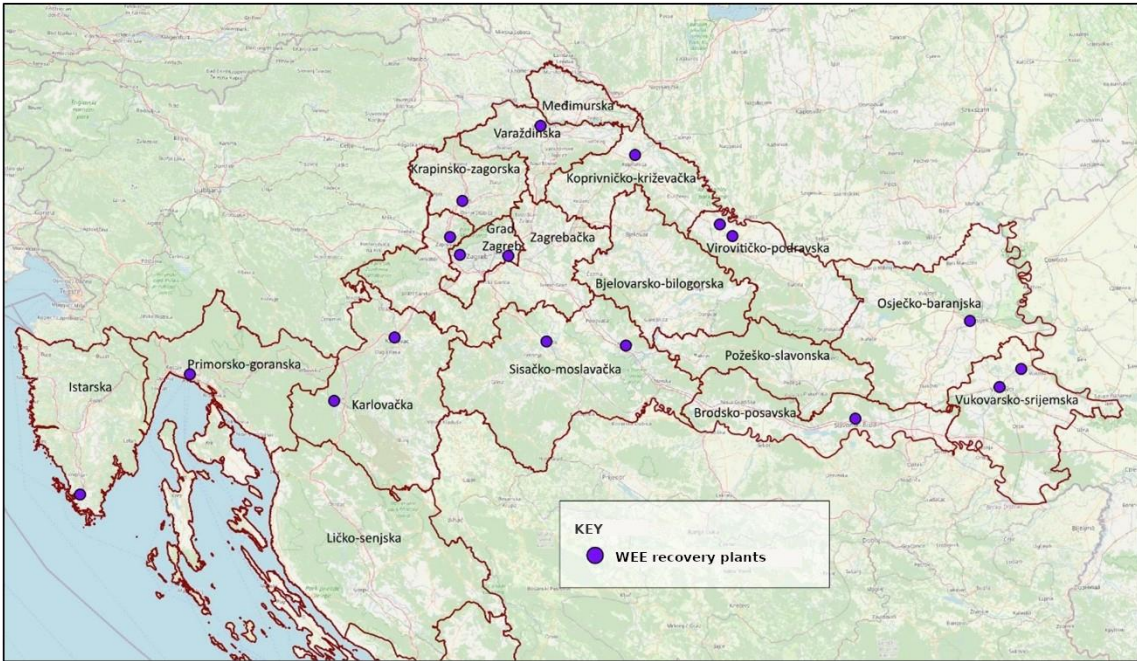
**Figure 53. Glass recycling plant location**

Two companies specialise in paper recycling and the total paper recycling capacity is 349,930 tonnes /year. Other companies with the R3 waste treatment licence perform pre-treatment recycling operations (such as sorting, baling, shredding, etc.).



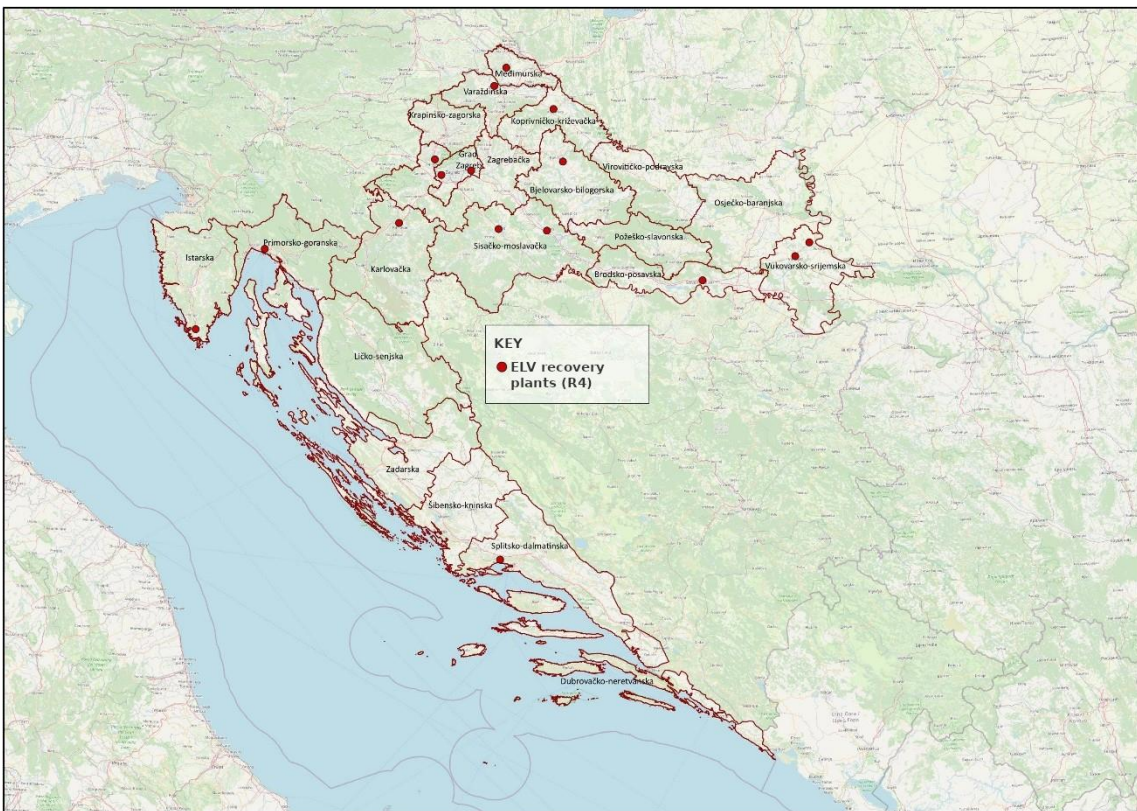
**Figure 54. Paper recycling plant locations**

In October 2022, 5 companies owned the R4 licence for the material recovery of WEEE. They performed WEEE waste recovery in 18 locations, with the total capacity of 64,370 tonnes/year for hazardous waste and 500,510 tonnes/year for non-hazardous waste (Figure 55).



**Figure 55.** Electrical and electronic waste recovery plant locations

The recovery of end-of-life vehicles using the R4 waste recovery operation is performed by 5 companies through 16 facilities with a total capacity of 84,100 tonnes/year for hazardous waste and 453,500 tonnes/year for non-hazardous waste (Figure 56.).



**Figure 56.** End-of-life vehicle recovery plant locations

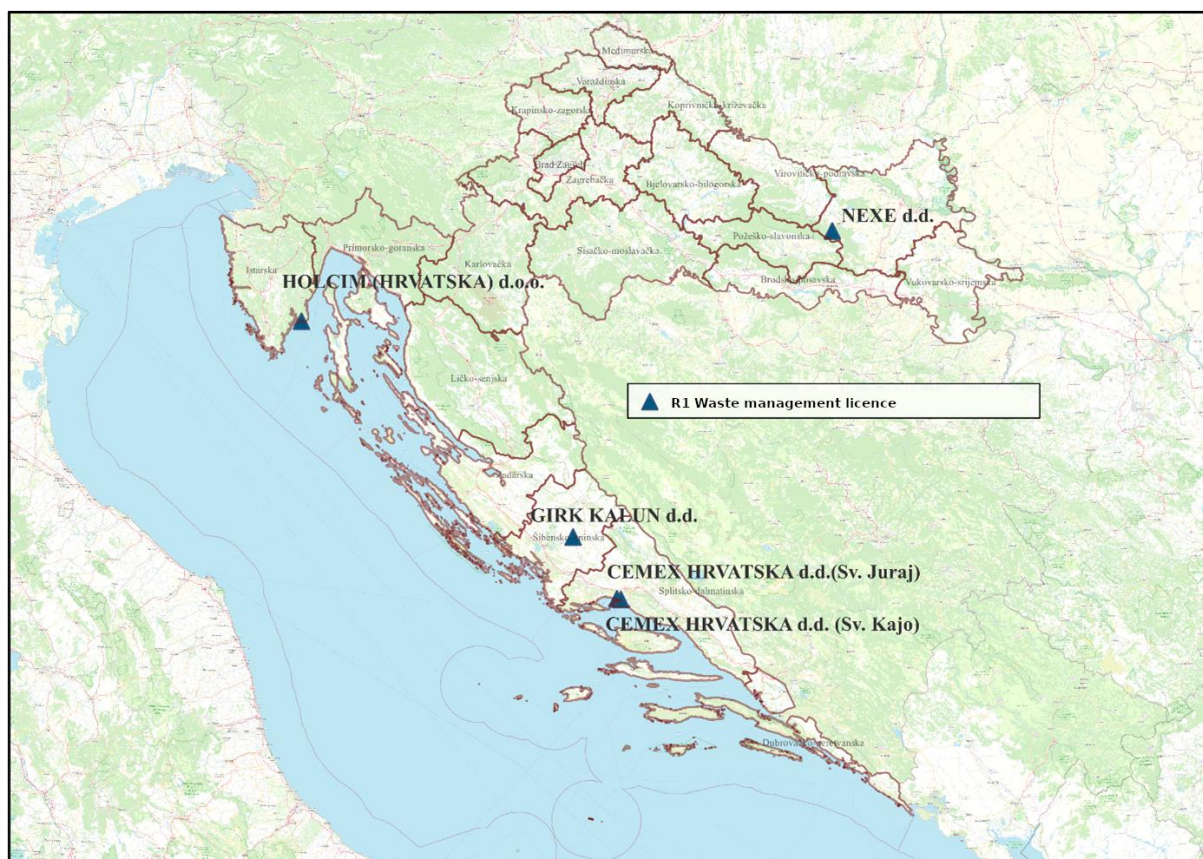
The waste batteries material recovery licence is owned by a single company in Croatia, the facility of which has a total capacity of 10,000 tonnes/year and is located in the Krapina-Zagorje County.

#### 2.4.1.4. Facilities for energy recovery and co-incineration of waste using the R1 waste recovery operation

Until August 2022, there were four companies in Croatia with the licence for waste recovery using the R1 recovery operation in five different locations with a total capacity of 392,479 tonnes/year (Figure 57.).

Additionally, there were 36 energy recovery facilities that, pursuant to the provisions of the Waste Management Act (ZGO) and the Regulation on Waste Management were not required to obtain the waste management licence, but performed their activity on the basis of the registration with the Register of Waste Carriers and recovery Operators. Annex VII. of the Regulation on Waste Management specified the procedures for waste recovery operations for which a waste management licence is not issued, as well as the types and quantities of waste that can be processed using the specific methods.

None of the companies has obtained a licence for waste incineration without energy recovery.



**Figure 57.** Overview of the locations of the plants with valid waste management licences for R1 recovery operation in 2022



### 2.4.1.5. Waste management centres

A Waste Management Centre (WMC) is a waste collection complex with several functionally and/or technologically interrelated buildings and devices used in municipal waste treatment. This system also includes transfer stations where waste is stored, prepared and transferred to the waste treatment facility.

By the beginning of 2023, three waste management centres out of the 11 planned waste management centres in Croatia have been built and are operational, which are the following: Marišćina WMC, Kaštijun WMC and Bikarac WMC.

Biljane Donje WMC is under construction, with a trial run and commissioning being envisaged in 2023.

For the waste management centres in Babina Gora, Lučino Razdolje and Lečevica, contracts for construction works have been signed, while the waste management centre of Piškornica is currently undergoing a public procurement procedure for the purpose of design and construction contracting.

The waste management centre in Piškornica will be built in such a way as to include the Koprivnica-Križevci County, the Krapina-Zagorje County, the Međimurje County and the Varaždin County in the first phase, and the Bjelovar-Bilogora County in the second phase, in line with the objectives of increasing the separately collected waste collection rate.

As for the waste management centres of Orlovnjak, Šagulje and Zagreb, the documents for applying for the EU co-financing is being prepared (Table 18) (Figure 58).

Table 19 shows the waste management centres with the corresponding local self-government units.

In addition to the said waste management centres, private funds have been used to finance the construction of the Mechanical Biological Treatment Plant in the City of Varaždin.

**Table 18.** Completion status of the planned waste management centres, April 2023

Nr.	Name	Completion status
1.	Marišćina WMC	Operational
2.	Kaštijun WMC	Operational
3.	Bikarac WMC	Operational
4.	Biljane Donje WMC	WMC is under construction, with the trial run and commissioning planned for 2023
5.	Babina gora WMC	WMC is under construction, with the trial run planned for 2026
6.	Lečevica WMC	WMC is under construction, with the trial run planned for 2028
7.	Lučino razdolje WMC	WMC is under construction, with the trial run planned for 2026
8.	Piškornica WMC	The public procurement procedure related to WMC construction works is underway
9.	Orlovnjak WMC	Preparation of documents for applying for the EU co-financing
10.	Šagulje WMC	Preparation of documents for applying for the EU co-financing
11.	Zagreb WMC	Preparation of documents for applying for the EU co-financing

Source: MESD (Cro. abbrev. MINGOR)

**Table 19. List of waste management centres with the corresponding local self-government units**

Nr.	Name	County	Corresponding local self-government units
1.	Marišćina WMC	Primorje-Gorski kotar	Towns: Bakar, Cres, Crikvenica, Čabar, Delnice, Kastav, Kraljevica, Krk, Mali Lošinj, Novi Vinodolski, Opatija, Rab, Rijeka, Senj, Vrbovsko;  Municipalities: Baška, Brod Moravice, Čavle, Dobrinj, Fužine, Jelenje, Klana, Kostrena, Lokve, Lopar, Lovran, Malinska-Dubašnica, Matulji, Mošćenička Draga, Mrkopalj, Omišalj, Punat, Ravna Gora, Skrad, Vinodolska općina, Viškovo and Vrbnik.
2.	Kaštijun WMC	Istria	<i>All the LSGUs</i> Towns: Buje, Buzet, Labin, Novigrad, Pazin, Poreč, Pula, Rovinj, Umag, Vodnjan;  Municipalities: Bale, Barban, Brtonigla, Cerovlje, Fažana, Funtana, Gračišće, Grožnjan, Kanfanar, Karojba, Kaštelir-Labinci, Kršan, Lanišće, Ližnjan, Lupoglav, Marčana, Medulin, Motovun, Oprtalj, Pićan, Raša, Sveta Nedelja, Sveti Lovreč, Sveti Petar u Šumi, Svetvinčenat, Tar-Vabriga, Tinjan, Višnjan, Vižinada, Vrsar, Žminj.
3.	Bikarac WMC	Šibenik-Knin	<i>All the LSGUs</i> Towns: Drniš, Knin, Skradin, Šibenik, Vodice;  Municipalities: Bilice, Biskupija, Cijvljane, Ervenik, Kijevo, Kistanje, Murter-Kornati, Pirovac, Primošten, Promina, Rogoznica, Ružić, Tisno, Tribunj, Unešić.
4.	Biljane Donje WMC	Zadar	<i>All the LSGUs</i> Towns: Benkovac, Biograd na Moru, Nin, Obrovac, Pag, Zadar;  Municipalities: Bibinje, Galovac, Gračac, Jasenice, Kali, Kolan, Kukljica, Lišane Ostrovičke, Novigrad, Pakoštane, Pašman, Polača, Poličnik, Posedarje, Povljana, Preko, Privlaka, Ražanac, Sali, Stankovci, Starigrad, Sukošan, Sveti Filip i Jakov, Škabrnja, Tkon, Vir, Vrsi, Zemunik Donji.
		Part of the Lika-Senj County	Towns: Gospić i Novalja;  Municipalities: Karlobag, Lovinac, Donji Lapac, Perušić, Udbina.
5.	Babina gora WMC	Karlovac	<i>All the LSGUs</i> Towns: Duga Resa, Karlovac, Ogulin, Ozalj, Slunj;  Municipalities: Barilović, Bosiljevo, Cetingrad, Draganić, Generalski stol, Josipdol, Kamanje, Krnjak, Lasinja, Netretić, Plaški, Rakovica, Ribnik, Saborsko, Tounj, Vojnić, Žakanje.
		Part of the Lika-Senj County	Town: Otočac;  Municipalities: Brinje, Plitvička jezera (Plitvice Lakes), Vrhovine.
		Part of the Sisak-Moslavina County	Town: Glina;  Municipalities: Gvozd and Topusko.
6.	Lečevica WMC	Split-Dalmatia	<i>All the LSGUs</i> Towns: Hvar, Imotski, Kaštela, Komiža, Makarska, Omiš, Sinj, Solin, Split, Stari Grad, Supetar, Trilj, Trogir, Vis, Vrgorac, Vrljika;  Municipalities: Baška Voda, Bol, Brela, Cista Provo, Dicmo, Dugi Rat, Dugopolje, Gradac, Hrvace, Jelsa, Klis, Lečevica, Lokvičići, Lovreč, Marina, Milna, Muć, Nerežišća, Okrug, Otok, Podbablje, Podgora, Podstrana, Postira, Prgomet, Primorski Dolac, Proložac, Pučišća, Runovići, Seget, Selca, Sućuraj, Sutivan, Šestanovac, Šolta, Tučepi, Zadvarje, Zagvozd, Zmijavci.
7.	Lučino razdolje WMC	Dubrovnik-Neretva	<i>All the LSGUs</i> Towns: Dubrovnik, Korčula, Metković, Opuzen, Ploče;  Municipalities: Blato, Dubrovačko primorje, Janjina, Konavle, Kula Norinska, Lastovo, Lumbarda, Mljet, Orebić, Pojezerje, Slivno, Smokvica, Ston, Trpanj, Vela Luka, Zažablje, Župa dubrovačka.
8.	Piškovnica WMC *)	Koprivnica-Križevci (all the LSGUs),	<i>All the LSGUs</i> Towns: Đurđevac, Koprivnica, Križevci;

Nr.	Name	County	Corresponding local self-government units
			Municipalities: Drnje, Đelekovec, Ferdinandovac, Gola, Gornja Rijeka, Hlebine, Kalinovac, Kalnik, Kloštar Podravski, Koprivnički Bregi, Koprivnički Ivanec, Legrad, Molve, Novigrad Podravski, Novo Virje, Peteranec, Podravske Sesvete, Rasinja, Sokolovac, Sveti Ivan Žabno, Sveti Petar Orehovec, Virje.
		Krapina-Zagorje (all the LSGUs),	<p><i>All the LSGUs</i> Towns: Donja Stubica, Klanjec, Krapina, Oroslavje, Pregrada, Zabok, Zlatar;</p> <p>Municipalities: Bedekovčina, Budinščina, Desinić, Đurmanec, Gornja Stubica, Hrašćina, Hum na Sutli, Jesenje, Konjščina, Kraljevec na Sutli, Krapinske Toplice, Kumrovec, Lohor, Mače, Marija Bistrica, Mihovljan, Novi Golubovec, Petrovsko, Radoboj, Stubičke Toplice, Sveti Križ Začretje, Tuhelj, Veliko Trgovišće, Zagorska Sela, Zlatar Bistrica.</p>
		Međimurje	<p><i>All the LSGUs</i> Towns: Čakovec, Mursko Središće, Prelog;</p> <p>Municipalities: Belica, Dekanovec, Domašinec, Donja Dubrava, Donji Kraljevec, Donji Vidovec, Goričan, Gornji Mihaljevec, Kotoriba, Mala Subotica, Nedelišće, Orehovica, Podturen, Pribislavec, Selnica, Strahoninec, Sveta Marija, Sveti Juraj na Bregu, Sveti Martin na Muri, Šenkovec, Štrigova, Vratušinec.</p>
		Varaždin	<p><i>All the LSGUs</i> Towns: Ivanec, Lepoglava, Ludbreg, Novi Marof, Varaždin, Varaždinske Toplice;</p> <p>Municipalities: Bednja, Beretinec, Breznica, Breznički Hum, Cestica, Donja Voća, Gornji Knežinec, Jalžabet, Klenovnik, Ljubeščica, Mali Bukovec, Martijanec, Maruševec, Petrijanec, Sračinec, Sveti Đurđ, Sveti Ilija, Trnovec Bartolovečki, Veliki Bukovec, Vidovec, Vinica, Visoko.</p>
		Bjelovar-Bilogora	<p><i>All the LSGUs</i> Towns: Bjelovar, Čazma, Daruvar, Garešnica, Grubišno Polje;</p> <p>Municipalities: Berek, Dežanovac, Đulovac, Hercegovac, Ivanska, Kapela, Končanica, Nova Rača, Rovišće, Severin, Sirač, Šandrovac, Štefanje, Velika Pisanica, Velika Trnovitica, Veliki Grđevac, Veliko Trojstvo, Zrinski Topolovac.</p>
9.	Orlovnjak WMC	Osijek-Baranja	<p><i>All the LSGUs</i> Towns: Beli Manastir, Belišće, Donji Miholjac, Đakovo, Našice, Osijek, Valpovo;</p> <p>Municipalities: Antunovac, Bilje, Bizovac, Čeminac, Čepin, Darda, Donja Motičina, Draž, Drenje, Đurđenovac, Erdut, Ernestinovo, Feričanci, Gorjani, Jagodnjak, Kneževi Vinogradi, Koška, Levanjska Varoš, Magadenovac, Marijanci, Petlovac, Petrijevci, Podgorač, Podravska Moslavina, Popovac, Punitovci, Satnica Đakovačka, Semeljci, Strizivojna, Šodolovci, Trnava, Viljevo, Viškovci, Vladislavci, Vuka.</p>
		Vukovar-Srijem	<p><i>All the LSGUs</i> Towns: Ilok, Otok, Vinkovci, Vukovar, Županja;</p> <p>Municipalities: Andrijaševci, Babina Greda, Bogdanovci, Borovo, Bošnjaci, Cerna, Drenovci, Gradište, Gunja, Ivankovo, Jarmina, Lovas, Markušica, Negoslavci, Nijemci, Nuštar, Privlaka, Stari Jankovci, Stari Mikanovci, Štitar, Tompojevci, Tordinci, Tovarnik, Trpinja, Vođinci, Vrbanja.</p>
10.	Šagulje WMC	Slavonski Brod-Posavina	<p><i>All the LSGUs</i> Towns: Nova Gradiška, Slavonski Brod;</p> <p>Municipalities: Bebrina, Brodski Stupnik, Bukovlje, Cernik, Davor, Donji Andrijević, Dragalić, Garčin, Gornja Vrba, Gornji Bogičevci, Gundinci, Klakar, Nova Kapela, Okučani, Oprisavci, Oriovac, Podcrkavlje, Rešetari, Sibinj, Sikirevci, Slavonski Šamac, Stara Gradiška, Staro Petrovo Selo, Velika Kopanica, Vrbje, Vrpolje.</p>
		Požeška-Slavonia	<p><i>All the LSGUs</i> Towns: Kutjevo, Lipik, Pakrac, Pleternica, Požega;</p>

Nr.	Name	County	Corresponding local self-government units
			Municipalities: Brestovac, Čaglin, Jakšić, Kaptol, Velika.
		Part of the Sisak-Moslavina County	Towns: Sisak, Petrinja, Novska, Popovača, Kutina, Hrvatska Kostajnica; Municipalities: Donji Kukuruzari, Dvor, Hrvatska Dubica, Jasenovac, Lekenik, Lipovljani, Majur, Martinska Ves, Sunja, Velika Ludina.
		Virovitica-Podravina	<i>All the LSGUs</i> Towns: Virovitica, Slatina, Orahovica Municipalities: Crnac, Čačinci, Čađavica, Gradina, Lukač, Mikleuš, Nova Bukovica, Pitomača, Sopje, Suhopolje, Špišić Bukovica, Voćin, Zdenci
11.	Zagreb WMC	City of Zagreb,	Zagreb
		Zagreb County	<i>All the LSGUs</i> Towns: Dugo Selo, Ivanić-Grad, Jastrebarsko, Samobor, Sveta Nedelja, Sveti Ivan Zelina, Velika Gorica, Vrbovec, Zaprešić; Municipalities: Bedenica, Bistra, Brckovljani, Brdovec, Dubrava, Dubravica, Farkaševac, Gradec, Jakovlje, Klinča Sela, Kloštar Ivanić, Krašić, Kravarsko, Križ, Luka, Marija Gorica, Orle, Pisarovina, Pokupsko, Preseka, Pušća, Rakovec, Rugvica, Stupnik, Žumberak.

\*) Piškornica WMC will be built in such a way as to include the Koprivnica-Križevci County, the Krapina-Zagorje County, the Međimurje County and the Varaždin County in the first phase, and the Bjelovar-Bilogora County in the second phase, in line with the objectives of increasing the separately collected waste collection rate.



**Figure 58.** Position and status of the implementation of the envisaged waste management centres, April 2023

The 54 transfer stations are envisaged next to the 11 planned WMCs. Table 20. provides an overview and the completion status of individual transfer stations to be built.

**Table 20. Overview and status of the completion of the planned waste transfer stations (status April, 2023)**

WMC	TS	Location (county)	Location (LSGU)	Status
1. Marišćina	1. Pržići TS	Primorje-Gorski kotar County	Cres	TS is built and operational
	2. Duplja TS	Primorje-Gorski kotar County	Novi Vinodolski	TS is built and operational
	3. Sorinj TS	Primorje-Gorski kotar County	Rab	TS is built and operational
	4. Treskavac TS	Primorje-Gorski kotar County	Krk	TS is built and operational
	5. Sović Laz TS	Primorje-Gorski kotar County	Delnice	TS is built and operational
	6. Kalvarija TS	Primorje-Gorski kotar County	Mali Lošinj	TS is built and operational
WMC	TS	Location (county)	Location (municipality/town)	Status
2. Kaštijun	1. Košambra TS	Istria County	Poreč	TS is built and operational
	2. Donji Picudo TS	Istria County	Umag	TS is built and operational
	3. Cere TS	Istria County	Labin	TS is built and operational
	4. Griža TS	Istria County	Buzet	TS is built and operational
	5. Lokva Vidotto TS	Istria County	Rovinj	TS is built and operational
	6. Jelenčiči V TS	Istria County	Pazin	TS is built and operational
WMC	TS	Location (county)	Location (municipality/town)	Status
3. Bikarac	1. Biskupija TS	Šibenik-Knin County	Biskupija	TS is built and operational
	2. Pirovac TS	Šibenik-Knin County	Pirovac	TS is built and operational
WMC	TS	Location (county)	Location (municipality/town)	Status
4. Biljane Donje	1. Biograd na Moru	Zadar County	Biograd na Moru	TS is built but not operational
	2. Pag-Povljana	Zadar County	Pag-Povljana	TS is built but not operational
	3. Gračac	Zadar County	Gračac	TS is built but not operational
	4. Rakitovac TS	Lika-Senj County	Gospić	In preparation for construction
WMC	TS	Location (county)	Location (municipality/town)	Status
5. Lečevica	1. Brač	Split-Dalmatia County	Brač	Under construction
	2. Zagvozd	Split-Dalmatia County	Zagvozd	Under construction
	3. Sinj	Split-Dalmatia County	Sinj	Under construction
	4. Split	Split-Dalmatia County	Split	In the design phase
	5. Hvar	Split-Dalmatia County	Starigrad	In the design phase
	6. Vis	Split-Dalmatia County	Vis	In the design phase
WMC	TS	Location (county)	Location (municipality/town)	Status
6. Piškornica	1. Zabok-Gubaševo	Krapina-Zagorje County	Zabok	In the design phase
	2. Varaždin-Poljana Biškupečka	Varaždin County	Varaždin	In the design phase
WMC	TS	Location (county)	Location (municipality/town)	Status
7. Babina gora	1. Karlovac	Karlovac County	Karlovac	Under construction
	2. Slunj	Karlovac County	Slunj	Under construction
	3. Ogulin	Karlovac County	Ogulin	Under construction
	4. Otočac	Lika-Senj County	Podum Otočac	Under construction
WMC	TS	Location (county)	Location (municipality/town)	Status
8. Orlovnjak	1. Beli Manastir	Osijek-Baranja County	Beli Manastir	In the design phase
	2. Belišće	Osijek-Baranja County	Valpovo	In the design phase
	3. Đakovo	Osijek-Baranja County	Budrovci	In the design phase
	4. Našice	Osijek-Baranja County	Ceremošnjak	In the design phase
	5. Stari Jankovci	Vukovar-Srijem County	Stari Jankovci	In the design phase
	6. Županja	Vukovar-Srijem County	Županja	In the design phase
WMC	TS	Location (county)	Location (municipality/town)	Status
9. Lučino razdolje	1. Dubrovnik	Dubrovnik-Neretva County	Town of Dubrovnik	In the design phase
		Dubrovnik-Neretva County	Municipality of Janjina, on the Pelješac Peninsula	In the design phase
	2. Janjina			
	3. Metković	Dubrovnik-Neretva County	Town of Metković	In the design phase
	4. Sitnica	Dubrovnik-Neretva County	Municipality of Blato, island of Korčula	In the design phase
	5. Lastovo	Dubrovnik-Neretva County	Municipality of Lastovo, Island of Lastovo	In the design phase
WMC	TS	Location (county)	Location (municipality/town)	Status
10. Šagulje	1. Slavonski Brod	Slavonski Brod-Posavina County	Slavonski Brod	In the design phase

	2.	Pakrac	Požega-Slavonia County	Pakrac	In the design phase
	3.	Požega	Požega-Slavonia County	Požega	In the design phase
	4.	Kutina	Sisak-Moslavina County	Kutina	In the design phase
	5.	Novska	Sisak-Moslavina County	Novska	In the design phase
	6.	Sisak	Sisak-Moslavina County	Sisak	In the design phase
	7.	Virovitica	Virovitica-Podravina County	Virovitica	In the design phase
<b>WMC</b>		<b>TS</b>	<b>Location (county)</b>	<b>Location (municipality/town)</b>	<b>Status</b>
<b>11. Zagreb</b>	1.	Ivanić Grad	Zagreb County	Ivanić Grad	In the design phase
	2.	Dugo Selo	Zagreb County	Dugo Selo	In the design phase
	3.	Vrbovec	Zagreb County	Vrbovec	In the design phase
	4.	Zaprešić	Zagreb County	Zaprešić	In the design phase
	5.	Jastrebarsko	Zagreb County	Jastrebarsko	In the design phase
	6.	Samobor	Zagreb County	Samobor	In the design phase

Source: EPEEF (Cro. abbrev. FZOEU)

#### 2.4.1.6. Landfills

In the period from 2005 to 2021, a total of 317 official landfilling locations have been registered. During 2021, waste was disposed of in 88 landfills. Municipal waste was disposed of in 80 landfills, and industrial waste was disposed of at 8 disposal sites. During 2021, 1,582,949 tonnes of waste (municipal waste and other types of waste) were disposed of, accounting for a reduction of 16 % compared to 2015, when 1,889,201 tonnes of waste were disposed of.

By the end of 2021, 229 landfill sites had been closed, and waste had been relocated from 96 locations where landfills were once located. From 2015 to the end of 2021, the number of remediated landfills increased from 171 to 229, with remediation activities in progress at 86 locations.

There are no hazardous waste landfills in the Republic of Croatia.

According to landfill operators' estimates, by the end of 2021, the total remaining capacity in all the landfills amounted to 16,624,770 tonnes. These capacities are based on the existing documents and issued licences, with the possibility of expansion, depending on the available space, needs and the selected approach to the treatment of the specific types of waste. Table 21. provides an overview of the status and capacities of active landfills for individual counties.

The overview of landfills in Croatia is shown in Figure 59.

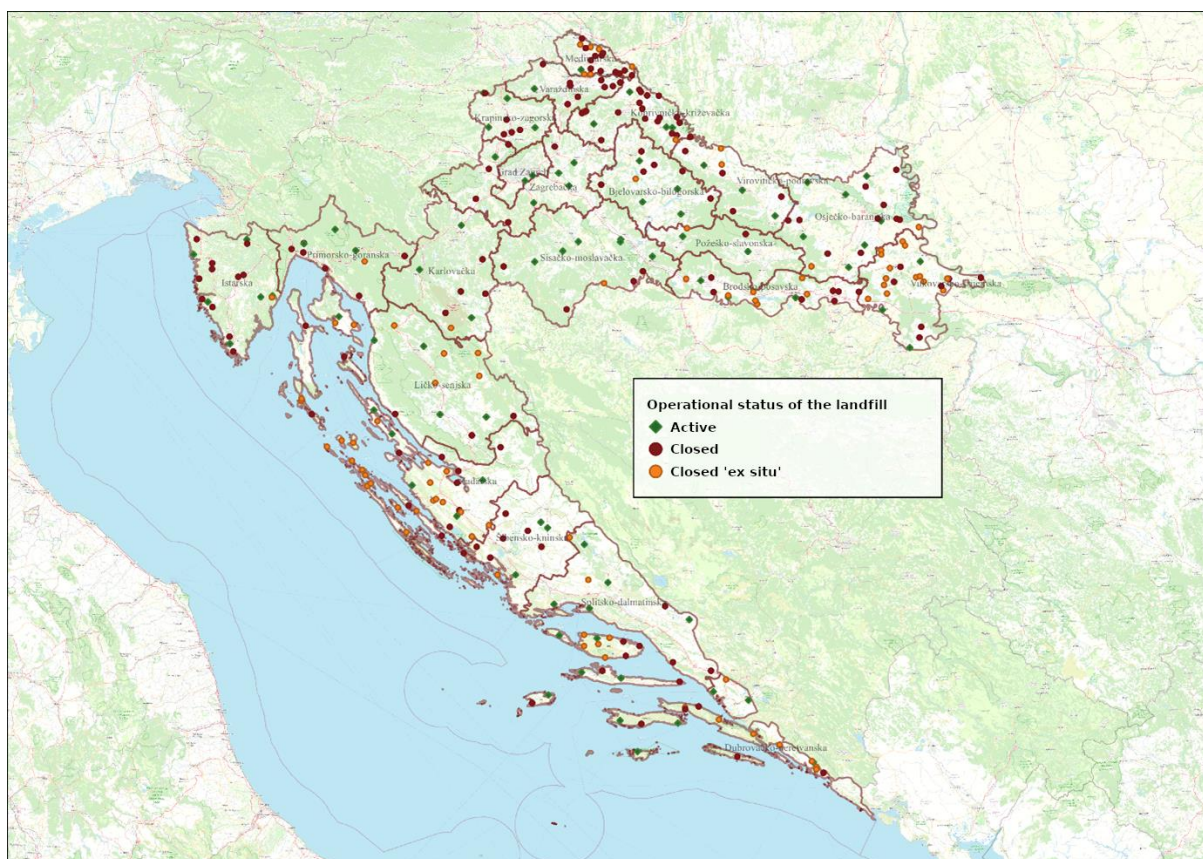


Figure 59. Locations of landfills in Croatia in 2021

Table 21. Overview of the status and capacities of active landfill sites by county in 2021

County	Active landfills	Active municipal waste landfills	Remaining capacities of all the active landfills (t)	Remaining capacities of active municipal waste landfills (t)
Bjelovar-Bilogora	4	4	217,630	217,630
Slavonski Brod-Posavina	3	3	82,203	82,203
Dubrovnik--Neretva	6	6	135,249	135,249
City of Zagreb	2	1	1,256,397	1,256,397
Istria	6	3	768,040	173,249
Karlovac	3	3	75,935	75,935
Koprivnica-Križevci	4	3	167,598	127,679
Krapina-Zagorje	4	4	60,981	60,981
Lika-Senj	5	5	134,201	134,201
Međimurje	1	1	10,300	10,300
Osijek-Baranja	7	7	279,657	279,657
Požega-Slavonia	2	2	98,830	98,830
Primorje-Gorski kotar	5	5	1,676,566	1,676,566
Sisak-Moslavina	6	5	6,303,557	116,936
Split-Dalmatia	10	10	626,520	626,520
Šibenik-Knin	3	2	89,274	78,500
Varaždin	1	1	34,571	34,571
Virovitica-Podravina	3	3	46,970	46,970
Vukovar-Srijem	3	3	54,002	54,002
Zadar	5	4	2,809,478	2,809,478
Zagreb County	5	5	1,696,809	1,696,809
<b>Total</b>	<b>88</b>	<b>80</b>	<b>16,624,770</b>	<b>9,792,665</b>

Source: MESD (Cro. abbrev. MINGOR)

Continuous efforts are being made to improve the monitoring system for achieving the set objectives and to implement measures aimed at reducing waste disposal. This is supported by the adoption of the Decision on the Sequence and Schedule of Landfill Closures (Official Gazette No. 3/19, 17/19 - correction, and 45/23 - Decision and Ruling of the Constitutional Court of the Republic of Croatia). The Decision, among other things, determined the schedule and deadline for closing non-hazardous waste landfills for individual counties, which were supposed to be closed by December 31st, 2018. All the 26 planned landfills were closed by the end of 2020.

Landfill remediation is being carried out continuously and is progressing at a reasonable pace. This is supported by the fact that remediation has been completed or is underway at more than 79% of all the official landfills in Croatia, while remediation is in the preparation phase at the remaining landfills.

Regarding environmental protection measures implemented at landfills and the equipment of landfills, it is important to note that on most landfills that were active in 2021, waste levelling, compaction, and covering are being carried out (95% of landfills). Around 70% of active landfills have drainage systems for leachate, and about 60% have gas collection systems.

In order to reduce the amounts of waste being disposed of and achieve the prescribed objectives for reducing the disposal of biodegradable municipal waste, it is essential to intensify the existing implementation of measures aimed at separation of municipal waste, as well as the equipment and construction of infrastructure for the composting and recycling of municipal waste, and the introduction of landfill charges in the upcoming period.

## **2.4.2. The existing waste management systems**

### **2.4.2.1. Construction waste**

The comparison of data on reported construction and demolition waste generated with economic and other indicators for the construction industry indicates the insufficient understanding of the flows of construction and demolition waste and the need to provide a better implementation of the waste management system for this specific waste category. There is also a need to improve the quality of data, primarily for mixed types of waste (demolition waste, debris), which are underreported in some areas of Croatia. The cause, besides insufficient awareness among waste producers, can be explained by the lack of, or insufficient, waste processing capacity in certain regions, ultimately resulting in a significant portion of waste not being managed in accordance with issued licences, thus remaining unrecorded within the official system. Improvements are expected only when addressing the issue of inadequate infrastructure or through enhanced inspection oversight, and all the participants in the construction and demolition waste management system are required to make an effort.

A total of 300 companies own a construction waste treatment (pre-treatment), recovery or disposal licence. The processing of construction waste is performed in 190 different locations, predominantly on the territory of the City of Zagreb, The Zagreb County, the Varaždin County and the Osijek-Baranja County, and, to a lesser extent, in the Lika-Senj, Požega-Slavonia County and Virovitica-Podravina counties.

The majority of licences are issued for scrap metal, concrete, bricks, roofing/ceramic tiles and ceramics, as well as soil (including the soil excavated from polluted sites), stone and dredging spoils. The licence for one of the construction waste material recovery procedures (not including pre-treatment processes) has been obtained by 200 companies. Some counties must provide additional



capacities for the processing of specific types of waste, predominantly mineral non-hazardous construction waste.

In 2021, 45 crushers were identified which are intended for the processing of mineral construction waste.

#### **2.4.2.2. Construction waste containing asbestos**

For the purpose of disposing of construction waste containing asbestos (D5 code - disposal of waste in specially engineered landfill cells (disposal in interconnected chambers that are closed and isolated from each other and from the environment, etc.)), the 'cassettes' were constructed at 18 selected waste disposal sites. The total capacity of all the 18 constructed cassettes is approximately 87,100 m<sup>3</sup> (Figure 60).

The filling intensity of the cassettes decreased after 2016 when the co-financing of the collection system in the EPEEF system ceased.

In some counties waste is not disposed of in the built landfill cells (cassettes). There are 12 such cassettes, located in the following counties: Međimurje, Lika-Senj (filled), Bjelovar-Bilogora, Vukovar-Srijem, Virovitica-Podravina, Slavonski Brod-Posavina, Primorje-Gorski kotar, and the City of Zagreb.

In 2021, construction waste containing asbestos was disposed of on the territory of six counties, including: Koprivnica-Križevci, Dubrovnik-Neretva, Split-Dalmatia, Karlovac, Zadar and Požega-Slavonia. In 2021, in the Požega-Slavonia County, a new landfill cell (cassette) intended for the disposal of asbestos was built and commissioned.

On the territory of six counties in Croatia, cassettes intended for the disposal of construction waste containing asbestos have not been built. These counties include the following: Zagreb County, Krapina-Zagorje, Sisak-Moslavina, Varaždin County, Šibenik-Knin, Istria County and the Osijek-Baranja County.



**Figure 60.** *Cassette layout and status of disposal of construction waste containing asbestos in 2021*

### 2.4.2.3. Waste polychlorinated biphenyls (PCBs) and polychlorinated terphenyls (PCTs)

In the period from 2008 to 2021, there has been an evident cumulative increase in the disposal of equipment containing PCBs. However, compared to the previous period, from 2017 to 2021, the annual average amount of disposed equipment has decreased due to the fact that 58 % of the remaining equipment containing PCBs is owned by the companies that went bankrupt or were revoked.

Since there is a specific number of new holders of PCB-contaminated equipment every year, there are potentially still some companies that have not recognised their own responsibilities and obligations under the Regulation on the Management of Polychlorinated Biphenyls and Polychlorinated Terphenyls (Official Gazette no.54/23).

The delay in disposing of the remaining quantities is mainly due to the economic situation and the lack of financial resources for the replacement and disposal of equipment containing PCBs.

Equipment containing PCBs (transformers, capacitors) is processed abroad, which is currently an appropriate way of managing this type of waste and will continue in the upcoming planning period.

#### **2.4.2.4. Public municipal waste collection service**

In 2021, the separate collection of the municipal waste as part of the public service was performed in one of the following ways: through waste bins at users' premises ('doorstep' system), garbage bins placed in public areas, as well as stationary and/or mobile recycling centres.

According to data collected through the reports on the work of public service providers (Cro. abbrev. IRDJU), in 2021 there were 522 LSGUs (94 %), accounting for 124 towns and 398 municipalities that had met the separate waste collection requirements for at least one of the four following municipal waste categories: paper/cardboard, plastics, glass and metal. On the other hand, there were 22 LSGUs (4 %) that had not met the requirements for the separate collection of at least one of the four aforementioned municipal waste categories.

Therefore, we can conclude that a total of 408 LSGUs (73 %) had met the conditions for the separate collection of all the four aforementioned municipal waste categories.

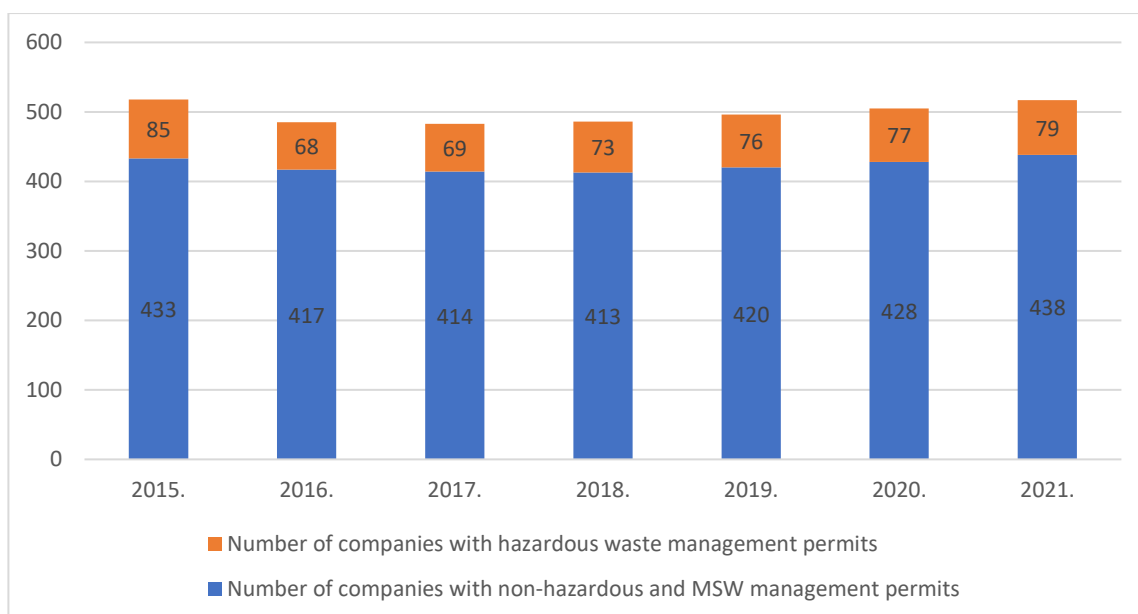
Requirements for the separation of waste paper and cardboard were met by 521 LSGUs (94 %), with 515 (93 %) having met the requirements for the separate collection of plastics, 482 (87 %) for the separate collection of glass and 425 (76 %) of the LSGUs met the conditions required for the separate collection of metal.

By the end of 2021, 66,629 composters were distributed to households, with the City of Zagreb setting a good example with 18,936 composters distributed to households. Composters intended for home composting were distributed on the territory of 111 (20 %) LSGUs, including 62 (48 %) towns and 50 (12 %) municipalities.

The most common criteria for the charging of public service was the bin volume and the frequency with which the bins get emptied in over 90 % of the LSGUs, including all the public service users (both legal and natural persons). According to the weight of the waste handed over, the fee was charged to natural persons on the territory of 7 LSGUs, and on the territory of 14 LSGUs the fee was charged to legal entities.

#### **2.4.3. An overview of the companies engaged in waste management activities**

In the period from 2015 to 2021, the total number of the companies with a waste management licence was stagnating, with minor changes (Figure 61). In 2021, there were 462 companies with a waste management licence. The hazardous waste management licence was issued to 79 companies, and the non-hazardous and municipal waste management licence was issued to 438 companies. Some of the companies have obtained both the hazardous and non-hazardous waste management licences, so their number does not match the total number of companies with the waste management licence.



Source: MESD (Cro. abbrev. MINGOR), Register of Waste Management Permits and Certificates  
**Figure 61.** Number of companies with a waste disposal licence from 2015 to 2020

With the entry into force of the Waste Management Act (ZGO) in July 2021, the companies engaged in waste collection are required to be entered in the Register of Waste Collectors and Recovery Operators, forming part of the Waste Management Activity Register, with no licence being issued for the specific waste management activity. The Register also includes the waste recovery operators who carry out recycling processes that do not require the issuing of a waste management licence. In accordance with the previous Sustainable Waste Management Act (Official Gazette no. 94/13, 73/17, 14/19, 98/19), the recyclers who were not required to obtain a waste management licence were legal entities or physical persons, such as craftsmen and farmers who engaged in energy recovery of non-hazardous waste, if they were entered in the Register of Energy Recovery Operators for a specific waste category. The 2021 Waste Management Act expanded the scope of waste management activities for which a licence will not be required. The list of processes and activities that do not require a waste management licence, as well as the list of recovery processes which do not require the issuing of a waste management licence and the establishment of the Register of Waste Collectors are regulated by a bylaw, i.e., the Regulation on Waste Management (Official Gazette no. 106/22).

In addition to this, the entry into force of the Waste Management Act terminates the obligation of the entry into the register of waste importers/exporters not subject to the notification procedure.

As a result to the said modifications, the jurisdiction for the entry into the Register of Waste Management Activities has changed as well, being transferred to the competent administrative authority of the local (regional) self-government unit or the City of Zagreb. They process the requests for registration in the Register of By-products generated at a location within their jurisdiction, the requests for registration in the Register of waste collectors and recovery operators, and keep records of waste transporters, waste brokers, waste dealers, recycling plants, and waste recovery and reuse centres. The Ministry of Economy and Sustainable Development processes the requests of entry into the End of Waste (EoW) Register.

The number of companies registered for waste management activities from 2015 to 2022 has been on the rise (Table 22). However, some of the registered companies have engaged in the said activities only occasionally.

**Table 22.** Number of companies with a certificate of entry in the Waste Management Activity Register (logbooks and records), August 2022.

Register/Records	Number of companies with the certificate of entry
Register of waste carriers	3645
Register of waste brokers	909
Register of waste dealers	680
Register of civic amenity sites	348
Register of waste exporters not subject to the notification procedure	484
Register of waste importers not subject to the notification procedure	236
Register of by-products	242
End-of-waste Register	94
Register of waste recovery operators for waste not subject to licensing	63

Source: MESD (Cro. abbrev. MINGOR)

The number of companies engaged in the waste management activity is rather satisfactory.

#### 2.4.4. Statuses of the 'hot spot' remediation projects

The 'hot spots' are the areas with high waste pollution level caused by a prolonged and improper management of industrial (technological) waste (such as waste from leather and textile manufacturing, processing and manufacturing residues, mud, oil-contaminated soil and sludge remaining around deep drilling sites, deposits left in tanks, waste from inorganic technological processes, such as acids, alkalis, heavy metal salts, waste from artificial fertiliser production, waste from organic chemical processes, waste from paints, varnishes, pesticides, waste from the photo industry, waste from inorganic thermal processes, residual mineral oil and residual organic solvents, tyres, vehicles and waste prof asbestos production, batteries and accumulators).

The list of 'hot spot' sites and remediation statuses on individual sites is shown in Table 23.

**Table 23.** List and status of remediation of waste 'hot spots' in 2022

Nr. on the map	'Hot spot' – name	Waste type	Remediation status	Description	Potential funding sources
1.	Pools of red sludge and waste lye from the former alumina factory in Obrovac	red mud and waste lye	Inactive	In December 2010, the EPEEF, as an investor, halted construction works even though the remediation works were not completed due to the legal status of the previous contracts for the remediation and an ongoing legal proceeding. Project documentation is being prepared in order to complete the remediation. Partial remediation has been carried out, aiming to dispose of approximately 400,000 cubic metres of red mud and 800,000 cubic metres of waste lye water.	National funding/EPEEF/EU
2.	Coastal area opposite the plant of Salanit JSC in liquidation - Kosica	asbestos	Documents are being prepared	The necessary documentation is being prepared for the project remediation application for EU funding.	National funding/EPEEF/EU

Nr. on the map	'Hot spot' – name	Waste type	Remediation status	Description	Potential funding sources
				It is necessary to remediate an area of 63,000 square metres contaminated with asbestos waste (both on land and in the sea).	
3.	Location with significant amounts of slag and ash: slag landfill in the Bay of Kaštela (Cro. Kaštelanski zaljev).	slag landfill	inactive	The remediation project for the slag landfill in the Bay of Kaštela (Cro. Kaštelanski zaljev) was prepared in 2007, and an amendment to the remediation project was made in 2014. The documentation was submitted to the Town of Kaštela in 2014 to align with spatial planning documents, resolve ownership issues (multiple private owners), address concessions at the pollution site, and determine the boundaries of maritime property. The ash and slag that need to be managed are spread across an area of approximately 200,000 m <sup>2</sup> on the site.	Owner/ LSGU/National funding/ EPEEF/ EU
4.	Location of the laundry and disinfection station in Botovo	oil sludge	inactive	Inactive. By splitting the polluting company, new companies were established. It is necessary to establish responsibility for remediation or the legal successor of the remediation. Additional investigative work is required to determine the exact quantity of contaminated soil (gravel and sand), the type and degree of contamination, and to assess the extent of groundwater pollution.	Legal successor of the polluter/EU
5.	Sovjak Pit near the Town of Rijeka	waste tar	Ongoing remediation	A contract for the design and execution of the Sovjak Pit remediation works has been signed, and the design phase began in 2022. It is necessary to remediate an area of 8,000 square metres.	EPEEF/ EU
6.	DIV LTD. – fuel oil within the TVIK screw factory in Knin	fuel oil	Documentation is being prepared	Under the responsibility of the owner, DIV Ltd. The contamination with tar within the Tvik factory in Knin is estimated to cover an area of 47,940 square metres.	Polluter, the Town of Knin, the Šibenik-Knin County, Hrvatske vode / Croatian water supply company
7.	Phosphogypsum landfill – Petrokemija in Kutina	Phosphogypsum and sour water	Waste water is being treated in line with the Environmental permit for the landfill operation	Flamtron JSC., a company from Kutina, purchased DE-FOS LTD., a state-owned company, formerly established by the Croatian government for the purpose of the non-hazardous waste disposal. The total area of the landfill amounts to 1,700,000 m <sup>2</sup> , with the quantity of the non-hazardous solid waste disposed of estimated at 8,5 million tonnes and the amount of the processed sour water being 2,000,000 m <sup>3</sup>	Owner

Nr. on the map	'Hot spot' – name	Waste type	Remediation status	Description	Potential funding sources
8.	Stone aggregate landfill (the so-called 'Black Hill', Cro. Crno brdo) – Biljane Donje	Stone aggregate	determining the dynamics of further activities	During the remediation of the Ferroalloy and Electrode Factory (TEF JSC.) on the site in Šibenik, which ceased its operations in 1994, the MLM GROUP-ZAGREB LTD. carried out the excavation, collection, crushing, grinding, and separation of ferromanganese and silicomanganese slag in 2009. They sold the separated metal (ferromanganese), while the remaining 'stone aggregate' weighing approximately 140,000 tonnes, was processed between May 2010 and February 2011 and disposed of on the site in Biljane Donje (the so-called 'Black Hill') where it is still located. Between 2008 and 2021, a series of measurements, analyses, and expert assessments were carried out on ferromanganese and silicomanganese slag to examine its suitability for use as stone aggregate in construction and its potential environmental impacts. Regarding the use of slag deposited at the Biljane Donje site, based on the Expert Report on slag deposited at the Crno Brdo (Black Hill) location (parcel 87/1, cadastral municipality of Biljane Donje), number 217/22 dated July 5th, 2022, prepared for the Ministry of Spatial Planning, Construction, and State Assets, it is possible to use the slag with other materials and determine the further course of action.	National funding/EU

By applying the 'polluter pays' principle, the remediation of the Botovo car wash and insecticide station site and the remediation of the fuel oil at the former Tvik screw factory in Knin should be carried out by the legal successor entity.

Regarding the remediation of the phosphogypsum landfill of Petrokemija in Kutina, as part of the restructuring and recapitalisation process of Petrokemija JSC. from Kutina, a state-owned company named DE-FOS Ltd. for the disposal of non-hazardous waste was established. This company was acquired through a tender process by Flamtron Ltd. from Kutina, which is required to remediate and close the phosphogypsum landfill.

### **3. ASSESSMENT OF WASTE MANAGEMENT IN THE REPUBLIC OF CROATIA**

Significant progress has been made in the development of the waste management system in the previous programme period. The establishment of waste management centres continued, a large number of priority sites contaminated with hazardous waste were remediated, as well as non-compliant and illegal landfills. Systems and infrastructure for managing specific waste categories were developed.

By intensifying measures and activities related to separate waste collection and recovery, investing in the construction of new infrastructure and the acquisition of necessary equipment, raising awareness through education, and encouraging the preparation, implementation, and development of various programmes and projects, significant progress has been made in the area of municipal and special waste management.

However, the analysis of waste management in Croatia (Chapter 2) has shown that the existing waste management system is not fully satisfactory. Therefore, further intensification of the said system is required, as well as a better coordination of the corresponding activities.

Onsite segregation of metal, glass, plastics and paper from municipal waste is carried out in the majority of towns and municipalities (93 %). In order to achieve the recycling rate set for municipal waste and similar types of waste, it is necessary to continue with the implementation of informational and educational activities aimed at promoting waste segregation as part of public services. These include building and equipping additional civic amenity sites, purchasing of waste collection equipment, vehicles and vessels, as well as building waste sorting, recycling and recovery facilities.

In addition to the improvement of the waste separation system, the development of an appropriate municipal waste treatment system is essential. Although the proportion of municipal waste disposed of in landfills decreased in the previous planning period, the largest quantities of municipal waste are still disposed of without prior treatment through landfilling. This does not result in a sufficient reduction of biodegradable municipal waste sent to landfills. In order to address this issue, it is necessary to accelerate the establishment of waste management centres, material recovery facilities, and ensure adequate capacity for waste-to-energy processes. Activities related to landfill remediation, closure, and the introduction of landfill charges should continue. It is also necessary to determine the fractions in waste that can be recovered and develop a doorstep collection system in order to collect targeted fractions for recycling.

In order to enable the treatment of biowaste, composting facilities need to be built, especially in the areas with significant seasonal increases in municipal waste volume, including coastal and island municipalities. This also applies to parts of Croatia where such facilities are currently lacking. Alongside the establishment of biowaste treatment systems, intensive education about the importance of separate biowaste collection is necessary.

Considering the establishment of water supply and waste water treatment systems, including the operation of waste water treatment facilities, which leads to an increasing production of sewage sludge, the improvement of the system of material and energy recovery from this type of waste is needed.

As a result of improving the national system for special categories of waste, the quantities of hazardous waste have increased in the previous reference period. Adequate waste management systems and capacities have been established for specific categories of hazardous waste, but systematic



management of hazardous waste as a whole has not been established yet. Due to insufficient infrastructure, hazardous waste is predominantly exported to other countries.

In terms of special categories of waste, a system of extended producer responsibility has been established for six specific waste categories (packaging waste, waste tyres, waste oil, waste batteries and accumulators, end-of-life vehicles, waste electrical and electronic equipment), resulting in intensive growth in the collected and processed quantities of waste. This indicates the maximum has been reached in terms of the existing capacities and organisation of the system.

## 4. WASTE MANAGEMENT OBJECTIVES

The waste management objectives stipulated by the Waste Management Act and the corresponding implementing provisions, have been carried over from the EU regulation by:

- Directive 2008/98/EC
- Directive 1999/31/EC
- Directive 2006/66/EC
- Directive 94/62/EC
- Directive 2000/53/EC
- Directive 2012/19/EC
- Directive 2019/904.

In addition to the afore-mentioned EU legal acts, a more detailed calculation methodology has been regulated for the specific objectives by the following EU legal acts:

- The Commission regulation of 18 November 2011, laying down rules and calculation methods for the verifying of compliance with the targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council (communicated under document number C(2011) 8165) (2011/753/EU) ( OG 310, 25.11.2011.)
- The Commission Implementing Regulation (EU) 2019/1004 of 7 June 2019, establishing rules on calculation, verification and reporting of data on waste in accordance with Directive 2008/98/EC of the European Parliament and of the Council, repealing the Commission Implementing Decision C(2012) (communicated under document number C(2019) 4114) (OG 163, 20.6.2019.)
- The Commission regulation of 22 March 2005 establishing formats relating to the database system pursuant to Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste (communicated under document number C(2005) 854) as last amended by the Commission Implementing Decision (EU) 2019/665 of 17 April 2019 amending Decision 2005/270/EC establishing formats relating to the database system pursuant to Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste (communicated under document number C(2019) 2805) (OG 112, 26.4.2019.)
- The Commission Regulation of 1 April 2005 establishing detailed rules for the monitoring of targets in terms of reuse/recovery and reuse/recycling as referred to in Directive 2000/53/EC of the European parliament and of the Council on end-of-life vehicles (communicated under document number C(2004) 2849) (OG 94, 13. 4. 2005.)
- The Commission Regulation (EU) nr. 493/2012 of 11 June 2012 on the establishing of detailed rules for the calculation of recycling efficiency in waste battery and accumulator recycling processes, pursuant to Directive 2006/66/EC of the European Parliament and of the Council (OG 151, 12.6.2012)
- The Commission Implementing Regulation (EU) 2017/699 of 18 April 2017 establishing a common methodology for the calculation of the weight of electrical and electronic equipment (EEE) placed on the market of each Member State and a common methodology for the calculation of the quantity of waste electrical and electronic equipment (EEE) generated by weight in each Member State (OG 103, 19.4.2017.)
- The Commission Implementing Regulation (EU) 2019/290 of 19 February 2019 establishing the format for registration and reporting of producers of electrical and electronic equipment to the register (OG 48, 20.2.2019.)
- The Commission Implementing Regulation (EU) 2019/2193 of 17 December 2019 laying down rules for the calculation, verification and reporting of data and establishing data formats for

the purposes of Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) (notified under document number C(2019) 8995) (OG 330, 20.12.2019.)

- The Commission Implementing Decision (EU) 2021/958 of 31 May 2021 laying down the format for reporting data and information on fishing gear placed on the market and waste fishing gear collected in Member States and the format for the quality check report in accordance with Articles 13(1)(d) and 13(2) of Directive (EU) 2019/904 of the European Parliament and of the Council (OG 211, 15.6.2021.)
- The Commission Implementing Decision (EU) 2021/2267 of 17 December 2021 laying down the format for reporting data and information on the collected post-consumption waste of tobacco products with filters and of filters marketed for use in combination with tobacco products (OG 455, 20.12.2021.)
- The Commission Implementing Decision (EU) 2021/1752 of 1 October 2021 laying down rules for the application of Directive (EU) 2019/904 of the European Parliament and of the Council as regards the calculation, verification and reporting of data on separate collection of waste single-use plastic beverage bottles (OG 349, 4.10.2021.)
- The Commission Implementing Decision (EU) 2022/162 of 4 February 2022 laying down rules for the application of Directive (EU) 2019/904 of the European Parliament and of the Council as regards the calculation, verification and reporting on the reduction in the consumption of certain single-use plastic products and the measures taken by Member States to achieve such reduction (OG 26, 7.2.2022.).

Table 24 shows the achievement status of the set EU targets.

**Table 24. Status of the achievement of the targets required under EU acts**

EU directive	Time limit	Target	Year	Croatia's target achievement	Indicator	
<b>Waste Framework Directive (EU) 2008/98/EC</b>	12/2020	At least 50% of the total weight of waste generated by households and waste from other sources with waste streams similar to household waste, including at least paper, metal, plastic, and glass, must be recovered through recycling and preparation for reuse.	2021	31 %	Not achieved	
		At least 70% of the weight of non-hazardous construction and demolition waste, except for materials from natural sources defined by code 17 05 04 - soil and stones that are not listed under 17 05 03, must be recovered through recycling, preparation for reuse, and other material recovery processes, including landfilling where waste is used as a substitute for other materials.	2020	60 %	Not achieved	
<b>Directive on packaging and packaging waste (EU) 94/62/EC</b>	Of 31 Dec.2008	Separately collect and recover, either through material or energy recovery, at least 60% of the total weight of packaging waste produced in the Republic of Croatia.	2021	51 %	Not achieved	
		Recycle at least 55% and up to a maximum of 80% of the total weight of packaging waste intended for material recovery.	2021	51 %	Not achieved	
		Minimum annual targets of the recycling of material contained in the packaging waste:				
		(i) 60 % of weight for glass	2021	55 %	Not achieved	
		(ii) 60 % of weight for paper and cardboard	2021	74 %	Achieved	
		(iii) 50 % of weight for metal	2021	25 %	Not achieved	
(iv) 22.5 % of weight for plastic, only including the	2021	34 %	Achieved			

		material recycled back to its original plastic form.			
		(v) 15 % of the weight for wood	2021	16 %	Achieved
<b>Directive on ELV vehicles (EU) 2000/53/EC</b>	1 Jan. 2015	Annual reuse and recovery rate to be at least 95 % of the average vehicle weight.	2021	97.28 %	Achieved
		Annual reuse and recycling rate to be at least 85 % of the average vehicle weight.	2021	97.97 %	Achieved
<b>Directive on batteries (EU) 2006/66/EC</b>	26 Sep. 2016	The annual rate of separate collection of waste batteries and accumulators must be at least 45% of the average annual quantity placed on the market in the past three years.	2021	74 %	Achieved
	Recycling processes must achieve the following minimum recycling efficiencies:				
	26 Sep. 2011	(a) Recycling 65% of the average weight of lead-acid batteries and accumulators, including the recycling of the lead content to the maximum technically feasible extent while avoiding excessive costs.	2021	83 %	Achieved
		(b) Recycling 75% of the average weight of nickel-cadmium batteries and accumulators, including the recycling of the cadmium content to the maximum technically feasible extent while avoiding excessive costs.	2021	79 %	Achieved
(c) Recycling 50% of the average weight of other waste batteries and accumulators.		2021	86 %	Achieved	
<b>Directive on landfills (EU) 1999/31/EC</b>	By 31 Dec. 2020	Reduce the landfilling of biodegradable municipal waste to 35% of the weight of biodegradable municipal waste generated in 1997 (264,661 tonnes).	2021	594,107 t (79 % of the quantity achieved in 1997)	Not achieved
<b>Directive on WEEE (EU) 2012/19/EC</b>	From 2019	The annual rate of separate collection of waste electrical and electronic equipment (WEEE) must be at least 65% of the average weight of electrical and electronic equipment placed on the market in the three previous years or 85% of WEEE produced on the territory of the Republic of Croatia.	2021	56 % <sup>27</sup>	Not achieved
	From 15 Aug. 2018	For the heat exchange equipment: 85% recycling 80% preparation for reuse and recycling of the collected weight.	2021	97 % 95 %	Achieved
		For displays, monitors, and equipment containing displays with a surface area greater than 100 cm <sup>2</sup> : 80% recovery 70% preparation for reuse and recycling of the collected weight.	2021	89 % 89 %	Achieved
		For light bulbs: 80% of the collected weight to be recycled.	2021	89 %	Achieved
		For large equipment with external dimensions larger than 50 cm: 85% recovery 80% preparation for reuse and recycling of the collected weight.	2021	95 % 94 %	Achieved
		For small equipment with no external dimension larger than 50 cm: 75% return 55% preparation for reuse and recycling of the collected	2021	88 % 88 %	Achieved

<sup>27</sup> The first method was used for the purpose of calculating the achievement of the set target, which takes into account the weight of the electrical and electronic equipment placed on the market in the past three years.

		weight.			
		For small IT and communications equipment with no external dimension larger than 50 cm: - 75 % return - 55 % preparation for reuse and recycling of the collected weight.	2021	88 % 88 %	Achieved

The waste management objectives specified in the Waste Management Plan arise from the obligations under the Waste Management Act, i.e., EU legislation (Table 25).

**Table 25. Waste Management Plan objectives**

Nr.	Type of waste	Objective
1.	MSW	Recycle, repair and prepare for reuse at least: <ul style="list-style-type: none"> <li>● 55 % of the MW weight by 2025</li> <li>● 60 % of the MW weight by 2030 and</li> <li>● 65 % of the MW weight by 2035.</li> </ul>
		Allow to all the waste management licence holders in Croatia the disposal of a maximum of 264,661 tonnes of biodegradable municipal waste (35% of the biodegradable municipal waste generated in 1997) in a single calendar year.
		The quantity of municipal waste disposed of in landfills shall not exceed 10% of the total weight of municipal waste produced by 2035.
		Improve the system for collecting and recovering biowaste and separately collect and recycle 36% of biowaste from municipal waste.
2.	Packaging waste	<ul style="list-style-type: none"> <li>❖ Separately collect and recover, either through material or energy recovery, at least 60% of the total weight of packaging waste produced on the territory of Croatia.</li> <li>❖ Recycle 55% - 80% of the total weight of packaging waste intended for material recovery. Process, through recycling, at least the following proportions of material weight in packaging waste: <ul style="list-style-type: none"> <li>● 60 % of weight for glass;</li> <li>● 60 % of weight for paper and cardboard;</li> <li>● 50 % of weight for metal;</li> <li>● 22.5 % of weight for plastic, only including the material recycled back to the original plastic form;</li> <li>● 15 % of weight for wood.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>❖ Recycle at least 65% of the total weight of packaging waste by <b>December 31st, 2025</b>. By December 31st, 2025, process, through recycling, at least the following proportions of material weight in packaging waste: <ul style="list-style-type: none"> <li>● 50 % of plastic;</li> <li>● 25 % of wood;</li> <li>● 70 % of non-ferrous metals;</li> <li>● 50 % of aluminium;</li> <li>● 70 % of glass;</li> <li>● 75 % of paper and cardboard;</li> </ul> </li> <li>❖ Recycle at least 70 % of the total packaging waste weight by no later than <b>December 31st, 2030</b>. By December 31st, 2030, process, through recycling, at least the following proportions of material weight in packaging waste: <ul style="list-style-type: none"> <li>● 55 % of plastic;</li> <li>● 30 % of wood;</li> <li>● 80 % of non-ferrous metals;</li> <li>● 60 % of aluminium;</li> <li>● 75 % of glass;</li> <li>● 85 % of paper and cardboard.</li> </ul> </li> </ul>
3.	Waste single-use plastic products	<ul style="list-style-type: none"> <li>● <b>By 2025</b>, ensure separate collection for recycling of quantities of beverage bottles (up to 3L, including their caps and lids) made primarily of polyethylene terephthalate (PET bottles), equivalent to <b>77%</b> of the weight placed on the market for that year. By 2029, achieve <b>90%</b>.</li> <li>● <b>From 2025</b>, ensure that PET bottles contain at least 25% recycled plastic, calculated as an</li> </ul>

		average for all PET bottles placed on the market in Croatia; and from 2030, ensure a minimum of 30% of the recycled plastic content.
		Achieve a measurable quantitative reduction in the consumption of single-use plastic products (beverage cups, including their caps and lids, food containers, i.e., containers such as boxes, with or without lids, used for food storage) by 2026 compared to 2022.
		Achieve a minimum annual collection rate for plastic-containing fishing gear intended for recycling. <sup>28</sup>
4.	<b>Construction waste</b>	Recycle, prepare for reuse, and use other material recovery methods, including landfilling where waste is used as a substitute for other materials, for at least 70% of the weight of non-hazardous construction and demolition waste, excluding materials specified under the EWC code 17 05 04 - soil and stones not containing hazardous substances, not listed under the EWC code 17 05 03.
5.	<b>ELV vehicles</b>	Meet the following objectives annually: <ul style="list-style-type: none"> <li>● A reuse and recycling rate for end-of-life vehicles accepted for treatment of at least 95% of the average weight of end-of-life vehicles.</li> <li>● A reuse and recycling rate for end-of-life vehicles delivered for treatment of at least 85% of the average weight of end-of-life vehicles.</li> </ul>
6.	<b>Waste batteries and accumulators</b>	Achieve an annual rate of separate collection of waste batteries and accumulators of at least 45% of the average annual quantity placed on the market in the past three years.  Achieve a minimum recycling efficiency as follows: <ol style="list-style-type: none"> <li>65% recycling of the average weight of lead-acid batteries and accumulators, including recycling of lead content to the greatest technically feasible extent while avoiding excessive costs.</li> <li>75% recycling of the average weight of nickel-cadmium batteries and accumulators, including recycling of cadmium content to the greatest technically feasible extent while avoiding excessive costs.</li> <li>50% recycling of the average weight of other waste batteries and accumulators.</li> </ol>
7.	<b>Waste electrical and electronic equipment</b>	Achieve an annual rate of separate collection of waste electrical and electronic equipment (WEEE) of at least 65% of the average weight of electrical and electronic equipment placed on the market in the previous three years or 85% of WEEE generated on the territory of Croatia.  Reuse WEEE on an annual basis for at least: <ul style="list-style-type: none"> <li>● 85% or by preparing for reuse and recycling, at least 80% of the weight of collected heat exchange equipment or large equipment with external dimensions exceeding 50 cm.</li> <li>● 80% or by preparing for reuse and recycling, at least 70% of the weight of collected screens, monitors, and equipment containing screens with a screen area exceeding 100 cm<sup>2</sup>.</li> <li>● 75% or by preparing for reuse and recycling, at least 55% of the weight of collected small equipment with no external dimension exceeding 50 cm, or small IT and telecommunications equipment with no external dimension exceeding 50 cm</li> <li>● Recycle 80% of the weight of collected light bulbs.</li> </ul>
8.	<b>Waste tyres</b>	Ensure: <ul style="list-style-type: none"> <li>● A systematic separate collection of waste tyres.</li> <li>● Treatment of all separately collected waste tyres.</li> <li>● Recycle at least 80% of the weight of separately collected waste tyres in that calendar year in Croatia.</li> </ul>
	<b>Waste oil</b>	Ensure: <ul style="list-style-type: none"> <li>● Separate collection of waste oil.</li> <li>● Treatment of waste oil.</li> </ul>
<b>9. Improve the waste management system for all other special categories of waste not covered by objectives 1-8.</b>		
<b>10. Improve the hazardous waste management system.</b>		
<b>11. Remediate sites contaminated by waste.</b>		
<b>12. Enhance the information system and waste management monitoring.</b>		
<b>13. Improve waste management supervision.</b>		

The objectives, measures, and activities through which Croatia plans to contribute to achieving EU and UN's Agenda 2030 for Sustainable Development, specifically Goal 12.3 on Responsible Production and Consumption with the specific aim of halving per capita food waste at the retail and consumer levels and reducing food losses across the entire production and supply chain by 2030, are defined in the

<sup>28</sup> Minimum annual rate specified in the Directive passed by the Government of the Republic of Croatia

'Plan for the Prevention and Reduction of Food Waste in the Republic of Croatia for the period from 2023 to 2028' (Official Gazette nr. 156/22). This plan falls under the jurisdiction of the Ministry of Agriculture.

## **5. ASSESSMENT OF WASTE FLOW DEVELOPMENT, REQUIREMENTS AND METHODS OF IMPLEMENTATION OF NEW WASTE MANAGEMENT SYSTEMS AND THE CONSTRUCTION OF NEW WASTE MANAGEMENT INFRASTRUCTURE AND PLANTS**

### **5.1. Assessment of the municipal waste flow development**

An estimate of future quantities of municipal and packaging waste has been made for the period from 2023 to 2035. The same was based on a multiple linear regression model, which relied on three indicators that impact the generation of municipal waste:

- Demographic trends in Croatia between the two population censuses in 2011 and 2021 (Source: Croatian Bureau of Statistics – Cro. abbrev. DZS).
- An estimate of Gross Domestic Product (GDP) trends for Croatia (Source: Ministry of Finance, National Development Strategy of the Republic of Croatia until 2030<sup>29</sup>);
- The number of foreign tourist overnight stays in Croatia for the period 2009-2019 (Source: Croatian Bureau of Statistics – Cro. abbrev. DZS).

As for population projections from 2023 to 2035, an arithmetic growth/decline rate was used for the period between 2011 and 2021, which amounted to -0.84% annually.

When determining GDP growth values, estimates from the Ministry of Finance from April 2022 were used for the period from 2023 to 2025. For the period from 2026 onwards, the assumption of an annual GDP growth rate of 3.5% until 2030 was used, as stated in the National Development Strategy of the Republic of Croatia until 2030, which was adopted from the forecasts of the European Commission.

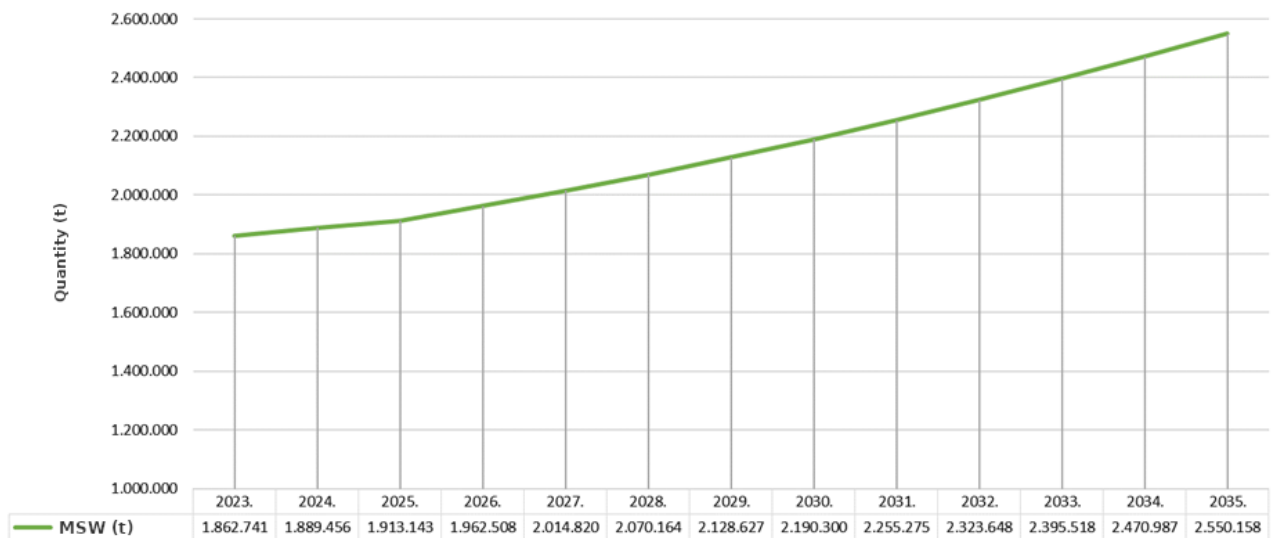
In the estimates of the number of foreign tourist overnight nights, an arithmetic growth/decline rate for the period between 2009 and 2019 was used, which amounted to 6.1%. Due to the significant negative impact of the COVID-19 pandemic on tourist demand in 2020 and 2021, these years were not considered in the estimate, and instead, the previous stable period was taken into account.

The estimate of the amount of the municipal waste in 2028 was 2,070,164 tonnes, and in 2035 there were 2,550,158 tonnes (Figure 62.).

---

<sup>29</sup><http://www.rera.hr/upload/stranice/2021/03/2021-03-10/18/nacionalnarazvojnastategijarhdo2030godine.pdf>





**Figure 62.** Estimates of annual amounts of generated municipal waste for the period from 2023 to 2035

## 5.2. Packaging waste

The estimate of packaging waste quantities has been made for the two following variables:

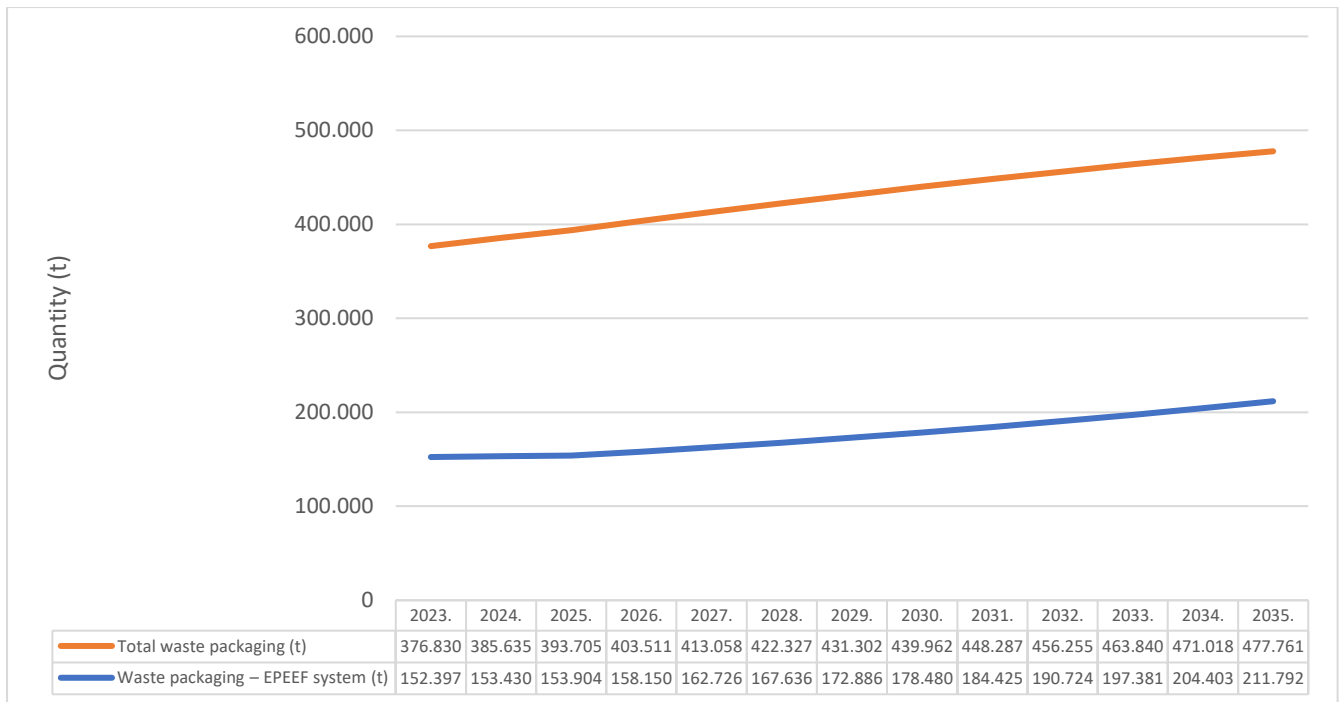
- Packaging waste from the EPEEF system, which includes quantities of packaging waste collected and recorded through the extended producer responsibility system of the EPEEF.
- The total quantity of packaging waste, which, in addition to the quantities from the EPEEF system, also includes quantities of packaging waste not recorded through the EPEEF system.

The estimate shows an increasing trend in quantities for both variables and for the following types of packaging waste: paper and cardboard packaging waste, plastic packaging waste, glass packaging waste, metal packaging waste, wooden packaging waste, and glass packaging waste.

During the reference period, the total quantities of packaging waste will range between 376,000 tonnes and 423,000 tonnes, with an annual growth rate of 2%.

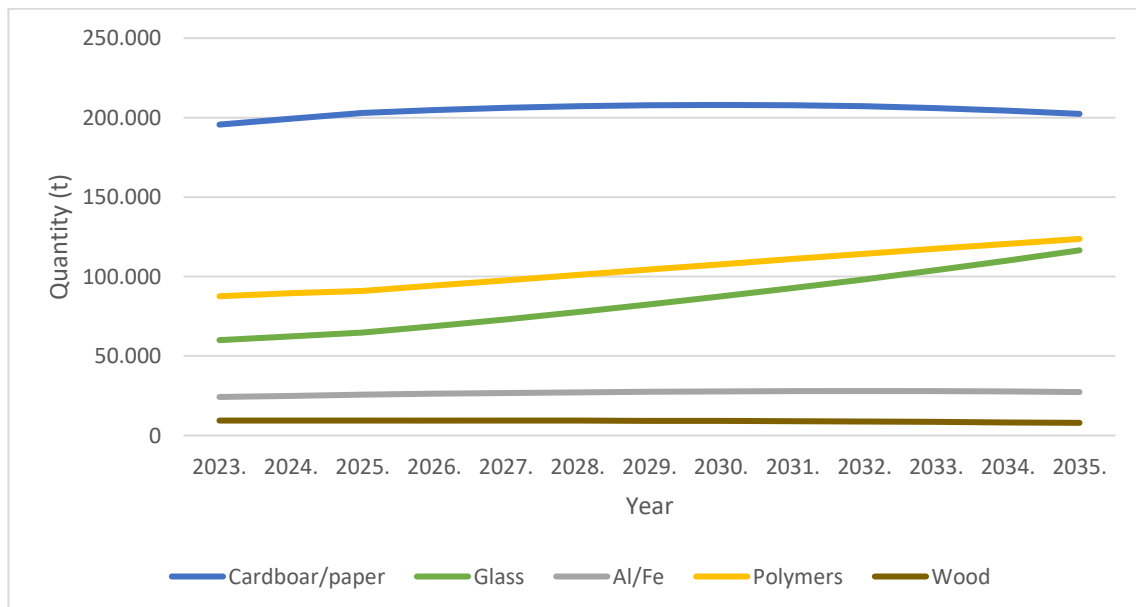
As for the quantities collected within the EPEEF system, according to the estimate, they will range between 152,000 tonnes and 168,000 tonnes during the reference period, with an annual growth rate of 1.7%.

The estimate of the total amount of packaging waste for both variables is given below (Figure 63.).



**Figure 63.** Estimate of annual amounts of total collected packaging waste and packaging waste collected through the EPEEF (Cro. abbrev. FZOEU) system for the period from 2023 to 2035

The estimate of quantities by type of packaging waste was based on data from the Waste Management Information System. It has shown that during the reference period, for all the types except wood, there will be a positive annual growth rate in quantities (Figure 64). For cardboard and paper, the annual growth rate will be 1.0%, for glass it will be 4.9%, for Al/Fe it will be 2.0%, amounting to 2.6 % for polymer packaging waste. A negative annual growth rate of -0.05% is expected for wood.



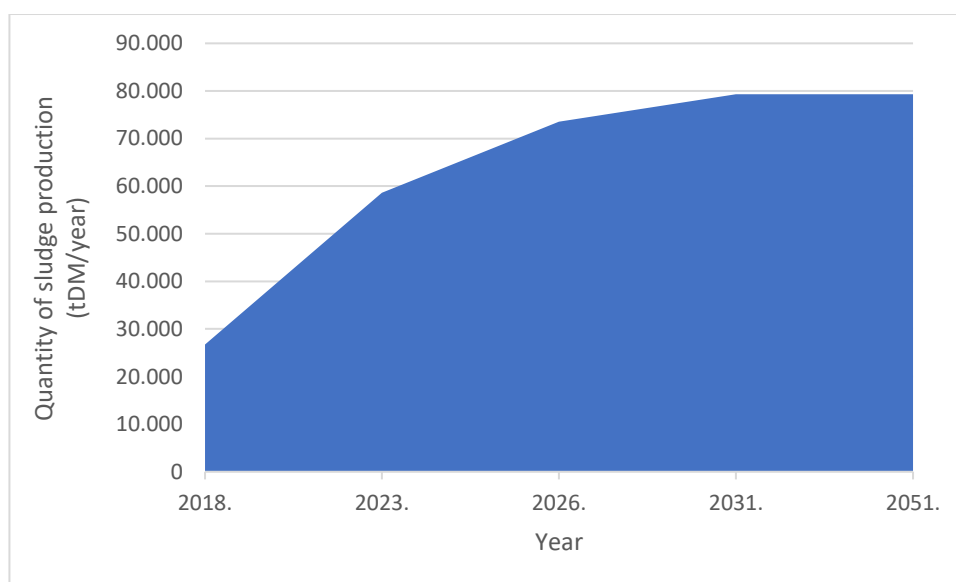
**Figure 64.** Estimate of annual amounts of total collected packaging waste by type of material for the period from 2023 to 2035

### 5.3. Residual sludge from waste water treatment plants

According to the existing analyses, it is estimated that the current production of sewage sludge in wastewater treatment plants in the Republic of Croatia is approximately 26,750 tonnes of dry solids per year.

In the period from 2018 to 2026, a significant increase in sewage sludge production from waste water treatment plants is expected due to the expansion of agglomerations and the commissioning of new facilities, as a result of compliance with the provisions of Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment (OG 135, 30.5.1991). (OG 135, 30.5.1991.).

Furthermore, from 2026 to 2031, additional slight increases in sewage sludge production from waste water treatment plants are expected due to a further increase in agglomeration loads, and in 2031, the peak sewage sludge production from waste water treatment plants will reach 79,300 tonnes of dry solids per year (Figure 65). In the following years, these quantities will remain stable.



**Figure 65.** Estimated amount of generated residual sludge from waste water treatment plants for the period from 2018 to 2051

There is no adequate waste management system for sewage sludge from waste water treatment plants in Croatia at the moment. Sewage sludge from waste water treatment plants is usually temporarily stored or disposed of in landfills, with smaller quantities being used for agricultural purposes or for composting.

It is necessary to establish an appropriate waste management system for sewage sludge from waste water treatment plants, which will include both material and energy recovery of sewage sludge. Sewage sludge from waste water treatment plants needs to be prepared/processed in order to minimise the amount of waste (waste with a higher percentage of dry matter), thus facilitating the handling of waste before its final recovery and/or disposal.

Pursuant to the provisions of the Waste Management Act, the residual sludge from waste water treatment plants is no longer classified as a special waste category.

Consequently, in accordance with the Multi-annual Programme for the Construction of Municipal Water Management Facilities for the Period Until 2030 <https://voda.hr/sites/default/files/2022->

[04/visegodisnji\\_program\\_gradnje\\_komunalnih\\_vodnih\\_gradevina\\_za\\_razdoblje\\_do\\_2030\\_godine.pdf](#) , the specific method of disposal of sludge will be determined at the level of service providers, service areas, and regions in later decision-making phases, during project preparation and implementation, along with additional environmental impact assessments. The choice will depend on available organisational, financial, and implementation possibilities. Considering the principles of the circular economy, when planning and designing facilities, possible sludge treatment processes that could be used for specific purposes need to be analysed. The aim is to minimise waste generation through these processes and to achieve the set parameters for these purposes, including dry matter percentage and sludge composition. In order to prevent and reduce waste generation in waste water treatment plants, planning and project documentation for these facilities should consider acceptable solutions that involve improving the existing sludge treatment line or constructing a new one using any treatment process (thickening, stabilisation (biological, chemical, thermal), thermal hydrolysis, co-digestion, dewatering, drying (convective, contact, solar), pelletisation, mono-incineration, gasification, pyrolysis, co-incineration (cement kilns, thermal power plants, brick factories, with municipal waste), composting, landfilling, mixing with other types of waste and raw materials to obtain a new product, and other methods). Improvements to existing sludge treatment lines or the construction of new ones at individual facilities are not limited solely to the needs of that facility; planning and construction of shared capacities for processing larger quantities of sludge transported from surrounding facilities (within a specific regional area) will also be considered for specific facilities.

#### **5.4. Other assessments of the waste flow development**

The development of waste flows for various other waste streams is planned as part of separate projects, some of which are in progress, while others are planned as measures specified in the National Waste Management Plan.

Assessments of waste flow development for hazardous waste are being carried out as part of an ongoing project, which will result in the feasibility study of the existing and required capacities for hazardous waste treatment and a study to identify locations contaminated with hazardous waste ('hot spots').

Additionally, Measure 6 - Analysis of the Efficiency of the System for Managing Special Categories of Waste with Proposals for Improvement envisages activities to conduct analyses and studies for other types of special categories of waste as described in the measure's description.

## **6. ASSESSING THE NEED TO CLOSE THE EXISTING AND BUILD NEW FACILITIES FOR THE PURPOSE OF DISPOSAL AND RECOVERY OF MIXED MUNICIPAL WASTE FROM HOUSEHOLD WASTE**

Waste management system development planning primarily depends on the quantities and composition of waste. Since mixed municipal solid waste (MMW) represents the residual part of municipal waste (the part that is not separately collected), its composition and quantities are directly dependent on the method and efficiency of the separate collection system for municipal waste. As the separate collection system has been constantly developing for many years now and will continue to evolve until 2035, the quantities and composition of the MMW will definitely change over the observed period. Therefore, it is necessary to anticipate the ultimate elements of the system (recovery

and disposal of the MMW) in a way that is adaptable to the quantities and composition of the MMW that will arise during that period.

With the aim of supporting the EU transition to a circular economy, Directive 1999/31/EC provides for a gradual reduction in waste disposal, particularly waste suitable for recycling or other forms of recovery. In order to ensure the proper application of the waste hierarchy, appropriate measures need to be taken to make ensure that, from 2030 onwards, restrictions on disposal are applied to all waste suitable for recycling and other material and energy recovery processes, with the exception of waste for which disposal has the best environmental outcome in accordance with Article 4 of Directive 2008/98/EC.

The measures taken must ensure that by 2035, the quantity of disposed municipal waste is reduced to 10% or less of the total mass of generated municipal waste.

In the upcoming/future period, priorities in upgrading or modifying the existing waste management system and establishing new waste management systems will be defined in accordance with the waste hierarchy order prescribed by the Waste Management Act and the level of development of existing waste management systems, as well as the given deadlines for their implementation.

Efforts should be directed to promote waste management as an economic and market activity aimed at maximising the utilisation of valuable waste fractions while preserving human health, applying environmental protection principles, and adhering to circular economy objectives that emphasise the utilisation of national resources with the highest environmental protection standards (the application of the best available technologies and practices accepted and prescribed by relevant EU-level documents).

Meeting the objectives of separate collection of usable waste types and their preparation for reuse, recycling, and recovery does not exclude any element of the waste hierarchy but makes it an integral part of a comprehensive system.

The management of mixed municipal waste is based on the last three stages of the waste hierarchy:

- Recycling (separation and preparation for reuse and recycling of usable waste fractions),
- Other recovery methods, e.g., energy recovery, and
- Waste disposal (incineration, landfilling, etc.).

The mixed municipal waste (MMW) is household waste and waste from other sources that are similar in characteristics and composition to household waste, and it is classified in the Waste Catalogue under EWC code 20 03 01.

The existing infrastructure for the disposal and recovery of mixed municipal waste is predominantly based on:

- Non-hazardous waste landfills
- Facilities for mixed municipal waste treatment

Since the development of the system is still ongoing, it is still not fully taking into consideration environmental protection and sustainability principles, economic justification, and cost-effectiveness while adhering to the waste hierarchy. In 2021, the quantity of the mixed municipal waste amounted to 1,004,877 tonnes, accounting for 57% of the total generated municipal waste. Considering that, in the same year, around 145,000 tonnes of mixed municipal waste were treated in MMW treatment facilities, it is evident that more than 85% of MMW was disposed of in landfills without prior treatment. This underscores the necessity of establishing a system and controlling the system for the treatment,

recovery, and disposal of MMW (material and energy recovery or treatment of MMW before disposal), especially during the reference period.

## 6.1. Basic considerations and prerequisites for the establishment and development of the mixed municipal waste disposal and recovery systems

Since the MMW represents the residual waste after separately collected waste fractions intended for recycling, the composition and quantities of the MMW will change over time in line with the increase in separately collected and recycled waste.

The objectives set by Directive 2008/98/EC for the preparation for reuse and recycling of waste have been strengthened by Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste to better reflect the Union's efforts to transition to a circular economy.

As per Directive 2008/98/EC, it was necessary to ensure, *by 2020, the preparation for reuse and recycling of household waste such as paper, metal, plastic, and glass, and, where possible, waste from other sources, to an extent that these waste flows, if similar to household waste, should be increased to a minimum of 50% of the total municipal waste by adding additional conditions which are as follows:*

- by 2025, the preparation for reuse and recycling of municipal waste needs to be increased to at least 55% by mass.
- by 2030, the preparation for reuse and recycling of municipal waste needs to be increased to at least 60% by mass.
- by 2035, the preparation for reuse and recycling of municipal waste needs to be increased to at least 65% by mass.

Looking at the key fractions of municipal waste (paper and cardboard, plastic, metal, glass, kitchen and garden waste, bulky waste, electrical and electronic waste), which, according to the waste composition analysis determined by the Methodology for Determining the Composition and Quantities of Municipal or Mixed Municipal waste (Croatian Agency for the Environment and Nature, 2015), make up more than 89 % (approximately 1,572,000 tonnes in 2021), in 2021, 761,683 tonnes, or approximately 48 % of the observed key fractions of generated municipal waste, were separately collected at the source of its generation. The trend in separately collected quantities of municipal waste as well as the change between 2017 and 2021 (Table 26) indicate positive trends in separate waste collection.

**Table 26.** Quantities of separately collected municipal waste and rate of change 2017 – 2021

	Increase in the quantity of collected waste from 2017 to 2021					2018 compared to 2017	2019 compared to 2018	2020 compared to 2019	2021 compared to 2020	Mean value
	2017	2018	2019	2020	2021					
<b>Total (t)</b>	<b>488,209</b>	<b>553,791</b>	<b>670,769</b>	<b>694,159</b>	<b>761,683</b>	13 %	21 %	3 %	10 %	12 %
Paper and cardboard	169,024	181,857	204,078	199,737	228,265	8 %	12 %	-2 %	14 %	8 %
Bulky waste	78,529	101,403	129,531	132,523	129,086	29 %	28 %	2 %	-3 %	14 %
Bio-waste	71,046	70,024	97,518	118,692	122,175	-1 %	39 %	22 %	3 %	16 %
Plastic	40,745	41,241	63,445	66,384	73,707	1 %	54 %	5 %	11 %	18 %
Glass	42,613	52,656	57,054	43,738	53,210	24 %	8 %	-23 %	22 %	8 %
Metal	25,029	33,528	32,401	38,622	51,225	34 %	-3 %	19 %	33 %	21 %
WEEE	33,900	38,072	36,812	32,455	32,503	12 %	-3 %	-12 %	0 %	-1 %

In order to estimate the quantities and composition of municipal waste up to the year 2035, it is necessary to make certain adjustments to the shares of specific key waste fractions in relation to the shares determined by the Methodology for determining the composition and quantities of municipal or mixed municipal waste (Croatian Environmental Agency, 2015). These adjustments apply to bulky waste, electrical and electronic waste, and metal, the proportions of which, according to the mentioned methodology, in the total municipal waste are as follows:

- bulky waste – 4.08 %
- electrical and electronic waste – 0.53 %
- metal – 2.54 %

Taking into account the total quantities of generated municipal waste in 2021, as well as the quantities of separately collected bulky waste, electrical and electronic waste, and metal, the adjusted share of these waste components in the total municipal waste is as follows:

- bulky waste - 7.08% (assuming 100% of the generated quantities are separately collected)
- electrical and electronic waste - 2.3% (assuming 80% of the generated quantities are separately collected)
- metal - 3.63% (assuming 80% of the generated quantities are separately collected)

It is worth mentioning that the analysis and estimates of the composition and quantities of separately collected waste (and consequently MSW) considered the assumed efficiency of separate collection for the reference years, taking into account the meeting of the targets as determined by Directive 2008/98/EC. For instance, for paper and cardboard, the efficiency of separate collection in 2021 was approximately 50% (with 228,265 tonnes separately collected out of a total of 453,829 tonnes of paper and cardboard in municipal waste). By 2025, the efficiency is expected to be around 61%, meaning that about 71,000 tonnes more paper and cardboard need to be collected in 4 years in order to meet the recycling target of 55%. The same approach was applied to all other waste categories for the reference years (2025, 2028) (Table 27) (Table 28).

**Table 27.** Estimate of municipal waste quantities that must be prepared for reuse or recycled in the period from 2022 to 2035

	2021	2022	2023	2024	2025	2026	2027	2028
Total (t)	1,766,560				1,913,143			
Paper and cardboard	228,265	248,876	269,487	290,098	310,710	327,473	344,237	361,001
Bulky waste	129,086	130,677	132,269	133,860	135,451	138,946	142,649	146,568
Bio-waste	122,175	188,025	253,875	319,725	385,575	406,378	427,181	447,984
Plastic	73,707	114,090	154,473	181,011	235,239	247,931	260,623	273,315
Glass	53,210	54,693	56,176	57,660	59,143	62,334	65,525	68,715
Metal	51,225	52,308	53,392	54,475	55,558	56,991	58,510	60,118
WEEE	32,503	33,178	33,852	34,527	35,202	36,110	37,073	38,091
	2029	2030	2031	2032	2033	2034	2035	
Total (t)		2,190,300					2,550,158	
Paper and cardboard	377,765	394,528	416,529	438,529	460,529	482,530	504,530	
Bulky waste	150,707	155,073	159,673	164,514	169,603	174,946	180,551	
Bio-waste	468,787	489,590	516,891	544,192	571,494	598,795	626,097	
Plastic	286,007	298,699	315,355	332,012	348,668	365,325	381,982	
Glass	71,906	75,097	79,285	83,473	87,660	91,848	96,036	
Metal	61,815	63,606	65,493	67,478	69,566	71,758	74,057	
WEEE	39,166	40,302	41,497	42,755	44,078	45,466	46,923	

**Table 28.** Estimate of quantities of municipal waste that must be collected separately in the period from 2022 to 2028 and the required rate of change (assuming it contains 13 % of impurities)

Increase in the quantities of separately collected waste from 2021 to 2028								
	2021	2022	2023	2024	2025	2026	2027	2028
<b>Total (t)</b>	<b>1,766,560</b>				<b>1,913,143</b>			
Paper and cardboard	262,374	286,065	309,755	333,446	357,137	376,406	395,675	414,943
Bulky waste	148,375	150,204	152,033	153,862	155,691	159,708	163,964	168,469
Bio-waste	140,431	216,121	291,811	367,500	443,190	467,101	491,013	514,924
Plastic	84,721	131,138	177,555	208,058	270,390	284,978	299,567	314,155
Glass	61,161	62,866	64,571	66,275	67,980	71,648	75,316	78,983
Metal	58,880	60,125	61,370	62,614	63,859	65,507	67,253	69,101
WEEE	37,360	38,135	38,911	39,686	40,462	41,506	42,612	43,783
	Increase in 2022 vs. 2021	Increase in 2023 vs. 2022	Increase in 2024 vs. 2023	Increase in 2025 vs. 2024	Increase in 2026 vs. 2025	Increase in 2027 vs. 2026	Increase in 2028 vs. 2027	Mean value
Paper and cardboard	9 %	8 %	8 %	7 %	5 %	5 %	5 %	10 %
Bulky waste	1 %	1 %	1 %	1 %	3 %	3 %	3 %	3 %
Bio-waste	54 %	35 %	26 %	21 %	5 %	5 %	5 %	24 %
Plastic	55 %	35 %	17 %	30 %	5 %	5 %	5 %	24 %
Glass	3 %	3 %	3 %	3 %	5 %	5 %	5 %	6 %
Metal	2 %	2 %	2 %	2 %	3 %	3 %	3 %	4 %
WEEE	2 %	2 %	2 %	2 %	3 %	3 %	3 %	3 %

Considering the rates of change in separate collection for the period from 2017 to 2021 and the period from 2022 to 2028, it is clear that the major investments are necessary in the separate collection and treatment of biowaste and plastic, with a separation rate expected to grow by an average of 21% or 22% during the observed period. Given the challenge of achieving the required rate of increase in separate collection (to meet the 55% target by 2025 for reuse or recycling), Table 29 provides an estimate of the quantity of municipal waste that must be separately collected in the period from 2022 to 2035 (to meet the 65% target by 2035 for reuse or recycling, but in the event of non-achievement of the interim targets in 2025 and 2030) and the necessary rate of change (assuming the contamination rate is 13%).

**Table 29.** Estimate of quantities of municipal waste that must be collected separately in the period from 2022 to 2035 and the required rate of change (assuming it contains 13 % of impurities) and assuming the ultimate objective is achieved in 2035 amounting to 65 %

Increase in the quantities of the separately collected waste from 2021 to 2035								
	2021	2022	2023	2024	2025	2026	2027	2028
<b>Total (t)</b>	<b>1,766,560</b>							
Paper and cardboard	228,265	247,998	267,731	287,465	307,198	326,931	346,664	366,398
Bulky waste	129,086	132,762	136,438	140,114	143,790	147,466	151,143	154,819
Bio-waste	122,175	151,195	180,214	209,233	238,252	267,271	296,291	325,310
Plastic	73,707	91,471	109,235	126,999	144,763	162,527	180,291	198,055
Glass	53,210	55,199	57,188	59,177	61,166	63,155	65,144	67,134
Metal	51,225	52,856	54,487	56,118	57,749	59,379	61,010	62,641
WEEE	32,503	33,533	34,563	35,593	36,623	37,653	38,683	39,713



	Increase in 2022 vs. 2021	Increase in 2023 vs. 2022	Increase in 2024 vs. 2023	Increase in 2025 vs. 2024	Increase in 2026 vs. 2025	Increase in 2027 vs. 2026	Increase in 2028 vs. 2027	Increase in 2029 vs. 2028
Paper and cardboard	9 %	8 %	7 %	7 %	6 %	6 %	6 %	5 %
Bulky waste	3 %	3 %	3 %	3 %	3 %	2 %	2 %	2 %
Bio-waste	24 %	19 %	16 %	14 %	12 %	11 %	10 %	9 %
Plastic	24 %	19 %	16 %	14 %	12 %	11 %	10 %	9 %
Glass	4 %	4 %	3 %	3 %	3 %	3 %	3 %	3 %
Metal	3 %	3 %	3 %	3 %	3 %	3 %	3 %	3 %
WEEE	3 %	3 %	3 %	3 %	3 %	3 %	3 %	3 %
	<b>2029</b>	<b>2030</b>	<b>2031</b>	<b>2032</b>	<b>2033</b>	<b>2034</b>	<b>2035</b>	
<b>Total (t)</b>							<b>2,550,158</b>	
Paper and cardboard	386,131	405,864	425,597	445,330	465,064	484,797	504,530	
Bulky waste	158,495	162,171	165,847	169,523	173,199	176,875	180,551	
Bio-waste	354,329	383,348	412,367	441,387	470,406	499,425	528,444	
Plastic	215,819	233,584	251,348	269,112	286,876	304,640	322,404	
Glass	69,123	71,112	73,101	75,090	77,079	79,068	81,057	
Metal	64,272	65,903	67,534	69,164	70,795	72,426	74,057	
WEEE	40,743	41,773	42,803	43,833	44,863	45,893	46,923	
	<b>Increase in 2030 vs. 2029</b>	<b>Increase in 2031 vs. 2030</b>	<b>Increase in 2032 vs. 2031</b>	<b>Increase in 2033 vs. 2032</b>	<b>Increase in 2034 vs. 2033</b>	<b>Increase in 2035 vs. 2034</b>	<b>Mean value</b>	
Paper and cardboard	5 %	5 %	5 %	4 %	4 %	4 %	7 %	
Bulky waste	2 %	2 %	2 %	2 %	2 %	2 %	3 %	
Bio-waste	8 %	8 %	7 %	7 %	6 %	6 %	10 %	
Plastic	8 %	8 %	7 %	7 %	6 %	6 %	10 %	
Glass	3 %	3 %	3 %	3 %	3 %	3 %	4 %	
Metal	3 %	2 %	2 %	2 %	2 %	2 %	4 %	
WEEE	3 %	2 %	2 %	2 %	2 %	2 %	4 %	

In accordance with the aforementioned, the annual rate of increase in separate collection of municipal waste amounts to 3 - 10 %, which still represents a relatively high growth in the quantities of separately collected municipal waste, but with significant investments this target can be achieved over the next 13 years.

Without an analysis of compliance with the targets set by Directive 2008/98/EC concerning the need to ensure the preparation for reuse and recycling of municipal waste in the years 2025, 2028, 2030, and 2035, it is not possible to create estimates for the expected quantities and composition of residual municipal waste, for which it is necessary a recovery and disposal system must be established. The presentation of the necessary trends in preparing for reuse and recycling of municipal waste for the years 2022-2035, as well as the quantities of residual municipal waste resulting from the established targets, is provided in Chapter 8.

## 6.2. Establishment of Waste Management Centres (Cro. abbrev. CGOs)

In accordance with legal regulations, it is permitted to dispose of waste that has undergone prior waste treatment before disposal in landfill sites. It is exceptionally allowed to dispose of waste that has not

undergone prior treatment before disposal if such disposal would not be contrary to the waste management objectives set by the Waste Management Act, subject to the following conditions:

- Prior treatment of this waste would not contribute to reducing the quantity of waste being disposed of.
- Prior treatment would not reduce the harmful impact caused by the properties of the disposed waste on the environment, especially the pollution of surface waters, groundwater, soil, and air, as well as the global environment, including the 'greenhouse effect', and other health hazards to humans that could occur due to waste disposal throughout the landfill's life cycle.
- Disposal of inert waste for which treatment is not technically feasible.

According to the Waste Management Act (WMA), 'waste treatment is a process of recovery or disposal, which includes preparation before recovery or disposal'. Prior waste treatment before disposal is considered a process in which the properties of waste are changed through physical, thermal, chemical, or biological processes, including sorting, with the aim of reducing the quantity or hazardous properties of the waste and improving its handling or utility.

At locations (facilities) where prior treatment of mixed municipal waste is carried out before disposal and/or other disposal methods, it is necessary to provide the following:

- Separation of recyclable waste fractions that were not separated at the point of origin for preparation for recovery and/or recycling.
- Biological treatment (stabilisation) of the biodegradable portion of mixed municipal waste.
- Energy recovery of waste and waste treatment by-products that cannot be materially recovered.
- Disposal and other disposal methods for non-recyclable treatment by-products and biologically stabilised waste.

This handling of mixed municipal waste is carried out in accordance with the waste management hierarchy, applying the 'proximity principle', whereby waste treatment must be carried out in the nearest appropriate facility or equipment relative to the waste generation point, taking into consideration economic efficiency and environmental acceptability.

In accordance with the proximity principle, the waste collection service provider is obliged to transfer the mixed municipal waste generated within a specific municipality/LSGU to the Waste Management Centre (WMC) associated with that municipality, as determined by this Waste Management Plan.

Considering the existing and planned waste management situation, a comprehensive waste management system cannot be established without the segment for mixed municipal waste treatment. Taking into account the aforementioned facts and the legally prescribed waste management hierarchy, the waste management system in the Republic of Croatia should be developed in the following areas:

- Organised separate collection of individual waste categories from municipal waste, with the provision of necessary infrastructure.
- Treatment or preparation of separately collected waste for reuse and recycling.
- Treatment of mixed municipal waste in facilities for mixed municipal waste treatment (waste management centre with or without energy recovery).
- Energy recovery of waste and waste treatment by-products that cannot be materially recycled, produced/generated in the Republic of Croatia.

- Disposal and other methods of managing non-recyclable treatment by-products and biologically stabilised waste.
- Disposal of stabilised hazardous waste.

A Waste Management Centre is a complex of several interrelated buildings and facilities for waste treatment (recovery and disposal) of municipal waste and other waste if that waste is similar in nature and composition to household waste or waste that can be processed in the Waste Management Centre according to the specified treatment technology. An integral part of the Waste Management Centre is the network of transfer stations with the function of waste collection and consolidation of waste shipments for transport to the Waste Management Centre or recycling facilities.

The Waste Management Centre (CGO) conducts various activities related to waste treatment before its final disposal and the management of remaining fractions, such as:

- Waste reception and treatment.
- Separation of waste suitable for reuse or recycling, as well as the separation and further handover of hazardous waste.
- Separation and distribution of waste that can be used for other purposes.
- Biological waste treatment.
- Preparation for energy recovery and the energy recovery of waste.
- Permanent disposal of treated waste.

For WMC projects currently in preparation, with the aim of meeting circular economy objectives in the waste management sector, it is necessary to plan the reception of the following types of waste within project preparation:

- Bulky waste.
- Separately collected waste paper/cardboard, plastic, metal, and glass.
- Separately collected organic waste.
- Construction waste.
- Asbestos-containing construction waste.
- Non-hazardous and inert industrial waste.
- Impurities separated during the treatment of the separately collected waste.

For Waste Management Centres (WMCs) that have been constructed or are under construction, it is necessary to consider potential adaptations in later operational phases for receiving separately collected waste to maximise the utilisation of existing capacities.

In WMCs, collected waste is prepared for further treatment. Valuable waste components that can be reused or recycled are separated, and types of waste suitable for energy recovery are identified. WMCs are equipped for mechanical and biological waste treatment and/or energy recovery, including the long-term disposal of waste. Possible concepts for energy recovery of municipal and other waste types are elaborated in more detail in the Waste-to-Energy section (Section 6.4).

According to the Waste Management Strategy of the Republic of Croatia (Official Gazette No. 130/05) and the Waste Management Plan of the Republic of Croatia for the period from 2017 to 2022 (Official Gazette Nos. 3/17 and 1/22), the Republic of Croatia has opted for a centralised system for managing mixed municipal waste, where all the mixed municipal waste collected as part of the public service will be treated and disposed of within the WMCs.

Although the establishment of centralised facilities for processing the mixed municipal waste and other separately collected waste categories requires higher initial investments (higher capital costs),

this approach impacts the optimisation of operational costs, which in the case of a decentralised system can represent a significant portion of the total costs for the treatment and disposal of the mixed municipal waste.

A total of 11 waste management centres are planned for construction in the Republic of Croatia. The centre locations have been determined as a result of optimising spatial and economic parameters, while the technical and technological solutions arise from the obligation to meet the set objectives in line with the best available techniques.

The required capacities for processing mixed municipal waste result from the planned establishment of separate collection for recyclable waste, as determined in the previous section. The capacities of individual WMCs are presented in Table 30.

**Table 30.** List and rated capacities of waste management centres

Nr.	Name	County	Capacity (tonne/year)
1.	Marišćina WMC	Primorje-Gorski kotar County (all the LSGUs)	100,000
2.	Kaštijun WMC	Istrian County (all the LSGUs)	90,000
3.	Bikarac WMC	Šibenik-Knin County (all the LSGUs)	40,000
4.	Biljane Donje WMC	Zadar County (all the LSGUs), part of the Lika-Senj County (towns of Gospić and Novalja, and municipalities of Karlobag, Perušić, Donji Lapac, Udbina and Lovinac)	75,000
5.	Babina Gora WMC	Karlovac County (all the LSGUs), part of the Lika-Senj County (town of Otočac and municipalities of Brinje, Plitvička jezera, Vrhovine), part of the Sisak-Moslavina County (town of Glina and municipalities of Gvozd and Topusko )	30,000
6.	Lečevica WMC	Split-Dalmatia County (all the LSGUs)	110,000
7.	Lučino Razdolje WMC	Dubrovnik-Neretva County (all the LSGUs)	40,000
8.	Piškovnica *) WMC	Koprivnica-Križevci County (all the LSGUs), Krapina-Zagorje County (all the LSGUs), Međimurje County (all the LSGUs), Varaždin County (all the LSGUs), Bjelovar-Bilogora County (all the LSGUs)	110,000
9.	Orlovnjak WMC	Osijek-Baranja County (all the LSGUs), Vukovar-Srijem (all the LSGUs)	60,000
10.	Šagulje WMC	Slavonski Brod-Posavina County (all the LSGUs), Požega-Slavonia County (all the LSGUs), Virovitica-Podravina County (all the LSGUs) part of the Sisak-Moslavina County (towns of Hrvatska Kostajnica, Kutina, Novska, Popovača, Sisak and municipalities of Donji Kukuruzari, Dvor, Hrvatska Dubica, Jasenovac, Lekenik, Lipovljani, Majur, Sunja, Topusko, Velika Ludina)	55,000
11.	Zagreb WMC	City of Zagreb, Zagreb County (all the LSGUs)	180,000

\*) Piškovnica WMC will be built in a way as to include the counties of Koprivnica-Križevci, Krapina-Zagorje, Međimurje and Varaždin in the first phase, while the second phase will include the county of Bjelovar-Bilogora, in line with the targets for the increase of the separately collected waste rate.

### 6.3. Non-hazardous waste landfills

In 2021, a total of 1,004,877 tonnes of mixed municipal waste were generated. Considering the current waste management situation where only approximately 146,000 tonnes of mixed municipal waste are processed within 2 existing Waste Management Centres (Kaštijun and Marišćina), a total of 848,075 tonnes of mixed municipal waste were disposed of in existing active landfills (80 of them in 2021) without prior treatment.

As previously mentioned in section 2.4.1.6, the overall remaining capacity in all landfills at the end of 2021, according to the landfill operators' estimates, was 16,624,770 tonnes, of which 9,792,665 tonnes are related to landfills receiving municipal waste. In 2021, 15 landfills submitted applications for remediation preparation, 28 landfills were undergoing remediation, and a total of 37 landfills have achieved a remediated status.

Continuous efforts are being made to enhance the monitoring system for achieving the prescribed objectives and to implement measures aimed at reducing waste disposal. This is also supported by the adoption of the Decision on the Sequence and Dynamics of Landfill Closures. Among other things, the Decision provides for the schedule and dynamics for the closing of landfills receiving non-hazardous waste within the public waste management utility, which were required to be closed by December 31st, 2018. By the end of 2020, all the 26 planned landfills had been closed.

Considering the number of non-compliant and compliant active official non-hazardous waste landfills, the quantities of the mixed municipal waste disposed of without prior treatment, and the objectives for gradually reducing waste sent to landfills, it is necessary to plan for the gradual redirection of waste from smaller, non-compliant, and non-remediated landfills, with the aim of remediating and closing them without further disposal, to larger, infrastructurally equipped, compliant landfills with sufficient capacities. At the same time, it is essential to continue activities related to the construction of planned waste recovery and disposal facilities, through the construction of waste management centres.

The Decision on the Sequence and Dynamics of Landfill Closures has determined existing non-hazardous waste landfills as follows:

- those that are closing,
- those where the disposal of non-hazardous municipal and industrial waste will continue until the disposal capacity is filled,
- those where the disposal of non-hazardous municipal and industrial waste will continue until the Waste Management Centres begin their operation.

In order to reduce the quantities of waste sent to landfills and achieve the set objectives for reducing the disposal of biodegradable municipal waste, it is necessary to intensify the existing implementation of measures aimed at separate collection of municipal waste, equipping and building infrastructure for the preparation of waste for reuse and recycling, and continuing the construction of facilities for the recovery and disposal of mixed municipal waste in the upcoming period.

The existing non-hazardous waste landfills that meet or will meet the conditions for operation (remediated and compliant with national and European regulations) will continue to operate and accept mixed municipal waste until the corresponding Waste Management Centres are put into operation, after which these landfills will be closed, or the remaining capacities will be used for the disposal of inert waste. Furthermore, in accordance with legal regulations, compliant waste landfills are allowed to receive waste that has undergone prior waste treatment before disposal. In exceptional cases, it is also allowed to dispose of waste that has not undergone prior treatment before disposal if such disposal would not contradict the waste management objectives set by the Waste Management Plan and if prior treatment would not reduce the environmental impact caused by the properties of waste. It is also allowed to dispose of inert waste for which treatment is not technically feasible.

## 6.4. Energy recovery of waste

A comprehensive waste management system cannot be achieved without waste-to-energy recovery, taking into account the waste management hierarchy as well as the established objectives for limiting the permissible quantity of waste that can be disposed of by 2035, which is set at 10%. Therefore, due to the established objectives, it is necessary to plan and construct waste-to-energy recovery facilities. The entire waste management system is based on the application of all the five segments of the waste management hierarchy (such as prevention, reuse, recycling, recovery and disposal), with the purpose of achieving self-sufficiency and sustainability of the system with minimal need for waste treatment and raw materials obtained from waste treatment abroad in order to reduce the costs of final waste disposal and to ensure a higher degree of energy independence for Croatia. This is evident in one of the visions of the Energy Development Strategy of the Republic of Croatia by 2030, with a view to 2050 ('Official Gazette' No. 25/20) entitled: 'Strengthen energy supply security through domestic production growth and energy infrastructure interconnection, as well as the introduction of mechanisms for developing production capacities'.

As evident from the waste generation, separate collection, and material recovery estimates, a system for the management of mixed municipal waste (municipal waste) of approximately 900,000 tonnes per year (Scenario nr. 1) or 1,000,000 tonnes per year (Scenario nr. 2) needs to be planned. Given Croatia's strategic commitment to treating mixed municipal waste as part of regional Waste Management Centres, the output products of the mixed municipal waste treatment include the following:

- Recyclables - separated waste suitable for material recovery
- Waste-derived fuels
- Residue for disposal - stabilised biodegradable waste and other waste unsuitable for any other recovery system

In line with this, there arises a need for energy recovery of waste that cannot be otherwise recovered or reused and is the result of waste treatment at Waste Management Centres, as well as waste sludge from municipal waste water treatment plants.

The combustible fractions from municipal waste, separated during the mechanical-biological treatment process within waste management centres, can be processed in industrial facilities or waste-to-energy plants, depending on their category and other parameters, along with treated sludge from municipal waste water treatment plants.

The result of waste-to-energy recovery is thermal and electrical energy, with slag and ash remaining as residues.

Thermal waste treatment with energy recovery is used, but is not limited to, the treatment of the following waste categories:

- Mixed and other municipal waste that cannot be reused or recycled
- Waste-derived fuels obtained after mechanical biological treatment
- Other wood production and wood product waste
- Sludge from municipal waste water treatment
- Other waste in accordance with regulations defining the management of specific waste categories and properties of the waste-to-energy facility itself.

In addition to the order of priority, the establishment of appropriate waste-to-energy facilities should be considered in the context of waste management principles (e.g., proximity and self-sufficiency). This is necessary to ensure the reduction of transportation costs and energy recovery in the case of waste incineration outside the territory of the Republic of Croatia and to secure self-sufficiency in the event of capacity shortages outside the Republic of Croatia.

Apart from the appropriate environmental protection, considering the broader contribution of waste-to-energy recovery, such as economic benefits and its importance in achieving the targets regulated by law, should not be underestimated.

In addition to new waste-to-energy facilities that can be planned within Waste Management Centres or as standalone facilities, the existing facilities with an established and operational infrastructure, including road and rail access, connections to the high-voltage network, and systems for the distribution of district heating and process steam, should also be considered.

The existing facilities on which the construction (upgrading) of waste-to-energy facilities generated on the territory of Croatia can be planned are:

- Industrial heating plants and boiler plants
- Thermal power plants
- Cement and lime factories

Some of the existing facilities already use waste-derived fuel as an alternative fuel or utilize waste through the R1 process (mainly for the purpose of energy recovery). As of August 2022, four companies in Croatia have permits for waste-to-energy at five locations, with a total capacity of 392,479 tonnes per year.

However, the issue lies in the fact that, due to the technological requirements of the process, these existing facilities have high-quality standards for waste-derived fuels. For instance, if all planned Waste Management Centres produced waste-derived fuel suitable for use in existing facilities, it would be necessary to produce high-quality waste-derived fuel, which represents at most around 20% (based on the projected composition of mixed municipal waste) of the input into the mixed municipal waste treatment process.

However, exclusively producing high-quality waste-derived fuel is not sufficient in order to meet the objectives of reducing the quantities allowed to be disposed of to a maximum of 10% of waste by 2035. Therefore, it is essential to design facilities capable of recovering waste from a wider qualitative range.

As a result, a system that can thermally recover approximately 400,000 tonnes per year of processed and/or unprocessed mixed municipal waste (Scenario nr. 1 - low to medium-quality waste-derived fuel) increased by sludge from municipal waste water treatment plants amounting to 100,000 tonnes per year, or approximately 145,000 tonnes per year of processed and/or unprocessed mixed municipal waste (Scenario nr. 2 - high-quality waste-derived fuel) needs to be planned.

Since the aforementioned systems and facilities are planned and constructed with a minimum operational lifespan of 30 years, any delays in line with Scenario nr. 2 will only result in the postponement of the additional capacities needed for energy recovery from larger quantities of the mixed municipal waste and waste-derived fuel.

The micro-locations for these facilities will be determined based on feasibility studies, taking into account factors such as transportation connectivity, environmental and nature protection conditions, and, most importantly, the ability to market the produced thermal and electrical energy. The highest

level of energy efficiency is achieved by combining energy recovery with the production of thermal energy and electricity.

The division into counties served only as a basis to show the potential and the need for waste-to-energy facilities based on geographical characteristics. However, the disposal of waste-derived fuel, sludge from municipal waste water treatment plants, and other waste intended for energy recovery will occur through market principles, independent of municipal and county-related jurisdictions, except for specific waste categories subject to special regulations.

Taking into account the EU-established objectives for municipal waste disposal, as well as the challenges in handling sludge from municipal waste water treatment plants and disposing of waste remaining after the treatment of MW and other types of waste, comprehensive application of all segments of the waste management hierarchy, including energy recovery and waste incineration, is essential. This is necessary in order to achieve the objectives set for the municipal waste disposal on the territory of the Republic of Croatia. Therefore, it is crucial to facilitate and enable interested entities to prepare and develop energy recovery projects.

Additionally, it is necessary to limit the existing administrative ban on the delivery of mixed municipal waste to the Republic of Croatia for energy recovery after 2028. This step aims to ensure the implementation of equal waste handling standards in cross-border waste transport in the OECD area. Such a ban can be an acceptable instrument if its application has a time-limited duration, which is linked to the development of sufficient capacities for the energy recovery of municipal waste within the territory of the Republic of Croatia.



## **7. RECOVERY AND/OR DISPOSAL OF SLUDGE FROM MUNICIPAL WASTE WATER TREATMENT PLANTS**

According to the *Action Plan for the utilisation of sludge from waste water treatment plants on suitable surfaces* (Hrvatske vode - Croatian Water management and supply company, March 2020), it is expected that peak sludge production will reach 79,300 tonnes of dry solids per year by 2031. This production is connected with the commissioning of new municipal waste water treatment plants. In 2028, a slightly smaller amount of sludge is expected compared to the maximum amount anticipated, but considering that the sludge management system needs to be planned for a range of -5% to +25% sludge loading, further requirements will take into account an expected maximum sludge quantity of 100,000 tonnes of dry solids per year.

This quantity pertains to sludge that is not returned to the municipal waste water treatment process and therefore must be recovered and/or disposed of while adhering to the waste management hierarchy as established by the Waste Management Act.

The possibilities for applying any of the recovery and/or disposal methods depend on the level of prior treatment and preparation of the sludge, specifically its dry solids content.

The planning of the system needs to be based on the 'proximity principle' in order to reduce environmental impact and associated risks. An exception is the energy recovery of waste water sludge for the production of electrical and thermal energy, which can justify longer transportation distances in terms of the CO<sub>2</sub> equivalent of the produced electrical and/or thermal energy.

Considering the limited capacities for treating sludge from municipal waste water treatment plants that are generated and will continue to be generated within the reference period in the Republic of Croatia, and in order to prevent any negative impact on the national waste management system, it is necessary to prohibit the import of waste with the following EWC codes 19 08 05, 19 08 11\*, 19 08 12, 19 08 13\*, and 19 08 1.

## 8. CRITERIA FOR DETERMINING PLANNED LOCATIONS AND THE NECESSARY CAPACITY OF NEW FACILITIES AND PLANTS

The establishing of preliminary locations for waste management facilities is based on the consideration of: principles of environmental protection and waste management defined by legal regulations, scientific knowledge, best global practices, professional rules, and financial-economic aspects.

The principles of proximity and self-sufficiency, combined with environmental protection principles, result in the optimisation and balance of the waste management system, leading to its sustainability over its lifecycle. The principle of proximity has different impacts on waste management systems for specific waste categories, depending on their sensitivity to transportation costs and the quantities of waste being managed, which necessitates the application of different criteria in optimising each system.

The fundamental prerequisite for the implementation of any facility within the waste management system is the alignment of the planned intervention with spatial plans in which the Republic of Croatia (RH) and the regional self-government units (JP(R)S) plan the location of waste management facilities according to the needs in a specific planning period. The development of the waste management system at the regional level (counties and the City of Zagreb) is addressed through the Waste Management Plans of regional self-government units, as mandated by the Waste Management Act (ZGO). These Plans provide a comprehensive approach to waste management, defining waste management from the point of origin to its final treatment location. Therefore, these Plans must be in accordance with the national Plan.

Waste management, particularly for municipal waste, which is one of the priority waste categories in terms of quantity and composition, degree of participants' engagement, and the complex requirements for an adequate waste management system and corresponding infrastructure, is conditioned by several factors, which are the following:

- Compliance with the legal framework
  - Separate collection of problematic waste, paper and cardboard, glass, plastic, biowaste, metal, textiles, and bulky waste.
  - Achievement of the preparation for reuse targets, including repair and recycling through separate collection of paper and cardboard, metals, plastic, glass, biowaste, and bulky waste, with a minimum proportion of:
    - **Scenario nr 1** – 55%, 60%, 65% by weight of municipal waste by 2025, 2030, 2035. Scenario nr. 1 envisages meeting the objectives set out in Article 11, paragraph 2 of Directive 2008/98/EC.
    - **Scenario nr 2** – 50%, 55%, 60% by weight of municipal waste by 2025, 2030, 2035. Scenario nr. 2 postpones the fulfilment of the objectives specified in Article 11, paragraphs 3 and 5 of Directive 2008/98/EC by 5 years.
  - Constraints on landfilling for all waste suitable for recycling and other material and energy recovery processes until 2030.
  - Limitation of the quantity of municipal waste disposed of:
    - **Scenario nr 1** - to a maximum of 10% of the total amount (by weight) of generated municipal waste by 2035. Scenario nr. 1 anticipates the meeting of the objectives set out in Article 5, paragraph 5 of Directive 1999/31/EC
    - **Scenario nr 2** - to a maximum of 10% of the total amount (by weight) of generated municipal waste by 2040 and to a maximum of 25% of the total

amount (by weight) of generated municipal waste by 2035. Scenario nr. 2 anticipates the meeting of the objectives specified in Article 5, paragraphs 6 and 8 of Directive 1999/31/EC

- Compulsory waste treatment before disposal.
- Reduction of the quantities of biodegradable municipal waste landfilled.
- Spatial characteristics of the area covered.
- Possibilities for the placement of separate waste collection bins for individual municipal waste components.
- Transport routes.
- The potential for treating the biodegradable portion of municipal waste.
- The level of development of the environment, with regard to the generation of specific waste categories.
- Properties of the existing and future municipal waste management system, depending on whether the location is already used for waste management purposes.

Regarding the Scenario nr. 1 and Scenario nr. 2, it should be emphasised that the objectives of this Waste Management Act are outlined in Chapter 4 and in Table 25 of the WMA. The extension of the deadline to 2030, included in Scenario nr. 2, will be required as a protective measure to avoid a situation of non-compliance with Directive 2008/98/EC if it becomes apparent during the implementation of the WMA that achieving a target of at least 55% for recycling, sorting, reusing, and repairing waste by 2025 is not feasible.

The locations of waste collection facilities (garbage bins in public areas, civic amenity sites) primarily intended for the residents are the result of an analysis of waste generation areas and are arranged in a way to provide the easiest access to end users living in waste generation hot spots and densely populated areas.

Some of the conditions that waste collection facilities/bins must meet include the following:

- Collection at the source – containers at the 'curb' or within the premises of legal entities for separate collection (no specific requirements exist other than the number of bins and their durability and handling properties)
- Collection at the source – bins in public areas. In case this is the only measure for separate waste collection, they must be easily accessible to both users and waste collection service providers
- Civic amenity sites – stationary waste separation facilities are mandatory in all local self-government units (JLS) with more than 3,000 inhabitants, with at least one yard per 25,000 inhabitants. The location is selected to ensure easy access to all users gravitating toward a specific recycling yard and authorised collectors/recovery operators of a particular waste category. The local self-government units (LSGUs) with less than 3,000 inhabitants that do not possess a stationary waste separation facility must provide access to a mobile waste separation facility.

The indicative locations for waste management system facilities (waste separation facilities intended for construction waste, integrated waste management facilities, waste-to-energy recovery plants, etc.) depend on environmental and natural protection conditions in specific areas, which impose restrictions on specific activities. The suitability of potential facility locations is mostly determined through a multi-criteria analysis, taking into account hydrological and hydrogeological characteristics of the location, distance from inhabited areas, transportation links (road, rail, maritime), infrastructure

development, considering the possibilities of placing products resulting from waste management (recovered material, thermal and electric energy, compost, etc.).

The criteria for determining the location of hazardous waste disposal sites are derived from strict regulations governing waste disposal methods and conditions, waste categories, and operating conditions for waste disposal sites.

## 8.1. Technical requirements for waste management facilities

Best Available Techniques (BAT) describe the mandatory techniques and technology that must be applied in the design, construction, operation, maintenance, and decommissioning of waste management facilities for which an environmental permit is required. Guidelines for the application of BAT are defined in the current version of a reference document on best available techniques resulting from data exchanges organised by the European Commission among member states, industry, environmental protection NGOs, and the European Commission. Emission limit values that must not be exceeded in the environment are derived from these BATs. In addition to BATs, it is necessary to consider examples of best practice and the state of technical knowledge at a given time for all the facilities.

The guidelines for the application of BATs are defined in the current version of the so-called reference document resulting from data exchanges organized by the European Commission between the Member States, industry, environmental non-governmental organisations, and the European Commission. From these BATs, emission limit values into the environment are derived, which must not be exceeded. In addition to BATs, it is necessary to consider examples of best practices and the state of technical knowledge at a given moment for all buildings.

Appropriate environmental protection measures, as well as the conditions for the construction and equipping of waste management system buildings for which there is no obligation to establish an environmental permit, are defined through relevant implementation regulations specifying minimum requirements for design, construction, operation of facilities, and emissions monitoring (Table 31).

**Table 31.** Legal regulations providing minimal requirements for the design, construction, management of facilities and the monitoring of emissions

Document	Brief document content description
Ordinance on Waste Management (Official Gazette nr. 106/22)	It prescribes the conditions and operating procedures for waste storage and civic amenity sites.
Ordinance on the Thermal Treatment of Waste (Official Gazette nr. 75/16)	It specifies the methods and conditions for the operation, the conditions for starting and ceasing the operation of incineration and co-incineration plants, the method of waste input control, methods for protecting air, soil, and water, as well as the handling of residual waste in waste incineration and co-incineration plants, and special conditions for other waste thermal treatment processes.
Ordinance on Waste Landfills (Official Gazette nr. 4/23)	It defines waste disposal categories, procedures, and other conditions for waste disposal, emission limits to the environment for waste disposal, conditions and measures regarding the planning, construction, operation, and closure of disposal sites, and actions following their closure; this applies to inert, non-hazardous, and hazardous waste disposal sites.
Ordinance on Waste Management (Official Gazette nr.106/22)	It prescribes the method of municipal waste management concerning the public service of collecting mixed municipal waste and biodegradable municipal waste, as well as separate collection of waste paper, metal, glass, plastic, textiles, problematic waste, and bulky waste, the spatial layout of recycling yards, the method of calculating the limit for mixed municipal waste for specific periods, the method and conditions for determining and calculating fees for the construction of municipal waste

	management facilities, and the calculation of incentive fees for reducing the quantity of mixed municipal waste.
Ordinance on Construction Waste and Waste Containing Asbestos (Official Gazette nr. 69/16)	It specifies the conditions for the management of construction waste, obligations of producers of the products containing asbestos, management procedures for the waste containing asbestos, requirements for asbestos waste storage and transport, and conditions for asbestos waste management.
Ordinance on the End-of-Waste Status (Official Gazette nr. 55/23)	It specifies the conditions for the processing and utilisation of construction waste that is no longer classified as waste (with the end-of-waste status); conditions for the processing and utilisation of biodegradable waste that is no longer classified as waste (with the end-of-waste status) (excluding paper and textile recycling).
The Environmental Impact Assessment Regulation (Official Gazette nr. 61/14 and 3/17)	It prescribes the conditions and the procedure for conducting Environmental Impact Assessments (EIA) and the Need for Environmental Impact Assessments (NEIA). It also specifies the activities for which conducting EIA and NEIA is required.
Regulation on the Environmental Permit (Official Gazette nr. 8/14, 5/18)	An environmental permit is a permit for the operation of a facility that the operator must obtain before putting a facility into operation for activities that may cause industrial emissions. The regulation also prescribes the method for determining the best available techniques and provides a list of pollutants for which emission limit values are specified.

## 8.2. Method of determining the required capacity of new waste recovery and disposal facilities

According to the prepared assessment of the development of the municipal waste flow, and in order to achieve the legally mandated objectives (Scenario nr. 1 or Scenario nr. 2) in the upcoming planning period, it is necessary to improve the existing facilities and establish new facilities for waste recovery and disposal. The assessment of the development of the municipal waste flow was conducted based on demographic trends in Croatia, gross domestic product trends, and the number of foreign tourist overnight stays in Croatia. The estimates cover a broader time frame than the one planned in this document to take into account long-term trends and objectives up to 2035 or 2040. The methodological approach and detailed calculations are presented in Chapter **6.1. Basic considerations and prerequisites for the establishment and development of the mixed municipal waste disposal and recovery operations.**

### 8.2.1. Sorting plants for separately collected dry recyclables

The total required capacity of new sorting facilities (or upgraded existing facilities with increased capacity or sorting efficiency) is derived from the existing capacities and estimates of specific EWC waste categories. These capacities are elaborated in detail in the tables and diagrams below, amounting to 763,149 tonnes per year for Scenario nr. 1, which anticipates the meeting of objectives set by Directive 2008/98/EC and Directive 1999/31/EC (Table 32) (Figure 66), and 691,401 tonnes per year for Scenario nr. 2, which involves delaying the objectives set by these directives (Table 33) (Figure 67).

**Table 32. Total required capacities of sorting facilities in 2028 – SCENARIO nr. 1**

County	County share in the total amount of collected MSW	Dry recyclables input (t/y)	Total number of required dry recyclable sorting facilities (t/y)	Capacity of the existing dry recyclable sorting facilities (R12) (t/y)	Additional capacity required for dry recyclable sorting facilities (t/y)	Cost estimate for the construction of new sorting plants in HRK (Croatian kuna)	Cost estimate for the construction of new sorting plants (EUR)
Bjelovar-Bilogora	1.6 %	763,149	12,182	2,100	10,082	35,285.332	4,683,168.36
Slavonski Brod - Posavina	2.0 %		15,617	0	15,617	54,661.020	7,254,764.09
Dubrovnik - Neretva	3.9 %		29,775	2,900	26,875	94,063.975	12,484,434.93
City of Zagreb	19.8 %		150,724	62,900	87,824	307,382.444	40,796,661.23
Istria	7.5 %		56,867	0	56,867	199,034.559	26,416,425.64
Karlovac	2.5 %		18,823	9,100	9,723	34,031.498	4,516,755.99
Koprivnica-Križevci	1.7 %		13,094	3,120	9,974	34,909.758	4,633,321.12
Krapina-Zagorje	1.7 %		13,209	40,000	0	0	0
Lika-Senj	1.5 %		11,336	380	10,956	38,345.700	5,089,348.99
Međimurje	2.6 %		19,993	10,500	9,493	33,225.250	4,409,748.49
Osijek - Baranja	5.1 %		38,547	0	38,547	134,915.138	17,906,316.01
Požega-Slavonia	1.0 %		7,323	0	7,323	25,631.925	3,401,941.07
Primorje – Gorski kotar	9.7 %		74,226	10,200	64,026	224,089.716	29,741,816.44
Sisak - Moslavina	2.7 %		20,805	5,800	15,005	52,518.362	6,970,384.50
Split-Dalmatia	14.3 %		108,926	200	108,726	380,539.911	50,506,325.70
Šibenik-Knin	3.2 %		24,749	0	24,749	86,619.901	11,496,436.53
Varaždin	2.6 %		19,478	7,000	12,478	43,673.311	5,796,444.49
Virovitica-Podravina	1.3 %		9,996	0	9,996	34,986.729	4,643,536.93
Vukovar-Srijem	2.9 %		22,039	0	22,039	77,136.555	10,237,780.21
Zadar	6.1 %		46,576	0	46,576	163,014.908	21,635,796.40
Zagreb	6.4 %	48,864	57,600	0	0	0	
<b>Total</b>			<b>763,149</b>	<b>211,800</b>	<b>586,876</b>	<b>2,054,065,991.5</b>	<b>272,621,407.06</b>

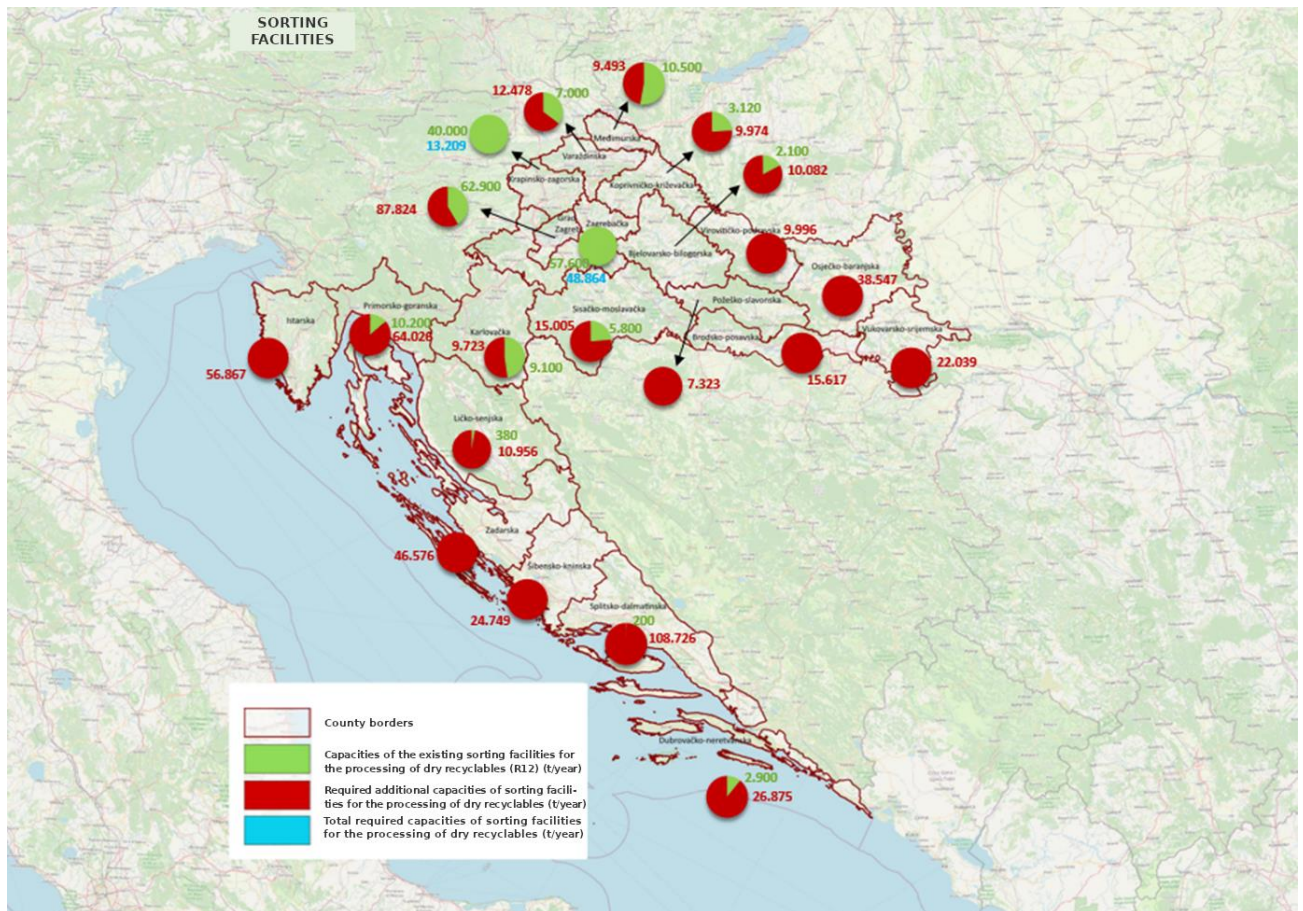


Figure 66. Total required capacity of waste sorting facilities in 2028 – SCENARIO Nr.1

Table 33. Total required capacities of sorting facilities in 2028 – SCENARIO nr. 2

2028 - Sorting facilities							
County	County share in the total amount of collected MSW	Dry recyclables input (t/y)	Total number of required dry recyclable sorting facilities (t/y)	Capacity of the existing dry recyclable sorting facilities (R12) (t/y)	Additional capacity required for dry recyclable sorting facilities (t/y)	Cost estimate for the construction of new sorting plants in HRK (Croatian kuna)	Cost estimate for the construction of new sorting plants (EUR)
Bjelovar-Bilogora	1.6 %	691,401	11,036	2,100	8,936	31,276.955	4,151,165.31
Slavonski Brod - Posavina	2.0 %		14,149	0	14,149	49,522.043	6,572,704.63
Dubrovnik - Neretva	3.9 %		26,976	2,900	24,076	84,266.258	11,184,054.42
City of Zagreb	19.8 %		136,553	62,900	73,653	257,786.280	34,214,119.05
Istria	7.5 %		51,521	0	51,521	180,322.249	23,932,875.31
Karlovac	2.5 %		17,054	9,100	7,954	27,837.624	3,694,687.64
Koprivnica-Križevci	1.7 %		11,863	3,120	8,743	30,601.056	4,061,458.09
Krapina-Zagorje	1.7 %		11,967	40,000	0	0	0
Lika-Senj	1.5 %		10,270	380	9,890	34,615.574	4,594,276.20
Međimurje	2.6 %		18,113	10,500	7,613	26,646.500	3,536,598.31
Osijek - Baranja	5.1 %		34,923	0	34,923	122,231.040	16,222,846.90
Požega-Slavonia	1.0 %		6,635	0	6,635	23,222.130	3,082,106.31
Primorje - Gorski kotar	9.7 %		67,247	10,200	57,047	199,665.487	26,500,164.18
Sisak - Moslavina	2.7 %		18,849	5,800	13,049	45,672.316	6,061,758.05
Split-Dalmatia	14.3 %		98,685	200	98,485	344,697.496	45,749,219.72
Šibenik-Knin	3.2 %		22,422	0	22,422	78,476.298	10,415,594.66
Varaždin	2.6 %		17,647	7,000	10,647	37,263.972	4,945,779.02

Virovitica-Podravina	1.3 %		9,056	0	9,056	31,697.438	4,206,972.99
Vukovar-Srijem	2.9 %		19,967	0	19,967	69,884.532	9,275,271.35
Zadar	6.1 %		42,197	0	42,197	147,688.999	19,601,698.72
Zagreb	6.4 %		44,270	57,600	0	0	0
<b>Total</b>			<b>691,401</b>	<b>211,800</b>	<b>520,964</b>	<b>1,823,374,246.95</b>	<b>242,003,350.85</b>

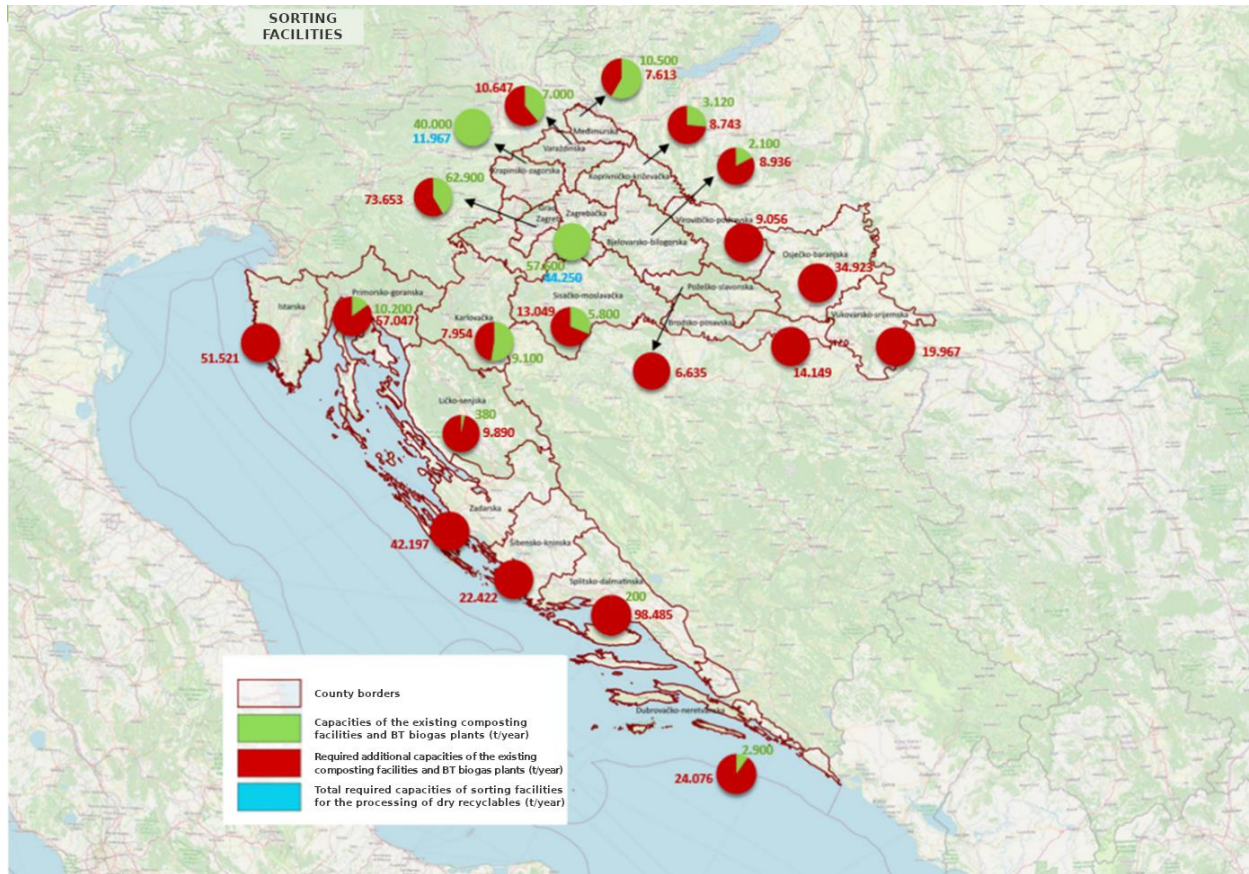


Figure 67. Total required capacity of waste sorting facilities in 2028 – SCENARIO Nr. 2



### **8.2.2. Separately collected bio-waste recovery facilities**

The required new capacities of the facilities intended for the recovery of separately collected bio-waste (recovery process R 3) are determined as the difference between the existing capacities by county and the City of Zagreb, based on data available in the Environmental Pollution Register (ROO), and the amount of waste that needs to be separately collected in order to meet the objectives of Scenario nr. 1 or Scenario nr. 2, taking into account an average impurity content in separately collected waste of 13%.

The total required capacities of new facilities for biological treatment, composting, and biogas facilities (or upgraded existing facilities with increased capacity or recovery efficiency) are derived from the existing capacities and estimates of specific EWC waste categories. These capacities are detailed in the tables and diagrams below (Table 34 and Figure 68 for Scenario nr. 1, Table 35 and Figure 69 for Scenario nr. 2).

Taking into account the provisions of Commission Implementing Decision (EU) 2019/1004 of June 7, 2019, on rules for calculating, verifying, and reporting waste data, the quantities of recycled municipal bio-waste are determined, considering separately collected and recycled municipal bio-waste at the source – 'home composting'.

**Table 34. Total required capacities of composting facilities and biogas plants in 2028 – SCENARIO nr. 1**

2028 – Composting and biogas facilities													
County	County share in the total amount of collected MSW	Biological treatment system input (t/y)	Total required capacity of composting and biological treatment biogas plants (t/y)	Number of biogas plants	Number of composting facilities	Capacity of the existing BT biogas plants (t/y)	Capacity of the existing BT composting plants (t/y)	Total existing capacity of biogas plants and BT composting plants (t/y)	Required additional capacity of composting and biogas BT plants (t/y)	Cost estimate for the construction of new composting and biogas plants in HRK (Croatian kuna)	Cost estimate for the construction of new composting and biogas plants (EUR)	Cost estimate for the upgrade of the existing biogas plants in HRK (Croatian kuna)	Cost estimate for the upgrade of the existing biogas plants (EUR)
Bjelovar-Bilogora	1.6 %	449,199	7,151	5	1	85,200	4,000	89,200	0	0	0	18,750,000	2,488,552.66
Slavonski Brod - Posavina	2.0 %		9,168	0	0	0	0	0	9,168	45,838,745	6,083,846.97	0	0.00
Dubrovnik - Neretva	3.9 %		17,479	0	1	0	5,720	5,720	11,759	58,793,865	7,803,286.88	0	0.00
City of Zagreb	19.8 %		88,478	2	3	27,033	42,038	69,071	19,407	97,033,836	12,878,603.23	7,500,000	995,421.06
Istria	7.5 %		33,382	0	0	0	0	0	33,382	166,910,430	22,152,821.02	0	0.00
Karlovac	2.5 %		11,050	0	0	0	0	0	11,050	55,248,241	7,332,701.71	0	0.00
Koprivnica-Križevci	1.7 %		7,687	3	3	108,000	28,763	136,763	0	0	0	11,250,000	1,493,131.59
Krapina-Zagorje	1.7 %		7,754	0	0	0	0	0	7,754	38,770,599	5,145,742.78	0	0.00
Lika-Senj	1.5 %		6,654	0	0	0	0	0	6,654	33,272,051	4,415,960.05	0	0.00
Međimurje	2.6 %		12,951	0	3	0	16,780	16,780	0	0	0	0	0.00
Osijek - Baranja	5.1 %		22,628	13	1	438,275	4,499	442,774	0	0	0	48,750,000	6,470,236.91
Požega-Slavonia	1.0 %		4,299	0	1	0	1,000	1,000	3,299	16,494,938	2,189,254.50	0	0.00
Primorje – Gorski kotar	9.7 %		43,572	0	1	0	2,000	2,000	41,572	207,859,719	27,587,725.66	0	0.00
Sisak - Moslavina	2.7 %		12,213	0	2	0	29,700	29,700	0	0	0	0	0.00
Split-Dalmatia	14.3 %		63,942	0	0	0	0	0	63,942	319,707,883	42,432,528.10	0	0.00
Šibenik-Knin	3.2 %		14,528	0	0	0	0	0	14,528	72,639,470	9,640,914.46	0	0.00
Varaždin	2.6 %		11,434	2	2	36,000	4,000	40,000	0	0	0	7,500,000	995,421.06
Virovitica-Podravina	1.3 %		5,868	2	0	36,500	0	36,500	0	0	0	7,500,000	995,421.06
Vukovar-Srijem	2.9 %		12,937	6	0	36,300	0	36,300	0	0	0	22,500,000	2,986,263.19
Zadar	6.1 %		27,341	0	0	0	0	0	27,341	136,704,341	18,143,784.06	0	0.00
Zagreb	6.4 %	28,684	2	1	72,500	30,000	102,500	0	0	0	7,500,000	995,421.06	
<b>Total</b>		<b>449,199</b>	<b>35</b>	<b>19</b>	<b>839,808</b>	<b>168,500</b>	<b>1,008,308</b>	<b>249,855</b>	<b>1,249,274,118.14</b>	<b>165,807,169.44</b>	<b>131,250,000.00</b>	<b>17,419,868.60</b>	
										<b>183,227,038.04 EUR (1,380,524,118.14 HRK)</b>			

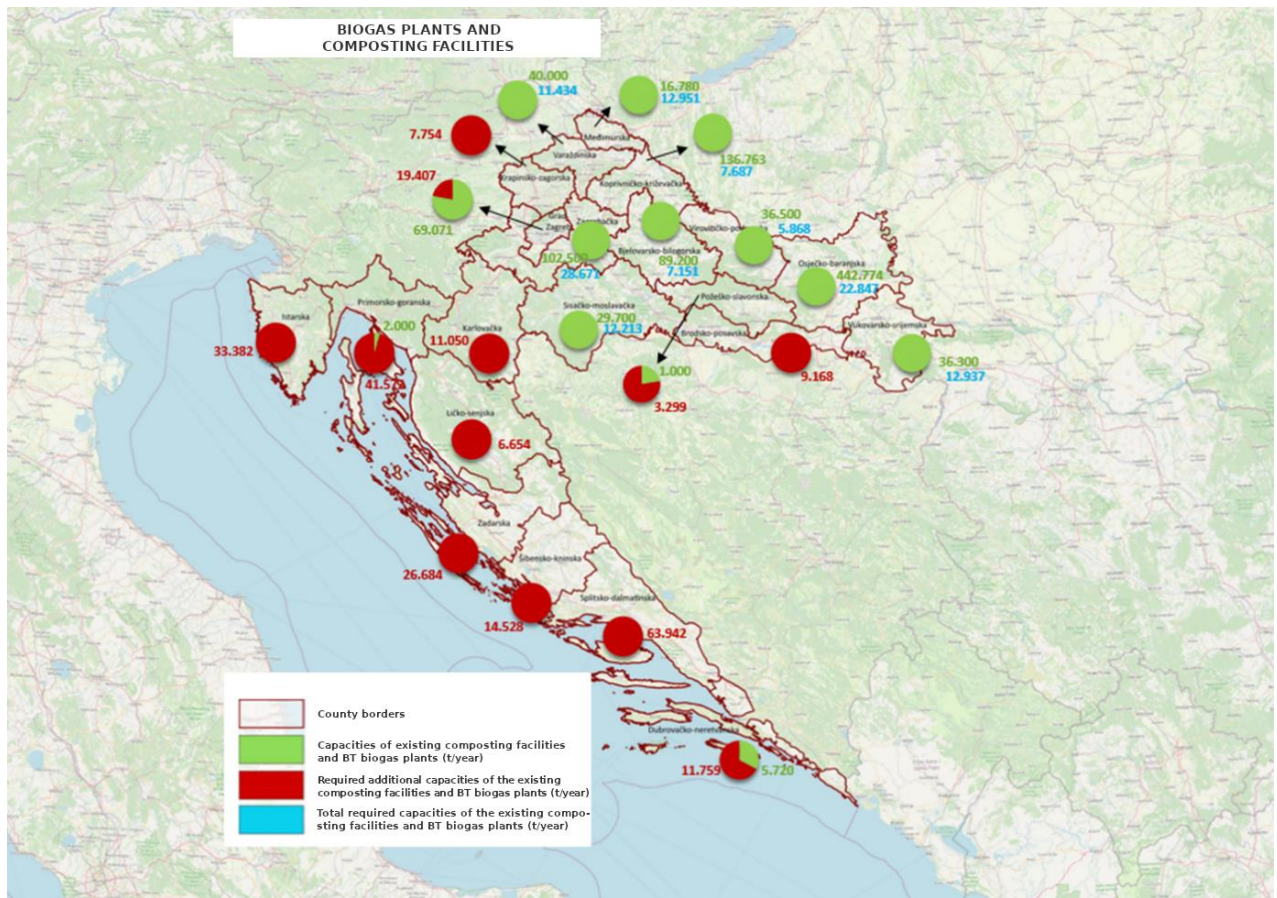
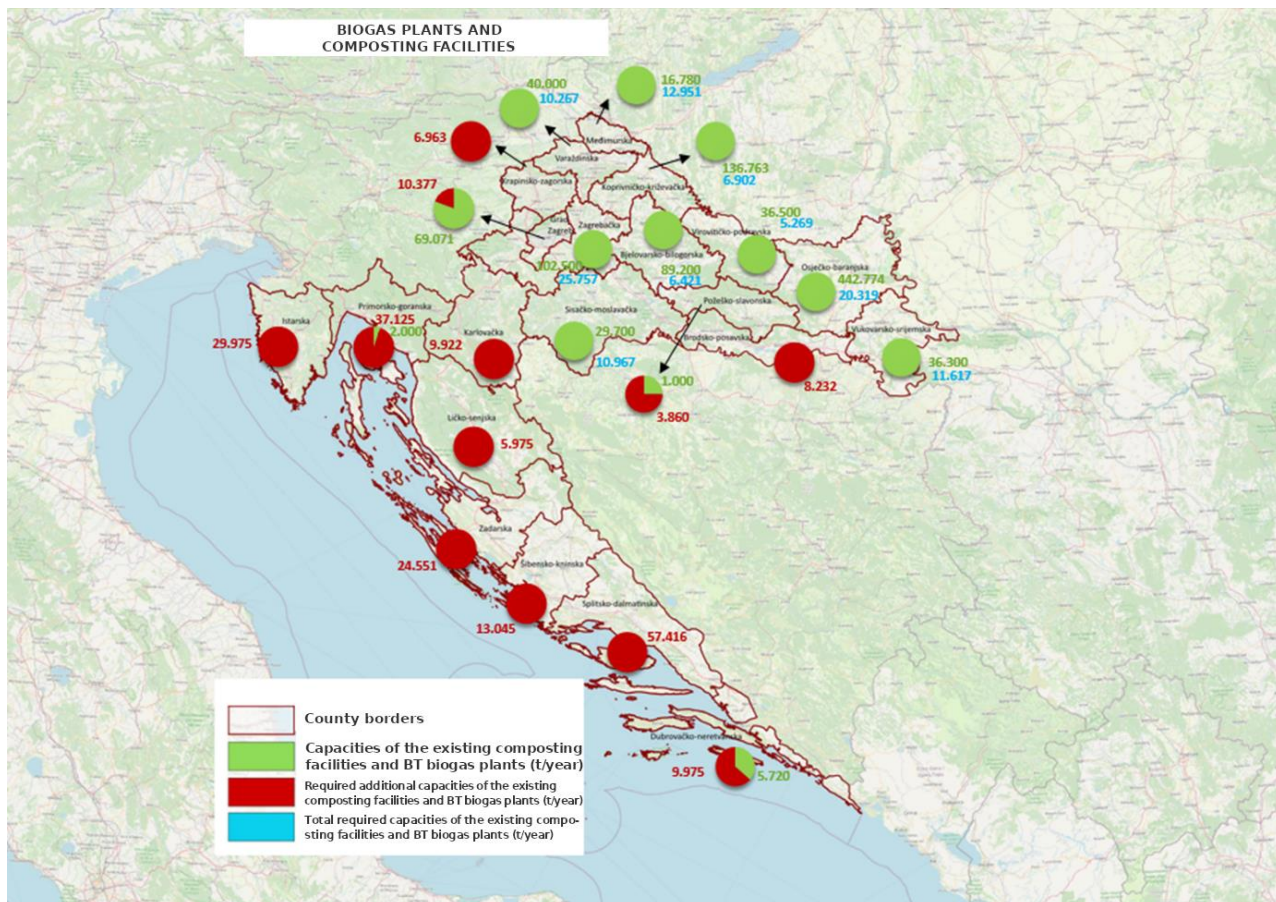


Figure 68. Total required capacity of composting facilities and biogas plants in 2028 – SCENARIO nr. 1

**Table 35. Total required capacities of composting facilities and biogas plants in 2028 – SCENARIO nr. 2**

2028 - Composting and biogas facilities													
County	County share in the total amount of collected MSW	Biological treatment system input (t/y)	Total required capacity of composting and biological treatment biogas plants (t/y)	Number of biogas plants	Number of composting facilities	Capacity of the existing BT biogas plants (t/y)	Capacity of the existing BT composting plants (t/y)	Total existing capacity of biogas plants and BT composting plants (t/y)	Required additional capacity of composting and biogas BT plants (t/y)	Cost estimate for the construction of new composting and biogas plants in HRK (Croatian kuna)	Cost estimate for the construction of new composting and biogas plants (EUR)	Cost estimate for the upgrade of the existing biogas plants in HRK (Croatian kuna)	Cost estimate for the upgrade of the existing biogas plants (EUR)
Bjelovar-Bilogora	1.6 %	404,677	6,421	5	1	85,200	4,000	89,200	0	0	0	18,750,000	2,488,552.66
Slavonski Brod - Posavina	2.0 %		8,232	0	0	0	0	0	8,232	41,160,679	5,462,960.91	0	0
Dubrovnik - Neretva	3.9 %		15,695	0	1	0	5,720	5,720	9,975	49,874,899	6,619,536.66	0	0
City of Zagreb	19.8 %		79,448	2	3	27,033	42,038	69,071	10,377	51,885,921	6,886,445.15	7,500,000	995,421.06
Istria	7.5 %		29,975	0	0	0	0	0	29,975	149,876,415	19,892,018.71	0	0
Karlovac	2.5 %		9,922	0	0	0	0	0	9,922	49,609,891	6,584,364.06	0	0
Koprivnica-Križevci	1.7 %		6,902	3	3	108,000	28,763	136,763	0	0	0	11,250,000	1,493,131.59
Krapina-Zagorje	1.7 %		6,963	0	0	0	0	0	6,963	34,813,872	4,620,594.86	0	0
Lika-Senj	1.5 %		5,975	0	0	0	0	0	5,975	29,876,478	3,965,290.07	0	0
Međimurje	2.6 %		12,951	0	3	0	16,780	16,780	0	0	0	0	0
Osijek - Baranja	5.1 %		20,319	13	1	438,275	4,499	442,774	0	0	0	48,750,000	6,470,236.91
Požega-Slavonia	1.0 %		3,860	0	1	0	1,000	1,000	2,860	14,301,276	1,898,105.51	0	0
Primorje – Gorski kotar	9.7 %		39,125	0	1	0	2,000	2,000	37,125	185,626,084	24,636,815.18	0	0
Sisak - Moslavina	2.7 %		10,967	0	2	0	29,700	29,700	0	0	0	0	0
Split-Dalmatia	14.3 %		57,416	0	0	0	0	0	57,416	287,080,151	38,102,083.88	0	0
Šibenik-Knin	3.2 %		13,045	0	0	0	0	0	13,045	65,226,262	8,657,012.68	0	0
Varaždin	2.6 %		10,267	2	2	36,000	4,000	40,000	0	0	0	7,500,000	995,421.06
Virovitica-Podravina	1.3 %		5,269	2	0	36,500	0	36,500	0	0	0	7,500,000	995,421.06
Vukovar-Srijem	2.9 %		11,617	6	0	36,300	0	36,300	0	0	0	22,500,000	2,986,263.19
Zadar	6.1 %		24,551	0	0	0	0	0	24,551	122,753,004	16,292,123.43	0	0
Zagreb	6.4 %	25,757	2	1	72,500	30,000	102,500	0	0	0	7,500,000	995,421.06	
<b>Total</b>			<b>404,677</b>	<b>35</b>	<b>19</b>	<b>839,808</b>	<b>168,500</b>	<b>1,008,308</b>	<b>216,417</b>	<b>1,082,084,932</b>	<b>143,617,351.12</b>	<b>131,250,000</b>	<b>17,419,868.60</b>
											<b>161,037,219.72 EUR (1,213,334,932.00 HRK)</b>		



**Figure 69.** Total required capacity of composting facilities and biogas plants in 2028 – SCENARIO nr. 2

Since the specific counties lack sufficient capacities or the existing facilities are not adequately equipped for the recovery of separately collected bio-waste generated and expected to be generated in the planning period, significant investments in infrastructure are required. Planning of the system should be based on the 'proximity principle' in order to reduce environmental impact and related risks.

Considering the limited capacities for processing bio-waste that is generated and will be generated in the planning period in Croatia, and in order to prevent a negative impact on the national waste management system, it is necessary to ban the import of waste under EWC codes 20 01 08, 20 02 01, and 20 03 02.

### 8.2.3. Plants for recovery and disposal of mixed municipal waste

Taking into consideration the following:

- shares of specific key components of municipal waste from 2015 (Croatian Environmental Protection and Nature Agency, 2015) with corresponding composition adjustments
- separately collected quantities of municipal waste in 2021 (paper and cardboard, metal, plastic, glass, kitchen and garden waste, bulky waste, electrical and electronic waste)

- targets set by Directive 2008/98/EC for municipal waste for the years 2025, 2030, and 2035 for Scenarios nr. 1 and 2
- estimated quantities of municipal waste generated in the period until 2035,

the expected composition and quantities of the mixed municipal waste have been determined for the reference years, as well as the target rate (and quantities) of the separate collection and recycling of the key MW components (paper, plastic, metal, glass, bio-waste, bulky waste, electrical and electronic waste). This calculation is based on the assumption of the contamination rate in separately collected waste, with a difference between the quantities of separately collected waste (according to 2021 data, with a contamination rate of approximately 13%) and the amounts of waste recycled and prepared for reuse. Assuming the fulfilment of the objectives set by Directive 2008/98/EC through the observation of key components of municipal waste and the composition of municipal waste from 2015 (for which it is assumed it will not change during the observed period, except for the corrections made), the expected composition of mixed municipal waste in the reference years and their expected quantities have been obtained. Adequate infrastructure is required for their recovery and disposal. Estimated quantities and composition of mixed municipal waste in the reference years for Scenario nr. 1 are presented in Table 36.

**Table 36.** Estimate of the changes in quantity and composition of the mixed municipal waste that must be recovered and disposed of in the key years – SCENARIO nr. 1

Year	2025	Share in the MMW	2028	Share in the MMW	2030	Share in the MMW	2035	Share in the MMW
MSW quantity (t)	1,913,143		2,070,164		2,190,300		2,550,158	
MMW	860,914		869,469		876,120		892,555	
Paper and cardboard	221,169	25.69 %	217,754	25.04 %	219,448	25.05 %	216,195	24.22 %
Metal	21,112	2.45 %	22,845	2.63 %	24,170	2.76 %	28,142	3.15 %
Glass	42,099	4.89 %	41,449	4.77 %	41,771	4.77 %	41,152	4.61 %
Plastic	167,448	19.45 %	164,863	18.96 %	166,145	18.96 %	163,682	18.34 %
Bio-waste	274,460	31.88 %	270,222	31.08 %	272,324	31.08 %	268,287	30.06 %
Bulky waste	17,609	2.05 %	19,054	2.19 %	20,159	2.30 %	23,472	2.63 %
WEEE	13,377	1.55 %	14,475	1.66 %	15,315	1.75 %	17,831	2.00 %
Other types of waste	103,642		118,808		116,787		133,795	

The assumed efficiency of the MMW treatment plant and the expected WMC outputs in the period from 2025 to 2035 for Scenario nr. 1 is given in Tables 37, 38, 39 and 40.

**Table 37.** Assumed efficiency of the mixed municipal waste treatment plants and the expected WMC outputs in 2025 – SCENARIO nr. 1

2025 – SCENARIO nr. 1							
	Quantity (t)	Recyclables separation rate	Separated recyclables amount (t/y)	Separation rate for energy recovery	Quantity of waste sent to energy recovery (t/y)	Landfill disposal rate	Disposal (t/y)
<b>MSW quantity</b>	<b>1,913,143</b>						
<b>MMW</b>	<b>860,914</b>						
Paper and cardboard	221,169	0.10	22,117	0.80	176,935	0.10	22,117
Metal	21,112	0.90	19,001	0.00	0	0.10	2,111
Glass	42,099	0.90	37,889	0.00	0	0.10	4,210
Plastic	167,448	0.20	33,490	0.70	117,213	0.10	16,745

Bio-waste	274,460	0.00	0	0.20	54,892	0.80	109,784
Bulky waste	17,609	0.00	0	0.00	0	0.00	0
WEEE	13,377	0.80	10,701	0.00	0	0.20	2,675
Other types of waste	103,642		0	0.30	31,093	0.70	72,550
Total quantity (t/y)			123,197		380,133		230,191
Share in WMC input			14 %		44 %		27 %

**Table 38.** Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2025 – SCENARIO nr. 1

2028 – SCENARIO nr. 1							
	Quantity (t)	Recyclables separation rate	Separated recyclables amount (t/y)	Separation rate for energy recovery	Quantity of waste sent to energy recovery (t/y)	Landfill disposal rate	Disposal (t/y)
<b>MSW quantity</b>	<b>2,070,164</b>						
<b>MMW</b>	<b>869,469</b>						
Paper and cardboard	217,754	0.10	21,775	0.80	174,203	0.10	21,775
Metal	22,845	0.90	20,560	0.00	0	0.10	2,284
Glass	41,449	0.90	37,304	0.00	0	0.10	4,145
Plastic	164,863	0.20	32,973	0.70	115,404	0.10	16,486
Bio-waste	270,222	0.00	0	0.20	54,044	0.80	108,089
Bulky waste	19,054	0.00	0	0.00	0	0.00	0
WEEE	14,475	0.80	11,580	0.00	0	0.20	2,895
Other types of waste	118,808		0	0.30	35,642	0.70	83,165
Total quantity (t/y)			124,192		379,294		238,840
Share in WMC input			14 %		44 %		27 %

**Table 39.** Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2030 – SCENARIO nr. 1

2030 – SCENARIO nr. 1							
	Quantity (t)	Recyclables separation rate	Separated recyclables amount (t/y)	Separation rate for energy recovery	Quantity of waste sent to energy recovery (t/y)	Landfill disposal rate	Disposal (t/y)
<b>MSW quantity</b>	<b>2,190,300</b>						
<b>MMW</b>	<b>876,120</b>						
Paper and cardboard	219,448	0.10	21,945	0.80	175,559	0.10	21,945
Metal	24,170	0.90	21,753	0.00	0	0.10	2,417
Glass	41,771	0.90	37,594	0.00	0	0.10	4,177
Plastic	166,145	0.20	33,229	0.70	116,302	0.10	16,615
Bio-waste	272,324	0.00	0	0.20	54,465	0.80	108,930
Bulky waste	20,159	0.00	0	0.00	0	0.00	0
WEEE	15,315	0.80	12,252	0.00	0	0.20	3,063
Other types of waste	116,787		0	0.30	35,036	0.70	81,751
Total quantity (t/y)			126,773		381,361		238,897
Share in WMC input			14 %		44 %		27 %

**Table 40.** Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2035 – SCENARIO nr. 1

2035 – SCENARIO nr. 1							
	Quantity (t)	Recyclables separation rate	Separated recyclables amount (t/y)	Separation rate for energy recovery	Quantity of waste sent to energy recovery (t/y)	Landfill disposal rate	Disposal (t/y)
<b>MSW quantity</b>	<b>2,550,158</b>						
<b>MMW</b>	<b>892,555</b>						
Paper and cardboard	216,195	0.10	21,619	0.80	172,956	0.10	21,619
Metal	28,142	0.90	25,327	0.00	0	0.10	2,814
Glass	41,152	0.90	37,037	0.00	0	0.10	4,115
Plastic	163,682	0.20	32,736	0.70	114,577	0.10	16,368
Bio-waste	268,287	0.00	0	0.20	53,657	0.80	107,315
Bulky waste	23,472	0.00	0	0.00	0	0.00	0
WEEE	17,831	0.80	14,265	0.00	0	0.20	3,566
Other types of waste	133,795		0	0.30	40,139	0.70	93,657
Total quantity (t/y)			130,985		381,329		249,455
Share in WMC input			15 %		43 %		28 %

Estimated quantities and composition of the mixed municipal waste in the reference years for the Scenario nr. 2 is shown in Table 41.

**Table 41.** Estimate of the changes in quantity and composition of the mixed municipal waste that must be recovered and disposed of in the reference years – SCENARIO nr. 2

Year	2020	Share in MMW	2025	Share in MMW	2028	Share in MMW	2030	Share in MMW	2035	Share in MMW
Quantity (t)	1,692,966		1,913,143		2,070,164		2,190,300		2,550,158	
Non-recycled part of the MMW	846,483		956,571		972,977		985,635		1,020,063	
Paper and cardboard	261,152	30.85 %	250,658	26.20 %	249,807	25.67 %	253,210	25.69 %	255,503	25.05 %
Metal	27,854	3.29 %	21,112	2.21 %	22,845	2.35 %	24,170	2.45 %	28,142	2.76 %
Glass	44,734	5.28 %	47,712	4.99 %	47,550	4.89 %	48,198	4.89 %	48,634	4.77 %
Plastic	271,528	32.08 %	189,774	19.84 %	189,130	19.44 %	191,706	19.45 %	193,442	18.96 %
Bio-waste	321,842	38.02 %	311,054	32.52 %	309,998	31.86 %	314,220	31.88 %	317,066	31.08 %
Bulky waste	4,567	0.54 %	17,609	1.84 %	19,054	1.96 %	20,159	2.05 %	23,472	2.30 %
WEEE	10,702	1.26 %	13,377	1.40 %	14,475	1.49 %	15,315	1.55 %	17,831	1.75 %
Other types of waste			105,276		120,120		118,657		135,973	

The assumed efficiency of the mixed municipal waste treatment plant and the expected WMC outputs in the period from 2025 to 2035 for the Scenario nr. 2 is shown in Tables 42, 43, 44 and 45.



**Table 42.** Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2025 – SCENARIO nr. 2

2025 – SCENARIO nr. 2							
	Quantity (t)	Recyclables separation rate	Separated recyclables amount (t/y)	Separation rate for energy recovery	Quantity of waste sent to energy recovery (t/y)	Landfill disposal rate	Disposal (t/y)
<b>MSW quantity</b>	<b>1,913,143</b>						
<b>MMW</b>	<b>956,571</b>						
Paper and cardboard	250,658	0.10	25,066	0.10	25,066	0.80	200,526
Metal	21,112	0.90	19,001	0.00	0	0.10	2,111
Glass	47,712	0.90	42,941	0.00	0	0.10	4,771
Plastic	189,774	0.20	37,955	0.40	75,910	0.60	113,864
Bio-waste	311,054	0.00	0	0.10	31,105	0.90	139,974
Bulky waste	17,609	0.00	0	0.00	0	0.00	0
WEEE	13,377	0.80	10,701	0.00	0	0.20	2,675
Other types of waste	105,276		0	0.10	10,528	0.90	94,748
Total quantity (t/y)			135.663		142.608		558.671
Share in WMC input			14 %		15 %		58 %

**Table 43.** Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2028 – SCENARIO nr. 2

2028 – SCENARIO nr. 2							
	Quantity (t)	Recyclables separation rate	Separated recyclables amount (t/y)	Separation rate for energy recovery	Quantity of waste sent to energy recovery (t/y)	Landfill disposal rate	Disposal (t/y)
<b>MSW quantity</b>	<b>2,070,164</b>						
<b>MMW</b>	<b>972,977</b>						
Paper and cardboard	249,807	0.10	24,981	0.10	24,981	0.80	199,845
Metal	22,845	0.90	20,560	0.00	0	0.10	2,284
Glass	47,550	0.90	42,795	0.00	0	0.10	4,755
Plastic	189,130	0.20	37,826	0.40	75,652	0.60	113,478
Bio-waste	309,998	0.00	0	0.10	31,000	0.90	139,499
Bulky waste	19,054	0.00	0	0.00	0	0.00	0
WEEE	14,475	0.80	11,580	0.00	0	0.20	2,895
Other types of waste	120,120		0	0.10	12,012	0.90	108,108
Total quantity (t/y)			137.741		143.644		570.865
Share in WMC input			14 %		15 %		59 %

**Table 44.** Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2030 – SCENARIO nr. 2

2030 – SCENARIO nr. 2							
	Quantity (t)	Recyclables separation rate	Separated recyclables amount (t/y)	Separation rate for energy recovery	Quantity of waste sent to energy recovery (t/y)	Landfill disposal rate	Disposal (t/y)
<b>MSW quantity</b>	<b>2,190,300</b>						
<b>MMW</b>	<b>985,635</b>						
Paper and cardboard	253,210	0.10	25,321	0.10	25,321	0.80	202,568
Metal	24,170	0.90	21,753	0.00	0	0.10	2,417

Glass	48,198	0.90	43,378	0.00	0	0.10	4,820
Plastic	191,706	0.20	38,341	0.40	76,682	0.60	115,024
Bio-waste	314,220	0.00	0	0.10	31,422	0.90	141,399
Bulky waste	20,159	0.00	0	0.00	0	0.00	0
WEEE	15,315	0.80	12,252	0.00	0	0.20	3,063
Other types of waste	118,657		0	0.10	11,866	0.90	106,791
Total quantity (t/y)			141,045		145,291		576,081
Share in WMC input			14 %		15 %		58 %

**Table 45.** Assumed efficiency of the mixed municipal waste treatment plants and the expected outputs from the waste management centre in 2035 – SCENARIO nr. 2

2035 – SCENARIO nr. 2							
	Quantity (t)	Recyclables separation rate	Separated recyclables amount (t/y)	Separation rate for energy recovery	Quantity of waste sent to energy recovery (t/y)	Landfill disposal rate	Disposal (t/y)
<b>MSW quantity</b>	<b>2,550,158</b>						
<b>MMW</b>	<b>1,020,063</b>						
Paper and cardboard	255,503	0.10	25,550	0.10	25,550	0.80	204,402
Metal	28,142	0.90	25,327	0.00	0	0.10	2,814
Glass	48,634	0.90	43,771	0.00	0	0.10	4,863
Plastic	193,442	0.20	38,688	0.40	77,377	0.60	116,065
Bio-waste	317,066	0.00	0	0.10	31,707	0.90	142,680
Bulky waste	23,472	0.00	0	0.00	0	0.00	0
WEEE	17,831	0.80	14,265	0.00	0	0.20	3,566
Other types of waste	135,973		0	0.10	13,597	0.90	122,376
Total quantity (t/y)			147,602		148,231		596,767
Share in WMC input			14 %		15 %		59 %

Taking into consideration the risk of achieving the set objectives for the preparation for reuse and recycling, as well as the envisaged method of treating mixed municipal waste (municipal waste), it is necessary to consider the separation, preparation for reuse, and recycling of usable waste components through the processing of mixed municipal waste, during which metal, plastic, paper and cardboard, electrical and electronic waste, and glass will be separated. According to the expected composition of mixed municipal waste, these components can account for approximately or more than 10% of the treatment process input weight.

A summary of the quantities covered by the municipal waste management system is provided in Table 46 for Scenario nr. 1 and Table 47 for Scenario nr. 2

**Table 46.** Key quantities of municipal waste in the period from 2025 to 2035 – SCENARIO nr. 1

MSW in 2025		
1,913,143		
MMW	Impurities separated during the separation process (13 %)	Separately collected MW (mostly paper, cardboard, glass, plastic, metal, bio-waste, etc.)
724,905	136,009	1,046,225
860,914		Dry recyclables - paper, cardboard, glass, plastic, metal, etc.
		Bio-waste

WMC input			Separate collection system input		Recycling – composting facility or anaerobic digestion BT input	
			660,649		385,575	
Recyclables handed over for recycling	Disposal	Energy recovery	Recyclables handed over for recycling	Impurities separated during the separation process (13 % - MSC inputs)	Compost/digestate	Impurities separated during the separation process (13 % - MSC inputs)
14 %	27 %	44 %				
123,197	230,191	380,133	574,765	85,884	167,725	50,125

MSW in 2028						
2,070,164						
MMW	Impurities separated during the separation process (13 %)		Separately collected MW (mostly paper, cardboard, glass, plastic, metal, bio-waste, etc.)			
712,022	157,447		1,211,133			
869,469			Dry recyclables - paper, cardboard, glass, plastic, metal, etc.		Bio-waste	
WMC input			Separate collection system input		Recycling – composting facility or anaerobic digestion BT input	
			763,149		447,984	
Recyclables handed over for recycling	Disposal	Energy recovery	Recyclables handed over for recycling	Impurities separated during the separation process (13 % - MSC inputs)	Compost/digestate	Impurities separated during the separation process (13 % - MSC inputs)
14 %	27 %	44 %				
124,192	238,840	379,294	663,940	99,209	194,873	58,238

MSW in 2030						
2,190,300						
MMW	Impurities separated during the separation process (13 %)		Separately collected MW (mostly paper, cardboard, glass, plastic, metal, bio-waste, etc.)			
704,322	171,798		1,321,520			
876,120			Dry recyclables - paper, cardboard, glass, plastic, metal, etc.		Bio-waste	
WMC input			Separate collection system input		Recycling – composting facility or anaerobic digestion BT input	
			831,931		489,590	
Recyclables handed over for recycling (14 %)	Disposal (28 %)	Energy recovery (45 %)	Recyclables handed over for recycling	Impurities separated during the separation process (13 % - MSC inputs)	Compost/digestate	Impurities separated during the separation process (13 % - MSC inputs)
14 %	27 %	44 %				
126,773	238,897	381,361	723,780	108,151	212,971	63,647

MSW in 2035						
2,550,158						

MMW	Impurities separated during the separation process (13 %)		Separately collected MW (mostly paper, cardboard, glass, plastic, metal, bio-waste, etc.)			
673,804	218,751		1,682,701			
892,555			Dry recyclables - paper, cardboard, glass, plastic, metal, etc.		Bio-waste	
WMC input			Separate collection system input		Recycling – composting facility or anaerobic digestion BT input	
			1,056,604		626,097	
Recyclables handed over for recycling (14 %)	Disposal (29 %)	Energy recovery (45 %)	Recyclables handed over for recycling	Impurities separated during the separation process (13 % - MSC inputs)	Compost/ digestate	Impurities separated during the separation process (13 % - MSC inputs)
15 %	28 %	43 %				
130,985	249,455	381,329	919,246	137,359	272,352	81,393

**Table 47.** Key quantities of municipal waste in the period from 2025 to 2035 – SCENARIO nr. 2

MSW in 2025						
1,913,143						
MMW	Impurities separated during the separation process (13 %)		Separately collected MW (mostly paper, cardboard, glass, plastic, metal, bio-waste, etc.)			
834,612	121,960		938,152			
956,571			Dry recyclables - paper, cardboard, glass, plastic, metal, etc.		Bio-waste	
WMC input			Separate collection system input		Recycling – composting facility or anaerobic digestion BT input	
			594,639		343,513	
Recyclables handed over for recycling	Disposal	Energy recovery	Recyclables handed over for recycling	Impurities separated during the separation process (13 % - MSC inputs)	Compost/ digestate	Impurities separated during the separation process (13 % - MSC inputs)
14 %	58 %	15 %				
135,663	558,671	142,608	517,336	77,303	149,428	44,657

MSW in 2028						
2,070,164						
MMW	Impurities separated during the separation process (13 %)		Separately collected MW (mostly paper, cardboard, glass, plastic, metal, bio-waste, etc.)			
830,800	142,177		1,093,666			
972,977			Dry recyclables - paper, cardboard, glass, plastic, metal, etc.		Bio-waste	
WMC input			Separate collection system input		Recycling – composting facility or anaerobic digestion BT input	
			691,401		402,265	

Recyclables handed over for recycling	Disposal	Energy recovery	Recyclables handed over for recycling	Impurities separated during the separation process (13 % - MSC inputs)	Compost/digestate	Impurities separated during the separation process (13 % - MSC inputs)
14 %	59 %	15 %				
137,741	570,865	143,644	601,519	89,882	174,985	52,294

MSW in 2030						
2,190,300						
MMW	Impurities separated during the separation process (13 %)		Separately collected MW (mostly paper, cardboard, glass, plastic, metal, bio-waste, etc.)			
829,922	155,713		1,197,791			
985,635			Dry recyclables - paper, cardboard, glass, plastic, metal, etc.		Bio-waste	
WMC input			Separate collection system input		Recycling – composting facility or anaerobic digestion BT input	
			756,358		441,433	
Recyclables handed over for recycling (14 %)	Disposal (28 %)	Energy recovery (45 %)	Recyclables handed over for recycling	Impurities separated during the separation process (13 % - MSC inputs)	Compost/digestate	Impurities separated during the separation process (13 % - MSC inputs)
14 %	58 %	15 %				
141,045	576,081	145,291	658,031	98,327	192,023	57,386

MSW in 2035						
2,550,158						
MMW	Impurities separated during the separation process (13 %)		Separately collected MW (mostly paper, cardboard, glass, plastic, metal, bio-waste, etc.)			
820,040	200,024		1,538,643			
1,020,063			Dry recyclables - paper, cardboard, glass, plastic, metal, etc.		Bio-waste	
WMC input			Separate collection system input		Recycling – composting facility or anaerobic digestion BT input	
			968,615		570,028	
Recyclables handed over for recycling (14 %)	Disposal (29 %)	Energy recovery (45 %)	Recyclables handed over for recycling	Impurities separated during the separation process (13 % - MSC inputs)	Compost/digestate	Impurities separated during the separation process (13 % - MSC inputs)
14 %	59 %	15 %				
147,602	596,767	148,231	842,695	125,920	247,962	74,104

From the information provided, it is evident that during the observed period, infrastructure needs to be established for the recovery and disposal of 850,000 to 900,000 tonnes per year of mixed municipal waste (municipal waste) according to Scenario nr. 1, and 950,000 to 1,020,000 tonnes per year of mixed municipal waste according to Scenario nr. 2.

Furthermore, based on the estimated quantities of municipal waste generation by 2035, the maximum amount of municipal waste allowed to be disposed of in 2035 is 255,000 tonnes per year for Scenario nr. 1 and 637,540 tonnes per year for Scenario nr. 2.

Considering the capacities of Waste-to-Energy facilities (WtE) and the expected quantities of processing products, it is necessary to establish an efficient system for using waste-derived fuels. Specifically, in the period observed: from 2023 to 2028, after the establishment and commencement of operations of all Waste-to-Energy facilities, an average of approximately 400,000 tonnes per year of low to medium-quality waste-derived fuel is expected according to Scenario nr. 1, or approximately 145,000 tonnes per year of high-quality waste-derived fuel according to Scenario nr. 2.

When planning waste-derived fuel and mixed municipal waste energy recovery facilities, taking into account the catchment areas of future facilities, it is necessary to anticipate additional capacity required for the recovery and/or disposal of sewage sludge from municipal waste water treatment plants at an expected maximum amount of 100,000 tonnes of dry solids per year (more than 80% of dry solids).

As there are currently no sufficient capacities for treating sewage sludge from municipal waste water treatment plants, it has been determined that these capacities need to be planned and constructed. This primarily applies to waste-to-energy facilities, including waste-derived fuel resulting from waste and/or mixed municipal waste processing. This energy potential has been recognised in the Energy Development Strategy of the Republic of Croatia until 2030 with a perspective to 2050 (Official Gazette nr. 25/20), which takes into account the energy potential of waste-derived fuels, mixed municipal waste, and sewage sludge from municipal waste water treatment plants.

In accordance with the scope of individual Waste-to-Energy facilities, the required capacities are presented in the following tables (Table 48 for Scenario nr. 1 and Table 49 for Scenario nr. 2).

**Table 48. Required capacities of waste management centres – SCENARIO nr. 1**

WMC	County	Expected nominal capacity (t/y)	Construction status	Calculated WMC capacity with respect to Scenario nr. 1 targets (t)
Babina gora	Karlovac, part of the Lika-Senj County and part of the Sisak-Moslavina County	30,000	Not constructed	27,971
Biljane Donje	Zadar and part of the Lika-Senj County	75,000	Under construction	59,584
Lečevica	Split-Dalmatia County	110,000	Not constructed	124,101
Lučino Razdolje	Dubrovnik-Neretva County	40,000	Not constructed	33,924
Piškovnica *)	Krapina-Zagorje County, Varaždin, Koprivnica-Križevci, Međimurje, Bjelovar-Bilogora	110,000	Not constructed	88,817
Šagulje	Požega-Slavonia, Slavonski Brod-Posavina, part of the Sisak-Moslavina County and the Virovitica-Podravina County	55,000	Not constructed	52,485
Orlovnjak	Osijek-Baranja and Vukovar-Srijem counties	60,000	Not constructed	69,027
Zagreb	City of Zagreb and the Zagreb County	180,000	Not constructed	227,393
<b>TOTAL:</b>		<b>660,000</b>	<b>0</b>	<b>683,302</b>

\*) Piškornica WMC will be built in such a way as to include the Koprivnica-Križevci County, the Krapina-Zagorje County, the Međimurje County and the Varaždin County in the first phase, and the Bjelovar-Bilogora County in the second phase, in line with the objectives of increasing the separately collected waste collection rate.

**Table 49. Required capacities of waste management centres – SCENARIO nr. 2**

WMC	County	Expected nominal capacity (t/y)	Construction status	Calculated WMC capacity with respect to Scenario nr. 2 targets (t)
<b>Babina gora</b>	Karlovac, part of the Lika-Senj County and part of the Sisak-Moslavina County	30,000	Not constructed	31,301
<b>Biljane Donje</b>	Zadar and part of the Lika-Senj County	75,000	Under construction	66,677
<b>Lečevica</b>	Split-Dalmatia County	110,000	Not constructed	138,875
<b>Lučino Razdolje</b>	Dubrovnik-Neretva County	40,000	Not constructed	37,962
<b>Piškovnica *)</b>	Krapina-Zagorje County, Varaždin, Koprivnica-Križevci, Međimurje, Bjelovar-Bilogora	110,000	Not constructed	99,390
<b>Šagulje</b>	Požega-Slavonia, Slavonski Brod-Posavina, part of the Sisak-Moslavina County and the Virovitica-Podravina County	55,000	Not constructed	58,733
<b>Orlovnjak</b>	Osijek-Baranja and Vukovar-Srijem counties	60,000	Not constructed	77,244
<b>Zagreb</b>	City of Zagreb and the Zagreb County	180,000	Not constructed	254,464
<b>TOTAL:</b>		<b>660,000</b>	<b>0</b>	<b>764,647</b>

\*) Piškornica WMC will be built in such a way as to include the Koprivnica-Križevci County, the Krapina-Zagorje County, the Međimurje County and the Varaždin County in the first phase, and the Bjelovar-Bilogora County in the second phase, in line with the objectives of increasing the separately collected waste collection rate.

#### 8.2.4. Construction and demolition waste recycling plants

Considering the recorded capacities for the recovery of construction and demolition waste (determined based on the existing waste management licences), which are sufficient in most counties (taking into account estimated quantities of generated construction and demolition waste in 2020), the assessment of the necessary additional capacities is only provided for counties where a capacity shortage has been identified (Table 50). Although there is a sufficient overall capacity for the recovery of construction and demolition waste at the national level, given the significant sensitivity to transportation costs for this type of waste, it is imperative to plan additional investments in areas with capacity shortages.

**Table 50.** Required capacities of mobile and stationary construction waste crushers

2028 – CONSTRUCTION WASTE-						
County	Estimated quantities of generated construction waste in 2020 (t/year)	Existing capacities of mobile crushers for construction waste (t/year)	Required additional capacity of mobile crushers and stationary construction waste processing plants (t/year)	Required number of plants	Investment (kn)	Investment (EUR)
Bjelovar-Bilogora	18.661	11.950	6.711	2	15.000.000	1.990.842,13
Slavonski Brod - Posavina	32.400	0	32.400	2	15.000.000	1.990.842,13
Dubrovnik - Neretva	79.127	898.090	0	0	0	0
City of Zagreb	334.639	1.530.500	0	0	0	0
Istria	118.680	390.000	0	0	0	0
Karlovac	23.558	141.000	0	0	0	0
Koprivnica-Križevci	18.365	11.300	7.065	2	15.000.000	1.990.842,13
Krapina-Zagorje	22.534	186.400	0	0	0	0
Lika-Senj	13.055	0	13.055	2	15.000.000	1.990.842,13
Međimurje	38.908	28.800	10.108	2	15.000.000	1.990.842,13
Osijek - Baranja	70.531	414.880	0	0	0	0
Požega-Slavonia	12.907	0	12.907	2	15.000.000	1.990.842,13
Primorje – Gorski kotar	105.341	220.980	0	0	0	0
Sisak - Moslavina	38.786	2.500	36.286	2	15.000.000	1.990.842,13
Split-Dalmatia	119.413	772.000	0	0	0	0
Šibenik-Knin	29.628	520.000	0	0	0	0
Varaždin	63.402	27.200	36.202	2	15.000.000	1.990.842,13
Virovitica-Podravina	15.376	0	15.376	2	15.000.000	1.990.842,13
Vukovar-Srijem	50.833	13.054	37.779	2	15.000.000	1.990.842,13
Zadar	85.461	13.568	71.893	2	15.000.000	1.990.842,13
Zagreb	107.589	480.000	0	0	0	0
<b>Total</b>	<b>1.399.193</b>	<b>5.662.222</b>	<b>279.781</b>	<b>22</b>	<b>165.000.000</b>	<b>21.899.263,39</b>

#### 8.2.5. Plastic recovery plants

Since there are no sufficient capacities at the national level for the material recovery of plastics, the estimate of the required additional capacities for the recovery of plastic waste at the national level is given in (Table 51) (Table 52).



**Table 51. Required capacities of plastic recycling facilities - SCENARIO nr. 1**

2028 -PLASTIC-						
County	County share in the total collected MSW	Recycling system input (t)	Required capacity (t)	Total capacity (t/y)	Number of plants	Required additional capacity (t/y)
Bjelovar-Bilogora	1.6 %	237,784	3,796	0	0	3,796
Slavonski Brod - Posavina	2.0 %		4,866	0	0	4,866
Dubrovnik - Neretva	3.9 %		9,278	0	0	9,278
City of Zagreb	19.8 %		46,963	0	0	46,963
Istria	7.5 %		17,719	0	0	17,719
Karlovac	2.5 %		5,865	8,808	2	-2,943
Koprivnica-Križevci	1.7 %		4,080	0	0	4,080
Krapina-Zagorje	1.7 %		4,116	0	0	4,116
Lika-Senj	1.5 %		3,532	0	0	3,532
Međimurje	2.6 %		6,229	0	0	6,229
Osijek - Baranja	5.1 %		12,011	50,000	1	-37,989
Požega-Slavonia	1.0 %		2,282	0	0	2,282
Primorje – Gorski kotar	9.7 %		23,127	0	0	23,127
Sisak - Moslavina	2.7 %		6,483	0	0	6,483
Split-Dalmatia	14.3 %		33,939	0	0	33,939
Šibenik-Knin	3.2 %		7,711	0	0	7,711
Varaždin	2.6 %		6,069	5,000	1	1,069
Virovitica-Podravina	1.3 %		3,115	0	0	3,115
Vukovar-Srijem	2.9 %		6,867	0	0	6,867
Zadar	6.1 %		14,512	0	0	14,512
Zagreb	6.4 %	15,225	440	3	14,785	
<b>Total</b>			<b>237,784</b>	<b>64,248</b>	<b>7</b>	<b>173,536</b>
<b>Investment</b>						<b>2,603,041,170.00 HRK</b> <b>345,482,934.50 EUR</b>

**Table 52. Required capacities of plastic recycling facilities - SCENARIO nr. 2**

2028 -PLASTIC-						
County	County share in the total collected MSW	Recycling system input (t)	Required capacity (t)	Total capacity (t/y)	Number of plants	Required additional capacity (t/y)
Bjelovar-Bilogora	1.6 %	213,517	3,408	0	0	3,408
Slavonski Brod - Posavina	2.0 %		4,370	0	0	4,370
Dubrovnik - Neretva	3.9 %		8,331	0	0	8,331
City of Zagreb	19.8 %		42,170	0	0	42,170
Istria	7.5 %		15,910	0	0	15,910
Karlovac	2.5 %		5,266	8,808	2	-3,542
Koprivnica-Križevci	1.7 %		3,664	0	0	3,664
Krapina-Zagorje	1.7 %		3,696	0	0	3,696
Lika-Senj	1.5 %		3,172	0	0	3,172
Međimurje	2.6 %		5,594	0	0	5,594
Osijek - Baranja	5.1 %		10,785	50,000	1	-39,215
Požega-Slavonia	1.0 %		2,049	0	0	2,049
Primorje – Gorski kotar	9.7 %		20,767	0	0	20,767
Sisak - Moslavina	2.7 %		5,821	0	0	5,821
Split-Dalmatia	14.3 %		30,476	0	0	30,476
Šibenik-Knin	3.2 %		6,924	0	0	6,924
Varaždin	2.6 %		5,450	5,000	1	450
Virovitica-Podravina	1.3 %		2,797	0	0	2,797
Vukovar-Srijem	2.9 %		6,166	0	0	6,166
Zadar	6.1 %		13,031	0	0	13,031
Zagreb	6.4 %	13,671	440	3	13,231	
<b>Total</b>			<b>213,517</b>	<b>64,248</b>	<b>7</b>	<b>149,269</b>
<b>Investment</b>						<b>2,239,035,990.00 HRK</b> <b>297,171,144.73 EUR</b>

## 8.2.6. Glass recovery plants

Since the existing glass waste recovery facilities meet the expected quantities of glass that must be recycled in 2028, no further investments in glass recovery facilities are necessary (Table 53) (Table 54).

**Table 53. Required capacities of glass recycling facilities - SCENARIO nr. 1**

2028 - GLASS-						
County	County share in the total collected MSW	Recycling system input (t)	Required capacity (t)	Total capacity (t/y)	Number of plants	Required additional capacity (t/y)
Bjelovar-Bilogora	1.6 %	59,782	954	0	0	954
Slavonski Brod - Posavina	2.0 %		1,223	0	0	1,223
Dubrovnik - Neretva	3.9 %		2,333	0	0	2,333
City of Zagreb	19.8 %		11,807	0	0	11,807
Istria	7.5 %		4,455	0	0	4,455
Karlovac	2.5 %		1,475	0	0	1,475
Koprivnica-Križevci	1.7 %		1,026	0	0	1,026
Krapina-Zagorje	1.7 %		1,035	131,400	1	-130,365
Lika-Senj	1.5 %		888	0	0	888
Međimurje	2.6 %		1,566	0	0	1,566
Osijek - Baranja	5.1 %		3,020	0	0	3,020
Požega-Slavonia	1.0 %		574	0	0	574
Primorje – Gorski kotar	9.7 %		5,815	0	0	5,815
Sisak - Moslavina	2.7 %		1,630	0	0	1,630
Split-Dalmatia	14.3 %		8,533	0	0	8,533
Šibenik-Knin	3.2 %		1,939	0	0	1,939
Varaždin	2.6 %		1,526	0	0	1,526
Virovitica-Podravina	1.3 %		783	0	0	783
Vukovar-Srijem	2.9 %		1,726	0	0	1,726
Zadar	6.1 %		3,649	0	0	3,649
Zagreb	6.4 %	3,828	0	0	3,828	
<b>Total</b>			<b>59,782</b>	<b>131,400</b>	<b>1</b>	<b>-71,618</b>

**Table 54. Required capacities of glass recycling facilities - SCENARIO nr. 2**

2028 - GLASS-						
County	County share in the total collected MSW	Recycling system input (t)	Required capacity (t)	Total capacity (t/y)	Number of plants	Required additional capacity (t/y)
Bjelovar-Bilogora	1.6 %	53,681	857	0	0	857
Slavonski Brod - Posavina	2.0 %		1,099	0	0	1,099
Dubrovnik - Neretva	3.9 %		2,094	0	0	2,094
City of Zagreb	19.8 %		10,602	0	0	10,602
Istria	7.5 %		4,000	0	0	4,000
Karlovac	2.5 %		1,324	0	0	1,324
Koprivnica-Križevci	1.7 %		921	0	0	921
Krapina-Zagorje	1.7 %		929	131,400	1	-130,471
Lika-Senj	1.5 %		797	0	0	797
Međimurje	2.6 %		1,406	0	0	1,406
Osijek - Baranja	5.1 %		2,711	0	0	2,711
Požega-Slavonia	1.0 %		515	0	0	515
Primorje – Gorski kotar	9.7 %		5,221	0	0	5,221
Sisak - Moslavina	2.7 %		1,463	0	0	1,463
Split-Dalmatia	14.3 %		7,662	0	0	7,662
Šibenik-Knin	3.2 %		1,741	0	0	1,741
Varaždin	2.6 %		1,370	0	0	1,370
Virovitica-Podravina	1.3 %		703	0	0	703
Vukovar-Srijem	2.9 %		1,550	0	0	1,550
Zadar	6.1 %		3,276	0	0	3,276
Zagreb	6.4 %	3,437	0	0	3,437	
<b>Total</b>			<b>53,681</b>	<b>131,400</b>	<b>1</b>	<b>-77,719</b>

## 8.2.7. Paper and cardboard recovery plants

Since the existing paper and cardboard waste recovery facilities meet the expected quantities of paper and cardboard that must be recycled in 2028, no further investments in paper and cardboard recovery facilities are necessary (Table 55) (Table 56).

**Table 55. Required capacities of paper recycling facilities - SCENARIO nr. 1**

2028 -PAPER-						
County	County share in the total collected MSW	Recycling system input (t)	Required capacity (t)	Total capacity (t/y)	Number of plants	Required additional capacity (t/y)
Bjelovar-Bilogora	1.6 %	314,071	5,013	0	0	5,013
Slavonski Brod - Posavina	2.0 %		6,427	0	0	6,427
Dubrovnik - Neretva	3.9 %		12,254	0	0	12,254
City of Zagreb	19.8 %		62,030	0	0	62,030
Istria	7.5 %		23,403	0	0	23,403
Karlovac	2.5 %		7,747	0	0	7,747
Koprivnica-Križevci	1.7 %		5,389	29,930	1	-24,541
Krapina-Zagorje	1.7 %		5,436	0	0	5,436
Lika-Senj	1.5 %		4,665	0	0	4,665
Međimurje	2.6 %		8,228	0	0	8,228
Osijek - Baranja	5.1 %		15,864	320,000	1	-304,136
Požega-Slavonia	1.0 %		3,014	0	0	3,014
Primorje – Gorski kotar	9.7 %		30,547	0	0	30,547
Sisak - Moslavina	2.7 %		8,562	0	0	8,562
Split-Dalmatia	14.3 %		44,828	0	0	44,828
Šibenik-Knin	3.2 %		10,185	0	0	10,185
Varaždin	2.6 %		8,016	0	0	8,016
Virovitica-Podravina	1.3 %		4,114	0	0	4,114
Vukovar-Srijem	2.9 %		9,070	0	0	9,070
Zadar	6.1 %		19,168	0	0	19,168
Zagreb	6.4 %	20,110	0	0	20,110	
<b>Total</b>			<b>314,071</b>	<b>349,930</b>	<b>2</b>	<b>-35,859</b>

**Table 56. Required capacities of paper recovery facilities - SCENARIO nr. 2**

2028 -PAPER-						
County	County share in the total collected MSW	Recycling system input (t)	Required capacity (t)	Total capacity (t/y)	Number of plants	Required additional capacity (t/y)
Bjelovar-Bilogora	1.6 %	282,018	4,502	0	0	4,502
Slavonski Brod - Posavina	2.0 %		5,771	0	0	5,771
Dubrovnik - Neretva	3.9 %		11,003	0	0	11,003
City of Zagreb	19.8 %		55,699	0	0	55,699
Istria	7.5 %		21,015	0	0	21,015
Karlovac	2.5 %		6,956	0	0	6,956
Koprivnica-Križevci	1.7 %		4,839	29,930	1	-25,091
Krapina-Zagorje	1.7 %		4,881	0	0	4,881
Lika-Senj	1.5 %		4,189	0	0	4,189
Međimurje	2.6 %		7,388	0	0	7,388
Osijek - Baranja	5.1 %		14,245	320,000	1	-305,755
Požega-Slavonia	1.0 %		2,706	0	0	2,706
Primorje – Gorski kotar	9.7 %		27,430	0	0	27,430
Sisak - Moslavina	2.7 %		7,688	0	0	7,688
Split-Dalmatia	14.3 %		40,253	0	0	40,253
Šibenik-Knin	3.2 %		9,146	0	0	9,146

2028 -PAPER-						
County	County share in the total collected MSW	Recycling system input (t)	Required capacity (t)	Total capacity (t/y)	Number of plants	Required additional capacity (t/y)
Varaždin	2.6 %		7,198	0	0	7,198
Virovitica-Podravina	1.3 %		3,694	0	0	3,694
Vukovar-Srijem	2.9 %		8,144	0	0	8,144
Zadar	6.1 %		17,212	0	0	17,212
Zagreb	6.4 %		18,057	0	0	18,057
<b>Total</b>				<b>282,018</b>	<b>349,930</b>	<b>2</b>

## 9. ASSESSING THE SCALE OF THE NECESSARY INVESTMENT AND OTHER FINANCIAL RESOURCES FOR THE DEVELOPMENT AND IMPROVEMENT OF THE WASTE MANAGEMENT SYSTEM

Based on the conducted analyses and estimates of waste quantities in various parts of the waste management system, and taking into account the current state of the system, the necessary additional capacities for the following system facilities have been identified:

- Sorting facilities for separately collected dry recyclables
- Facilities for material recovery of separately collected biodegradable waste
- Facilities for material recovery of separately collected and/or previously sorted dry recyclables
- Waste management centres
- Closing of existing non-hazardous waste landfills currently receiving municipal waste
- Waste-to-energy recovery facilities

In order to estimate the required investments in the reference period, and with the aim of closing the gap between the existing and the required capacities for waste treatment, recovery, and disposal, the assumptions used for each facility are listed below.

### 9.1. Assessment of the necessary investment in the construction of new sorting facilities

It is assumed that the sorting of separately collected waste will primarily take place within the county where the waste was generated. Therefore, an overview of the necessary additional capacities of facilities for sorting separately collected dry recyclables is presented at the county level for Scenarios nr. 1 and 2 (Table 57). For counties where the existing sorting facility capacity exceeds the requirements, no additional capacity is envisaged, and the difference (the excess capacity) will serve as a backup.

The estimation of capital costs is determined based on similar projects implemented or underway within the Operational programme entitled 'Competitiveness and Cohesion 2014-2020', using the unit cost of constructing facilities per tonne/year of input capacity, which ranges from 398,17 to 530.89 EUR/tonne/year (3,000 to 4,000 HRK/tonne/year), with an average of 464.53 EUR/tonne/year (3,500 HRK/tonne/year).

**Table 57.** Assessment of the necessary investment in the construction of sorting facilities – SCENARIOS 1 and 2

County	Scenario nr. 1			Scenario nr. 2		
	Required additional capacity (t/y)	Cost estimate of the construction of new sorting plants (HRK)	Cost estimate of the construction of new sorting plants (EUR)	Required additional capacity (t/y)	Cost estimate of the construction of new sorting plants (HRK)	Cost estimate of the construction of new sorting plants (EUR)
Bjelovar-Bilogora	10,082	35,285,332	4,683,168.36	8,936	31,276,955	4,151,165.31
Slavonski Brod - Posavina	15,617	54,661,020	7,254,764.09	14,149	49,522,043	6,572,704.63
Dubrovnik - Neretva	26,875	94,063,975	12,484,434.93	24,076	84,266,258	11,184,054.42
City of Zagreb	87,824	307,382,444	40,796,661.23	73,653	257,786,280	34,214,119.05
Istria	56,867	199,034,559	26,416,425.64	51,521	180,322,249	23,932,875.31
Karlovac	9,723	34,031,498	4,516,755.99	7,954	27,837,624	3,694,687.64
Koprivnica-Križevci	9,974	34,909,758	4,633,321.12	8,743	30,601,056	4,061,458.09
Krapina-Zagorje	0	0	0	0	0	0
Lika-Senj	10,956	38,345,700	5,089,348.99	9,890	34,615,574	4,594,276.20

County	Scenario nr. 1			Scenario nr. 2		
	Required additional capacity (t/y)	Cost estimate of the construction of new sorting plants (HRK)	Cost estimate of the construction of new sorting plants (EUR)	Required additional capacity (t/y)	Cost estimate of the construction of new sorting plants (HRK)	Cost estimate of the construction of new sorting plants (EUR)
Međimurje	9,493	33,225,250	4,409,748.49	7,613	26,646,500	3,536,598.31
Osijek - Baranja	38,547	134,915,138	17,906,316.01	34,923	122,231,040	16,222,846.90
Požega-Slavonia	7,323	25,631,925	3,401,941.07	6,635	23,222,130	3,082,106.31
Primorje – Gorski kotar	64,026	224,089,716	29,741,816.44	57,047	199,665,487	26,500,164.18
Sisak - Moslavina	15,005	52,518,362	6,970,384.50	13,049	45,672,316	6,061,758.05
Split-Dalmatia	108,726	380,539,911	50,506,325.70	98,485	344,697,496	45,749,219.72
Šibenik-Knin	24,749	86,619,901	11,496,436.53	22,422	78,476,298	10,415,594.66
Varaždin	12,478	43,673,311	5,796,444.49	10,647	37,263,972	4,945,779.02
Virovitica-Podravina	9,996	34,986,729	4,643,536.93	9,056	31,697,438	4,206,972.99
Vukovar-Srijem	22,039	77,136,555	10,237,780.21	19,967	69,884,532	9,275,271.35
Zadar	46,576	163,014,908	21,635,796.40	42,197	147,688,999	19,601,698.72
Zagreb	0	0	0	0	0	0
<b>Total</b>	<b>587,897</b>	<b>2,057,639,537</b>	<b>273,095,698.06</b>	<b>520,963</b>	<b>1,823,374,247</b>	<b>242,003,350.85</b>

## 9.2. Assessment of the necessary investment in the construction/extension for materials and energy recovery plants of the separately collected bio-waste

It is assumed that the recovery of separately collected organic waste will primarily take place within the county where the waste was generated. Therefore, an overview of the necessary additional capacities of the facilities for the recovery of separately collected organic waste is presented at the county level for Scenarios nr. 1 and 2 (Table 58) (Table 59). For counties where the existing facility capacity exceeds the requirements, no additional capacity is envisaged, and the difference (the excess capacity) will serve as a backup.

Considering the substantial number of the existing capacities (35 biogas facilities) in eastern and central Croatia, which have the potential to accept separately collected organic waste as a raw material for biogas production, investments are planned for the additional equipment of biogas facilities with equipment for the preparation of separately collected organic waste (pre-treatment before the 'organic soup' preparation), amounting to 464,529.83 EUR (3,500,000 HRK) per facility.

The estimate of capital costs is determined based on similar projects implemented or underway within the Operational programme entitled 'Competitiveness and Cohesion 2014-2020', using the unit cost of constructing facilities per tonne/year of input capacity, which ranges from 530.89 to 796.34 EUR/tonne/year (4,000 to 6,000 HRK/tonne/year), with an average of 663.61 EUR/tonne/year (5,000 HRK/tonne/year).

**Table 58.** Assessment of the necessary investment in the construction and/or upgrade of composting facilities and biogas plants – SCENARIO nr. 1

County	Total required capacity of composting and biogas BT plants (t/y)	Total existing capacity of composting and biogas BT plants (t/y)	Required additional capacity of composting and biogas BT plants (t/y)	Cost estimate of the construction of new composting and biogas plants (HRK)	Cost estimate of the construction of new composting and biogas plants (EUR)	Cost estimate of the upgrade of the existing biogas plants (HRK)	Cost estimate of the upgrade of the existing biogas plants (EUR)
Bjelovar-Bilogora	7,151	89,200	0	0.00	0.00	18,750,000.00	2,488,552.66

County	Total required capacity of composting and biogas BT plants (t/y)	Total existing capacity of composting and biogas BT plants (t/y)	Required additional capacity of composting and biogas BT plants (t/y)	Cost estimate of the construction of new composting and biogas plants (HRK)	Cost estimate of the construction of new composting and biogas plants (EUR)	Cost estimate of the upgrade of the existing biogas plants (HRK)	Cost estimate of the upgrade of the existing biogas plants (EUR)
Slavonski Brod - Posavina	9,168	0	9,168	45,838,744.50	6,083,846.90	0.00	0.00
Dubrovnik - Neretva	17,479	5,720	11,759	58,793,864.78	7,803,286.85	0.00	0.00
City of Zagreb	88,478	69,071	19,407	97,033,836.14	12,878,603.24	7,500,000.00	995,421.06
Istria	33,382	0	33,382	166,910,429.68	22,152,820.98	0.00	0.00
Karlovac	11,050	0	11,050	55,248,240.67	7,332,701.66	0.00	0.00
Koprivnica-Križevci	7,687	136,763	0	0.00	0.00	11,250,000.00	1,493,131.59
Krapina-Zagorje	7,754	0	7,754	38,770,598.82	5,145,742.76	0.00	0.00
Lika-Senj	6,654	0	6,654	33,272,051.44	4,415,960.11	0.00	0.00
Međimurje	12,951	16,780	0	0.00	0.00	0.00	0.00
Osijek - Baranja	22,628	442,774	0	0.00	0.00	48,750,000.00	6,470,236.91
Požega-Slavonia	4,299	1,000	3,299	16,494,938.36	2,189,254.54	0.00	0.00
Primorje – Gorski kotar	43,572	2,000	41,572	207,859,719.49	27,587,725.73	0.00	0.00
Sisak - Moslavina	12,213	29,700	0	0.00	0.00	0.00	0.00
Split-Dalmatia	63,942	0	63,942	319,707,882.66	42,432,528.06	0.00	0.00
Šibenik-Knin	14,528	0	14,528	72,639,470.11	9,640,914.47	0.00	0.00
Varaždin	11,434	40,000	0	0.00	0.00	7,500,000.00	995,421.06
Virovitica-Podravina	5,868	36,500	0	0.00	0.00	7,500,000.00	995,421.06
Vukovar-Srijem	12,937	36,300	0	0.00	0.00	22,500,000.00	2,986,263.19
Zadar	27,341	0	27,341	136,704,341.49	18,143,784.13	0.00	0.00
Zagreb	28,684	102,500	0	0.00	0.00	7,500,000.00	995,421.06
<b>Total</b>	<b>449,199</b>	<b>1,008,308</b>	<b>249,855</b>	<b>1,249,274,118.14</b>	<b>165,807,169.44</b>	<b>131,250,000.00</b>	<b>17,419,868.60</b>
				<b>1,380,524,118,14 HRK</b>			
				<b>183,227,038,04 EUR</b>			

**Table 59.** Assessment of the necessary investment in the construction and/or upgrade of sorting facilities, composting facilities and biogas plants – SCENARIO nr. 2

County	Total required capacity of composting and biogas BT plants (t/y)	Total existing capacity of composting and biogas BT plants (t/y)	Required additional capacity of composting and biogas BT plants (t/y)	Cost estimate of the construction of new composting and biogas plants (HRK)	Cost estimate of the construction of new composting and biogas plants (EUR)	Cost estimate of the upgrade of the existing biogas plants (HRK)	Cost estimate of the upgrade of the existing biogas plants (EUR)
Bjelovar-Bilogora	6,421	89,200	0	0.00	0.00	18,750,000.00	2,488,552.66
Slavonski Brod - Posavina	8,232	0	8,232	41,160,679.44	5,462,960.97	0.00	0.00
Dubrovnik - Neretva	15,695	5,720	9,975	49,874,899.17	6,619,536.69	0.00	0.00
City of Zagreb	79,448	69,071	10,377	51,885,920.73	6,886,445.12	7,500,000.00	995,421.06
Istria	29,975	0	29,975	149,876,414.93	19,892,018.70	0.00	0.00
Karlovac	9,922	0	9,922	49,609,891.12	6,584,364.07	0.00	0.00
Koprivnica-Križevci	6,902	136,763	0	0.00	0.00	11,250,000.00	1,493,131.59
Krapina-Zagorje	6,963	0	6,963	34,813,872.13	4,620,594.88	0.00	0.00
Lika-Senj	5,975	0	5,975	29,876,478.04	3,965,290.07	0.00	0.00

Međimurje	12,951	16,780	0	0.00	0.00	0.00	0.00
Osijek - Baranja	20,319	442,774	0	0.00	0.00	48,750,000.00	6,470,236.91
Požega-Slavonia	3,860	1,000	2,860	14,301,276.18	1,898,105.54	0.00	0.00
Primorje – Gorski kotar	39,125	2,000	37,125	185,626,083.87	24,636,815.17	0.00	0.00
Sisak - Moslavina	10,967	29,700	0	0.00	0.00	0.00	0.00
Split-Dalmatia	57,416	0	57,416	287,080,150.53	38,102,083.82	0.00	0.00
Šibenik-Knin	13,045	0	13,045	65,226,261.67	8,657,012.63	0.00	0.00
Varaždin	10,267	40,000	0	0.00	0.00	7,500,000.00	995,421.06
Virovitica-Podravina	5,269	36,500	0	0.00	0.00	7,500,000.00	995,421.06
Vukovar-Srijem	11,617	36,300	0	0.00	0.00	22,500,000.00	2,986,263.19
Zadar	24,551	0	24,551	122,753,003.79	16,292,123.40	0.00	0.00
Zagreb	25,757	102,500	0	0.00	0.00	7,500,000.00	995,421.06
<b>Total</b>	<b>404,677</b>	<b>1,008,308</b>	<b>216,417</b>	<b>1,082,084,931.61</b>	<b>143,617,351.07</b>	<b>131,250,000.00</b>	<b>17,419,868.60</b>

**1,213,334,931.61 HRK**

**161,037,219.67 EUR**

County	Total required capacity of composting and biogas BT plants (t/y)	Total existing capacity of composting and biogas BT plants (t/y)	Required additional capacity of composting and biogas BT plants (t/y)	Cost estimate of the construction of new composting and biogas plants (HRK)	Cost estimate of the construction of new composting and biogas plants (EUR)	Cost estimate of the upgrade of the existing biogas plants (HRK)	Cost estimate of the upgrade of the existing biogas plants (EUR)
Bjelovar-Bilogora	6,421	89,200	0	0.00	0.00	18,750,000.00	2,488,552.66
Slavonski Brod - Posavina	8,232	0	8,232	41,160,679.44	5,462,960.97	0.00	0.00
Dubrovnik - Neretva	15,695	5,720	9,975	49,874,899.17	6,619,536.69	0.00	0.00
City of Zagreb	79,448	69,071	10,377	51,885,920.73	6,886,445.12	7,500,000.00	995,421.06
Istria	29,975	0	29,975	149,876,414.93	19,892,018.70	0.00	0.00
Karlovac	9,922	0	9,922	49,609,891.12	6,584,364.07	0.00	0.00
Koprivnica-Križevci	6,902	136,763	0	0.00	0.00	11,250,000.00	1,493,131.59
Krapina-Zagorje	6,963	0	6,963	34,813,872.13	4,620,594.88	0.00	0.00
Lika-Senj	5,975	0	5,975	29,876,478.04	3,965,290.07	0.00	0.00
Međimurje	12,951	16,780	0	0.00	0.00	0.00	0.00
Osijek - Baranja	20,319	442,774	0	0.00	0.00	48,750,000.00	6,470,236.91
Požega-Slavonia	3,860	1,000	2,860	14,301,276.18	1,898,105.54	0.00	0.00
Primorje – Gorski kotar	39,125	2,000	37,125	185,626,083.87	24,636,815.17	0.00	0.00
Sisak - Moslavina	10,967	29,700	0	0.00	0.00	0.00	0.00
Split-Dalmatia	57,416	0	57,416	287,080,150.53	38,102,083.82	0.00	0.00
Šibenik-Knin	13,045	0	13,045	65,226,261.67	8,657,012.63	0.00	0.00
Varaždin	10,267	40,000	0	0.00	0.00	7,500,000.00	995,421.06
Virovitica-Podravina	5,269	36,500	0	0.00	0.00	7,500,000.00	995,421.06
Vukovar-Srijem	11,617	36,300	0	0.00	0.00	22,500,000.00	2,986,263.19
Zadar	24,551	0	24,551	122,753,003.79	16,292,123.40	0.00	0.00
Zagreb	25,757	102,500	0	0.00	0.00	7,500,000.00	995,421.06
<b>Total</b>	<b>404,677</b>	<b>1,008,308</b>	<b>216,417</b>	<b>1,082,084,931.61</b>	<b>143,617,351.07</b>	<b>131,250,000.00</b>	<b>17,419,868.60</b>

**1,213,334,931.61 HRK**

**161,037,219.67 EUR**

### 9.3. Assessment of the necessary investment for material recovery plants of the separately collected and/or pre-sorted dry recyclables and construction waste

It is assumed that the material recovery of separately collected and/or previously sorted waste will take place on the territory of the entire Republic of Croatia.

The estimate of capital costs is determined for similar projects carried out in the European Union over the last 5 years. This estimate is based on the unit cost of constructing facilities per tonne/year of input capacity and varies within the following ranges for the specified types of waste:



- Plastic from 1,592.67 to 2,389.01 EUR/tonne/year (12,000 – 18,000 HRK/tonne/year), depending on the type of plastic and the technological process, with an average of 1,990.84 EUR/tonne/year (15,000 HRK/tonne/year) (Table 61) (Table 62)
- Glass from 199.08 to 331.81 EUR/tonne/year (1,500 – 2,500 HRK/tonne/year), with an average of 265.45 EUR/tonne/year (2,000 HRK/tonne/year)

While there are sufficient capacities for the material recovery of glass waste at the national level, unit investment costs are specified for new facilities, as glass materials are sensitive to transport costs, and the only facility that recovers glass is located in the northwestern part of Croatia.

Similarly, for the material recovery of construction waste, there are adequate capacities at the national level. However, unit investment costs are specified for new facilities, considering that construction waste is sensitive to transport costs. As a result, in counties with sufficient capacity for construction waste recovery, no new investments are planned. In counties with insufficient capacity, two new facilities with storage and equipment for crushing and screening the processed waste into appropriate fractions (concrete aggregate, aggregate for unbound and hydraulically bound materials for use in construction and road construction, unbound mixtures, and other materials in accordance with end-of-waste status technical documentation) are planned.

The construction costs for the building of a facility for the storage and processing of construction waste are estimated at 995,421.06 EUR (7,500,000 HRK), with 663,614.04 EUR (5,000,000 HRK) allocated for equipment procurement and 331,807.02 EUR (2,500,000 HRK) for the infrastructure setup at the recovery site (Table 60).

**Table 60.** Assessment of the necessary investment in the building of construction waste treatment plants

County	Required additional capacity of mobile crushers and stationary construction waste processing plants (t/y)	Required number of plants	Cost estimate of mobile crushers and stationary construction waste processing plants (EUR)	Cost estimate of mobile crushers and stationary construction waste processing plants (HRK)
Bjelovar-Bilogora	6,711	2	1,990,842.13	15,000,000
Slavonski Brod - Posavina	32,400	2	1,990,842.13	15,000,000
Dubrovnik - Neretva	0	0	0	0
City of Zagreb	0	0	0	0
Istria	0	0	0	0
Karlovac	0	0	0	0
Koprivnica-Križevci	7,065	2	1,990,842.13	15,000,000
Krapina-Zagorje	0	0	0	0
Lika-Senj	13,055	2	1,990,842.13	15,000,000
Međimurje	10,108	2	1,990,842.13	15,000,000
Osijek - Baranja	0	0	0	0
Požega-Slavonia	12,907	2	1,990,842.13	15,000,000
Primorje – Gorski kotar	0	0	0	0
Sisak - Moslavina	36,286	2	1,990,842.13	15,000,000
Split-Dalmatia	0	0	0	0
Šibenik-Knin	0	0	0	0
Varaždin	36,202	2	1,990,842.13	15,000,000
Virovitica-Podravina	15,376	2	1,990,842.13	15,000,000
Vukovar-Srijem	37,779	2	1,990,842.13	15,000,000
Zadar	71,893	2	1,990,842.13	15,000,000
Zagreb	0	0	0	0
<b>Total</b>	<b>279,781</b>	<b>22</b>	<b>21,899,263.39</b>	<b>165,000,000</b>

**Table 61.** Assessment of the necessary investment in the construction of plastic recycling plants - SCENARIO 1

Type of waste	Required additional capacity (t/y)	Cost estimate of the construction of waste processing plants (HRK)	Cost estimate of the construction of waste processing plants (EUR)
Plastic	173,536	2,603,041,170.00	345,482,934.50
<b>Total</b>		<b>2,603,041,170.00</b>	<b>345,482,934.50</b>

**Table 62.** Assessment of the necessary investment in the construction of plastic recycling plants - SCENARIO 2

Type of waste	Required additional capacity (t/y)	Cost estimate of the construction of waste processing plants (HRK)	Cost estimate of the construction of waste processing plants (EUR)
Plastic	149,269	2,239,035,990.00	297,171,144.70
<b>Total</b>		<b>2,239,035,990.00</b>	<b>297,171,144.70</b>

## 9.4. Cost estimate of the closing of active waste landfills

A preliminary cost estimate for the closing of all active municipal waste landfills is shown in Table 63 and is based on the reported landfill surface area. The majority of the closure costs for landfills stem from activities involving covering the deposited waste with a final cover system, including gas management and collection and treatment of leachate (if applicable). The average construction cost of a final cover system in the past period (based on prices offered in public procurement procedures) was approximately 39.82 EUR/m<sup>2</sup> (300 HRK/m<sup>2</sup>), and this will be used in estimating the capital costs of closing non-hazardous waste landfills.

By the end of 2021, there were a total of 80 active municipal waste landfills in Croatia (two of which are located within the built waste-to-energy facilities and continue to operate. Their surface areas were not included in the cost estimate) that will cease their operations by the end of 2028.

**Table 63.** Cost estimate of the closing of all the active municipal waste landfill sites

County	Number of active MW landfills	Total surface (m <sup>2</sup> )	Closure cost estimate (HRK)	Closure cost estimate (EUR)
Bjelovar-Bilogora	4	214,925	64,477,500.00	8,557,634.88
Slavonski Brod - Posavina	3	199,609	59,882,700.00	7,947,800.12
Dubrovnik - Neretva	6	100,585	30,175,500.00	4,004,977.11
City of Zagreb	1	470,000	141,000,000.00	18,713,915.99
Istria	3	28,532	8,559,600.00	1,136,054.15
Karlovac	3	158,212	47,463,600.00	6,299,502.29
Koprivnica-Križevci	3	760,700	228,210,000.00	30,288,672.11
Krapina-Zagorje	4	49,008	14,702,400.00	1,951,343.82
Lika-Senj	5	86,756	26,026,800.00	3,454,349.99
Međimurje	1	41,380	12,414,000.00	1,647,620.94
Osijek - Baranja	7	521,000	156,300,000.00	20,744,574.96
Požega-Slavonia	2	51,000	15,300,000.00	2,030,658.97
Primorje – Gorski kotar	5	53,021	15,906,300.00	2,111,128.81
Sisak - Moslavina	5	327,166	98,149,800.00	13,026,717.10
Split-Dalmatia	10	331,024	99,307,200.00	13,180,330.48
Šibenik-Knin	2	151,122	45,336,600.00	6,017,200.88
Varaždin	1	10,711	3,213,300.00	426,478.20
Virovitica-Podravina	3	85,500	25,650,000.00	3,404,340.04
Vukovar-Srijem	3	84,670	25,401,000.00	3,371,292.06
Zadar	4	377,950	113,385,000.00	15,048,775.63
Zagreb	5	334,358	100,307,400.00	13,313,079.83
<b>TOTAL:</b>	<b>80</b>	<b>4,437,229</b>	<b>1,331,168,700.00</b>	<b>176,676,448.34</b>

## 9.5. Cost estimate of the construction of waste management centres

Taking into consideration the status of the implementation of individual Waste-to-Energy Facilities (waste management centres), an expected estimate of the total investment for establishing these facilities is presented based on the current market conditions and the average prices offered in public procurement procedures, using a unit cost per tonne of waste processed at the entrance to the WMC (Table 64) (Table 65). For the WMCs with a capacity larger than 100,000 tonnes/year, the estimated unit cost of investment is 1,088.33 EUR per tonne (8,200 HRK per tonne), while for the WMCs with a capacity below 50,000 tonnes/year, the estimated unit cost of investment is 1,459.95 EUR per tonne (11,000 HRK per tonne).

**Table 64. Cost estimate of the building of waste management centres – SCENARIO nr. 1**

WMC	County	Calculated WMC capacity considering the Scenario nr. 1 targets (t)	Expected nominal capacity (t/y)	Construction cost (HRK)	Construction cost (EUR)
Babina gora	Karlovac, part of the Lika-Senj County and part of the Sisak-Moslavina County	27,971	30,000	429,764,639.05	57,039,569.85
Biljane Donje	Zadar and part of the Lika-Senj County	59,584	75,000	486,000,000.00	64,503,284.89
Lečevica	Split-Dalmatia County	124,101	110,000	900,000,000.00	119,450,527.57
Lučino Razdolje	Dubrovnik-Neretva County	33,924	40,000	558,899,735.01	74,178,742.45
Piškovnica *)	Krapina-Zagorje County, Varaždin, Koprivnica-Križevci, Međimurje, Bjelovar-Bilogora	88,817	110,000	900,000,000.00	119,450,527.57
Šagulje	Požega-Slavonia, Slavonski Brod-Posavina, part of the Sisak-Moslavina County and the Virovitica-Podravina County	52,485	55,000	561,000,000.00	74,457,495.52
Orlovnjak	Osijek-Baranja and Vukovar-Srijem counties	69,027	60,000	612,000,000.00	81,226,358.75
Zagreb	City of Zagreb and the Zagreb County	227,393	180,000	1,260,000,000.00	167,230,738.60
<b>TOTAL:</b>		<b>683,302</b>	<b>660,000</b>	<b>5,707,664,374.06</b>	<b>757,537,245.20</b>

\*) Piškovnica WMC will be built in such a way as to include the Koprivnica-Križevci County, the Krapina-Zagorje County, the Međimurje County and the Varaždin County in the first phase, and the Bjelovar-Bilogora County in the second phase, in line with the objectives of increasing the separately collected waste collection rate.

**Table 65. Cost estimate of the building of waste management centres – SCENARIO nr. 2**

WMC	County	Calculated WMC capacity considering the Scenario nr. 2 targets (t)	Expected nominal capacity (t/y)	Construction cost (HRK)	Construction cost (EUR)
Babina gora	Karlovac, part of the Lika-Senj County and part of the Sisak-Moslavina County	31,301	30,000	429,764,639.05	57,039,569.85
Biljane Donje	Zadar and part of the Lika-Senj County	66,677	75,000	486,000,000.00	64,503,284.89
Lečevica	Split-Dalmatia County	138,875	110,000	900,000,000.00	119,450,527.57
Lučino Razdolje	Dubrovnik-Neretva County	37,962	40,000	558,899,735.01	74,178,742.45
Piškovnica *)	Krapina-Zagorje County, Varaždin, Koprivnica-Križevci, Međimurje, Bjelovar-Bilogora	99,390	110,000	900,000,000.00	119,450,527.57
Šagulje	Požega-Slavonia, Slavonski Brod-Posavina, part of the Sisak-Moslavina County and the Virovitica-Podravina County	58,733	55,000	561,000,000.00	74,457,495.52
Orlovnjak	Osijek-Baranja and Vukovar-Srijem counties	77,244	60,000	612,000,000.00	81,226,358.75
Zagreb	City of Zagreb and the Zagreb County	254,464	180,000	1,260,000,000.00	167,230,738.60
<b>TOTAL:</b>		<b>764,647</b>	<b>660,000</b>	<b>5,707,664,374.06</b>	<b>757,537,245.20</b>

\*) Piškovnica WMC will be built in such a way as to include the Koprivnica-Križevci County, the Krapina-Zagorje County, the Međimurje County and the Varaždin County in the first phase, and the Bjelovar-Bilogora County in the second phase, in line with the objectives of increasing the separately collected waste collection rate.

## 9.6. Assessment of the necessary investment in the construction of the plants for the energy recovery of waste

The costs of investing in the construction of new infrastructure for energy recovery from waste primarily depend on the installed capacity of the facilities and typically range from approximately 796.34 EUR per tonne per year (6,000 HRK per tonne per year) for the facilities with a capacity

exceeding 200,000 tonnes per year to 1,061.78 EUR per tonne per year (8,000 HRK per tonne per year) for the facilities with a capacity of 100,000 tonnes per year, which is the minimum capacity that can be justified for implementation.

Since the waste management targets cannot be achieved without energy recovery, it is also necessary to consider the costs of energy recovery and waste disposal in the 'do-nothing scenario'. In this case, costs of waste recovery and disposal outside of Croatia need to be taken into account (except for small quantities of high-quality waste-derived fuel that can be recovered in the existing facilities in Croatia using the R1 process). These costs typically range from 132.72 to 185.81 EUR per tonne (1,000 to 1,400 HRK per tonne) of waste-derived fuel, depending on the packaging and quality of the waste-derived fuel.

Therefore, for the Scenario nr. 1 and the need to recover and dispose of medium-quality waste-derived fuel of around 400,000 tonnes per year, annual costs amount to approximately 74,324,772.71 EUR (560,000,000 HRK), with 320,000 MWh of unused electricity and 640,000 MWh of thermal energy.

In the case of Scenario nr. 2 and the need to recover and dispose of medium-quality waste-derived fuel of around 145,000 tonnes per year, annual costs amount to approximately 19,244,807.22 EUR (145,000,000 HRK) with 174,000 MWh of potentially unused electricity and 348,000 MWh of thermal energy.

## **9.7. The cost of investment in the infrastructure necessary for the recovery and disposal of the sludge from municipal waste water treatment plants**

Assuming the entire sludge from waste water treatment plants is recovered and disposed of by incineration or co-incineration, it is necessary to provide incineration/co-incineration capacities for approximately 100,000 tonnes of dry solids per year (moisture content < 20%). Assuming a capital cost of 995.42 EUR per tonne (7,500 HRK per tonne) of annual installed capacity, the required investments amount to 124,427,632.89 EUR (937,500,000 HRK). Considering the limited quantities of available sludge from waste water treatment plants at the national level and the spatial distribution of sludge generation, a rational solution is needed in the form of energy recovery through co-incineration. In this way, taking into account the need for energy recovery of around 400,000 tonnes per year of waste-derived fuel resulting from the treatment of municipal waste, the total required co-incineration capacity is approximately 525,000 tonnes per year.

Assuming exclusively material recovery of sludge through composting, it is necessary to provide capacities for approximately 200,000 tonnes per year of sludge (100,000 tonnes of dry solids per year with a moisture content of 50%). Assuming a capital cost of 663.61 EUR per tonne (5,000 HRK per tonne) of annual installed capacity, the required investments amount to 132,722,808.41 EUR (1,000,000,000 HRK).

## 10. ORGANISATIONAL ASPECTS OF WASTE MANAGEMENT AND ALLOCATION OF RESPONSIBILITIES

Waste management encompasses all levels of administration (national, regional, local, municipal), nearly all sectors of the economy, including production, consumption, and daily life, and involves a wide range of diverse stakeholders.

Waste management and the construction of waste management facilities are of interest to the Republic of Croatia.

The management of waste and the efficiency of waste management are ensured by the Government of the Republic of Croatia and the ministry responsible for environmental protection by enacting waste management measures.

The implementing body at the national level is the Environmental Protection and Energy Efficiency Fund - EPEEF (Cro. abbrev. FZOEU).

The executive body of a local self-government unit and the executive body of a regional self-government unit or the City of Zagreb is responsible for providing conditions and implementing the prescribed waste management measures within their respective areas.

Multiple local and regional self-government units may, by mutual agreement, ensure the joint implementation of prescribed waste management measures.

### 10.1. National level

**The Croatian Parliament** is the representative body of citizens and the legislative authority in the Republic of Croatia. Its role includes the enactment of laws and national strategies, such as the Waste Management Plan and the Waste Management Strategy. The parliamentary committee provides opinions on specific laws and documents.

**The Government of the Republic of Croatia** formulates a Waste Management Plan for a six-year period and regulatory provisions (regulations). It adopts the Environmental State Report, and proposes appropriate legislation and strategies to the Parliament. The Croatian Government also ensures the conditions and prescribing measures for the management of hazardous waste generated within the territory of the Republic of Croatia. It establishes a company for the disposal of hazardous waste through landfilling and, in collaboration with a regional unit or the City of Zagreb, it establishes a company for the incineration of hazardous waste, exclusively for hazardous waste generated within the territory of the Republic of Croatia.

**The Ministry of Economy and Sustainable Development (Cro. abbrev. MINGOR)** as a state administration authority in the waste management sector, establishes strategic directions, develops programmes and sustainable development plans based on the principles of the green and circular economy, ensuring climate neutrality, the preservation and sustainable use of natural resources. It is responsible for the drafting of legislation, strategies, and the Waste Management Plan of the Republic of Croatia, as well as for the drafting of the State of the Environment Report and approving interventions based on environmental impact assessments. The Ministry can grant concessions for the performance of activities related to the disposal of hazardous waste through landfilling and incineration. Furthermore, the Ministry is responsible for issuing licences for the activities involving hazardous waste management and for R1 processes - using waste primarily as fuel or for other energy

production processes, and D10 - incineration of waste on land for hazardous and non-hazardous waste. It issues authorisations for waste processing activities by persons who stipulate contracts with the EPEEF within the extended producer responsibility system, addresses requests related to establishing the status of an Organisation, operates the management information system, and represents a competent authority for the implementation of Regulation (EC) No. 1013/2006 on waste shipments. The Ministry also prepares the required waste management reports.

**The EPEEF** is responsible for collecting off-budget funds, calculating and collecting prescribed fees, financing and co-financing waste management projects, managing the system for collecting and processing the specific special categories of waste, maintaining the Register of handling specific waste categories, and addressing requests for independently achieving individual targets for specific special categories of waste.

## 10.2. Regional level

The representative body of a **regional self-government unit and the City of Zagreb** is obliged to adopt regional waste management plans in line with the National Waste Management Plan (NWMP) based on the proposal of the executive body. The competent offices in the regions and the City of Zagreb are responsible for the collecting and forwarding of waste data (Environmental Pollution Register - ROO), maintaining records of waste collectors and recycling entities, by-products, reuse centres, waste transporters, waste brokers, waste traders, and recycling centres. They also issue waste management licences for non-hazardous waste for all recovery and disposal operations except R1 and D10, as well as waste management licences for the mining industry.

## 10.3. Local level

In **local self-government units**, towns and municipalities, including the City of Zagreb, various administrative bodies, typically the competent administrative departments, handle waste management tasks. The executive body of the unit of local self-government or the City of Zagreb is responsible for ensuring separate waste collection through recycling centres and containers at the premises of public service users. The representative body of the unit of local self-government enacts a Decision on the provision of the public service for the collection of the municipal waste. The municipal wardens of the unit of local self-government or the City of Zagreb are responsible for the implementation of the measures aimed at preventing improper waste disposal into the environment (keeping records of the locations where waste is discarded, conducting regular annual inspections of the local self-government areas, and other established measures) and for the removal of such improperly discarded waste.

## 10.4. Companies owned by regional self-government and local self-government units

**Companies owned by regional and local self-government units** or the City of Zagreb run the Waste Management Centre. The public municipal waste collection service is provided by the public service provider, which is as follows:

- a company, established by one or more LSGUs, the majority of shares of which are shares or stakes owned by one or more LSGUs, based on the decision of the representative body of the LSGU to grant the provision of the public service for the collection of the municipal waste

- a legal or natural person or a trader / craftsman, based on the concession granted by the Decision of the representative body of the LSGU

## 10.5. Private companies (legal and natural persons engaged in waste management activities)

Private companies (legal and natural persons engaged in waste management activities) can be engaged in waste management by carrying out waste transportation, waste brokerage, waste trade, waste collection, waste recovery, waste disposal, waste export and import activities, as well as the activities related to the provision of public MSW collection services (Figure 70).

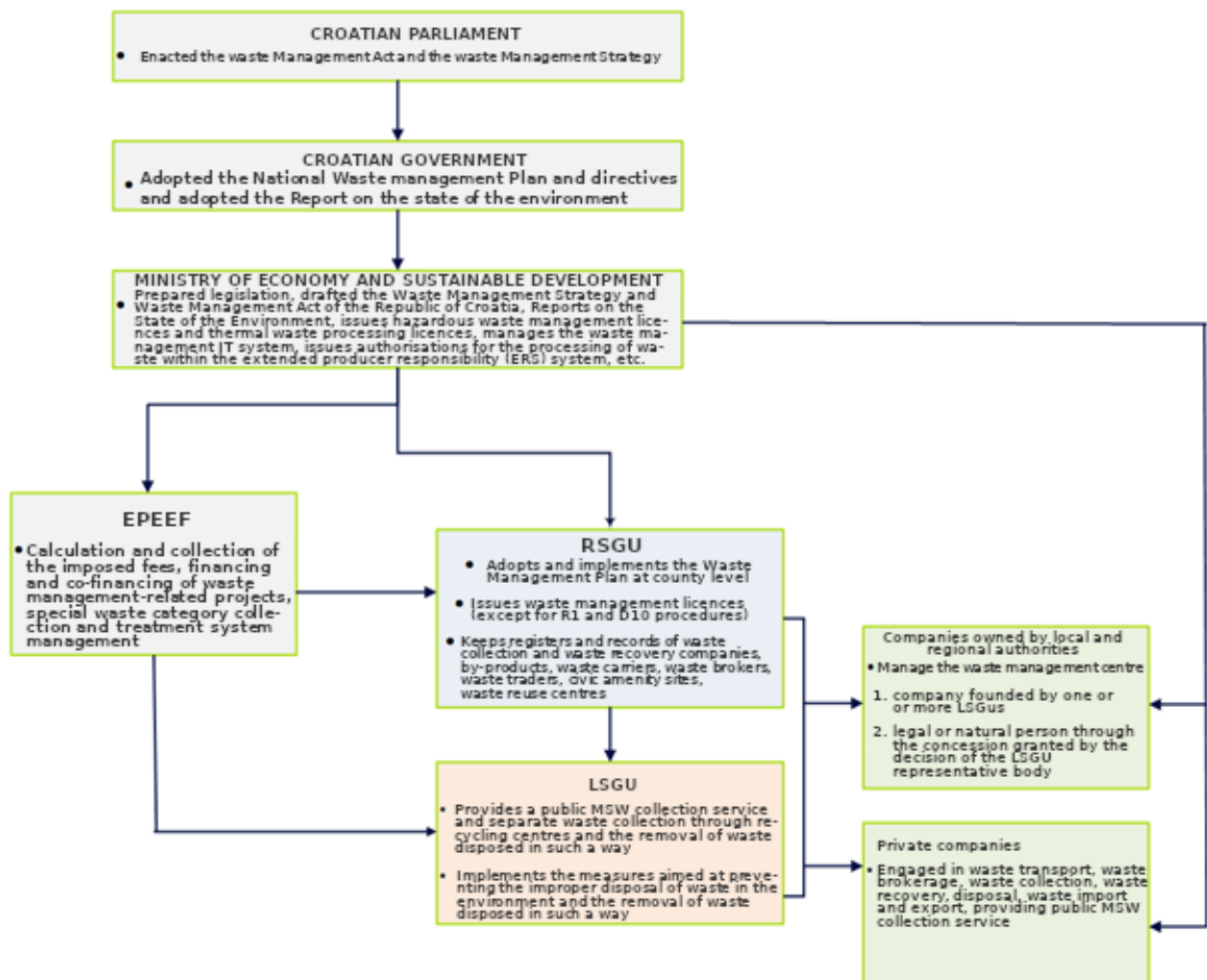


Figure 70. Organisational aspects of waste disposal and division of responsibility



## **11. EVALUATION OF THE USEFULNESS AND APPROPRIATENESS OF USE OF ECONOMIC INSTRUMENTS IN WASTE MANAGEMENT ENSURING THE PROPER FUNCTIONING OF THE INTERNAL MARKET**

Economic waste management instruments in Croatia are prescribed in the Waste Management Plan, including as follows: incentives and support, a landfill tax, proximity compensation for landfills, a fee for landfill use within the territory of a local self-government unit or the City of Zagreb, a return fee for waste management, and a fee for the public MW collection service. These fees are used to achieve the objectives of waste reduction, increased recycling, and reduced waste disposal.

### **11.1. Landfill tax**

The landfill tax is a measure aimed at encouraging the reduction of the amount of waste disposed of in landfills and promoting waste recycling and recovery. The fee payer is the person managing the landfill, and the fee is paid annually to the Environmental Protection and Energy Efficiency Fund (EPEEF, Cro. abbrev. FZOEU).

In addition to the landfill tax specified by the Waste Management Plan, the Environmental Protection and Energy Efficiency Fund Act (Official Gazette No. 107/03, 144/12) prescribes a fee for environmental pollution caused by waste, which relates to non-hazardous/technological waste, and a fee for hazardous waste, which applies to the production of hazardous waste that has not been processed or exported.

The funds collected by the EPEEF through the payment of these fees can be used to finance the construction of the necessary waste management infrastructure, especially in cases where EU co-financing cannot be obtained.

The landfill tax is not being applied.

### **11.2. Incentive fee**

Incentive fee is a measure designed to encourage a local self-government unit to implement actions that reduce the proportion of mixed municipal waste in municipal waste within their area. The fee payer is the local self-government unit, and the fee is paid annually to the Environmental Protection and Energy Efficiency Fund (EPEEF).

e incentive fee has been applied since 2017.

### **11.3. Landfill proximity compensation**

The monetary fee paid as a compensation for the proximity to landfills is granted to the owner of an existing residential or residential-commercial building in which they are registered, located within a distance of up to 500 metres, measured from the peak point of the cadastral parcel containing the landfill to the peak point of the cadastral parcel containing the residential or residential-commercial building. This is subject to the condition that ownership of the property was acquired before the commencement of the construction of the waste disposal facility. The fee is paid annually by the entity

responsible for landfill management, based on a decision by the local self-government unit or the City of Zagreb within the territory of which the landfill is situated.

The fee is being applied in some local self-government units.

#### **11.4. Fee for the usage of the landfill on the territory of another local self-government unit or the City of Zagreb**

Monetary fees for landfill use are granted to local self-government units, including the City of Zagreb, within the territory of which the waste disposal facility is located and used by other local self-government units or the City of Zagreb. The fees are paid by the City of Zagreb or the local self-government units that utilise the waste disposal facility on the territory of another local self-government unit or the City of Zagreb. Payment of the fee is not mandatory but depends on the decision of the local self-government unit within the territory of which the landfill is situated.

The fee is being applied in some local self-government units.

#### **11.5. Deposit fee**

The deposit fee is an incentive measure aimed at encouraging waste owners to return specific waste to the seller of the type of product from which the corresponding waste is generated or to the entity managing the recycling centre, in exchange for a specific deposit fee.

The deposit fee is a monetary amount paid by the product manufacturer placing the product on the market to the Environmental Protection and Energy Efficiency Fund (EPEEF). The end user or consumer is entitled to a refund of the deposit fee amount from the product seller or the entity managing the recycling centre by returning the corresponding waste. The product seller and the entity managing the recycling centre are required to accept the waste from products for which a deposit fee is required, pay the deposit fee amount to the waste deliverer, and hand over that waste to the entity designated by the EPEEF. The EPEEF will reimburse the product seller and the entity managing the recycling centre for the costs of the paid deposit fee.

The deposit fee is applicable only for the specific types of packaging, where significant success has been achieved, particularly in relation to beverage PET bottles.

#### **11.6. Waste management fee**

The waste management fee is a measure taken to ensure waste management services achieve the prescribed waste management objectives within the extended producer responsibility system. The waste management fee is paid to the Environmental Protection and Energy Efficiency Fund (EPEEF) by the product manufacturer placing a product on the market. The fee is determined for a specific type of product or a group of similar products.

The fee is being applied for specific product types.

## **11.7. Public waste collection service rate**

The fee for the public MW collection service is used to cover the costs of providing the public service. The fee is paid by users of the public service to the service provider based on the decision of the representative body of the local self-government unit and the service provider's price list.

The fee consists of the two following parts:

1. rate for the quantity of mixed municipal waste delivered, and
2. rate for the mandatory minimum public service.

The pricing of mixed waste quantity and the mandatory minimum public service price within the public service fee must be determined in a manner that ensures the provision of the public service in a quality, sustainable, and economically efficient manner, avoiding unjustifiably high costs, in line with the principles of sustainable development, environmental protection, transparency, and the polluter-pays principle, in order to encourage and ensure a separate waste collection service.

The fee has been in effect since 2017.

## **12. MEASURES FOR THE IMPLEMENTATION OF THE WASTE MANAGEMENT PLAN**

In line with the document entitled 'The Action Plan for the Circular Economy - Towards a Cleaner and More Competitive Europe' (COM 2020), the measures and activities of this WMP (Waste Management Plan) are designed to strengthen circularity and reduce waste generation by applying sustainability principles throughout the value chain. This includes sustainable product design, empowering consumers and public procurers (green public procurement, eco-labels, etc.) towards a more efficient separate waste collection service, waste reuse, and high-quality recycling. Furthermore, in line with the EU Action Plan, a set of measures and activities is specifically aimed at products identified within value chains as pivotal in removing barriers to the expansion of circular product markets, such as: electronic devices, batteries and vehicles, packaging, plastics, textile products, construction products, and food.

Below is an overview of the measures and activities required to achieve the objectives defined in this WMP (Chapter 4.) (Table 66).

Measures and activities defined in the Waste Prevention Programme (Chapter 15 of this WMP) are relevant for achieving certain waste management objectives, and their successful implementation has a direct impact and contributes to the achievement of the objectives specified in the WMP. Implementing waste prevention measures will largely contribute to sustainable management and the strengthening of the circularity of the following waste flows: municipal waste and its main components (bio-waste, paper and cardboard, textile waste and clothing, plastic waste), plastics, marine litter, paper and cardboard waste, textile and footwear waste, single-use plastic products, electrical and electronic waste, construction waste. Preventing the generation of municipal waste will increase waste reuse, reduce the total amount of municipal waste and biodegradable municipal waste disposed of in landfills, thus contributing to achieving the objectives set in Directive 1999/31/EC. Implementing measures to prevent the generation of special categories of waste, particularly in promoting reuse and applying eco-modulation in the extended producer responsibility system, will not only reduce waste generation but also enhance the waste management system for these special categories of waste and contribute to the achieving of separate collection, reuse, recycling and recovery targets specified in EU directives on special categories of waste, as well as the targets related to MW reuse and recycling set out in Directive 2008/98/EC.

**Table 66.** Correlation between the objectives and measures taken to achieve the objectives set by the EU specified in the WMP for the period from 2023 to 2028

WMP goal from 2023 to 2028	WMP measure 2023 - 2028	WMP activity 2023 - 2028	EU target	EU regulation
<b>Goal nr. 1. - MSW</b>				
<p>Recover through recycling and preparation for reuse and repair at least:</p> <ul style="list-style-type: none"> <li>• 55% of the municipal waste by 2025</li> <li>• 60% of the municipal waste by 2030 and</li> <li>• 65% of the municipal waste by 2035.</li> </ul>	<p>Measure nr. 1. Improvement of the system for separate collection of municipal waste and infrastructure (capacity and technology) for recycling and other methods of the recovery of municipal waste</p> <p>Measure nr. 2. Raising awareness, informing and educating the public on waste management and products</p> <p>Measure nr. 3. Establishing the MW composition at national level</p>	<p>Activities specified in the Waste Prevention Plan (WPP): A11.1, WPP A11.2 A 1.1. – A 1.5.; A 2.1. – A 2.3.; A 3.1.</p>	<p>Recover through recycling and preparation for reuse at least:</p> <ul style="list-style-type: none"> <li>• 55% of the municipal waste by 2025</li> <li>• 60% of the municipal waste by 2030 and</li> <li>• 65% of the municipal waste by 2035.</li> </ul> <p>By the 1st of January 2025, establish a separate textile collection system.</p>	<p>Directive 2008/98/EC</p>
<p>Authorise all the waste management licence holders in the Republic of Croatia to dispose of no more than 264,661 tonnes of biodegradable MW volume in a single calendar year (35 % of biodegradable MW volume generated in 1997.)</p>	<p>Measures and activities specified in the Waste Prevention Programme of the Republic of Croatia</p> <p>Measure nr. 4. Application of the landfill tax</p> <p>Measure nr. 5. Construction of waste management centres</p> <p>Measure nr. 14. Development and/or upgrade of applications within the</p>	<p>Activities specified in the WPP: WPP A 2.1.; WPP A 2.2.; WPP A 3.1.- WPP A 3.4.; WPP A 4.1.- WPP A 4.3; WPP A 7.1</p> <p>A 4.1.; A 5.1. – A 5.8., A 14.10.</p>	<p>Dispose less than 35 % of biodegradable municipal waste generated in 1997 in landfills.</p>	<p>Directive 1999/31/EC</p>

	waste management IT system			
The quantity of MW disposed in landfills will amount to no more than 10 % of the total generated MW volume by 2035	Measures and activities specified in the Waste Prevention Programme of the Republic of Croatia  Measure nr. 4. Implementation of the landfill tax  Measure nr. 5. Construction of waste management centres	Activities specified in the WPP: WPP A 2.1.; WPP A 2.2.; WPP A 3.1.- WPP A 3.4.; WPP A 4.1.- WPP A 4.3; WPP A 7.1  A 4.1.; A 5.1. – A 5.8.	By 2035, reduce waste disposal to no more than 10 % of the generated MW (by weight)	Directive 1999/31/EC
Improve the bio-waste collection and recovery system in order to separately collect and recycle 36 % of bio-waste from MSW	Measures and activities specified in the Waste Prevention Programme of the Republic of Croatia  Measure nr. 1. Improvement of the system for separate collection of municipal waste and infrastructure (capacity and technology) for recycling and other methods of the recovery of municipal waste  Measure nr. 2. Raising awareness, informing and educating the public on waste management and products	Activities specified in the WPP: WPP A 3.1.; WPP A 3.2.  A 1.1., A 1.3.; A 1.5; A 2.1 – A 2.3	By the 31st of December 2023, separate and recycle bio-waste at the source or through a separate collection system.	Directive 2008/98/EC
<b>Goal nr. 2. – Packaging waste</b>				
❖ Separately collect and recover, through energy or material recovery, at least 60 % of the total packaging	Measures and activities specified in the Waste Prevention Programme of	Activities specified in the WPP: WPP A 5.1. - WPP A 5.4.; WPP A 6.1.,	Take appropriate measures to encourage the design of products and product components that reduce the environmental impact of products and waste	Circular Economy Action Plan - For a Cleaner and More Competitive Europe (Brussels, March 11th, 2020, COM(2020) 98 final)

<p>waste volume generated on the territory of Croatia.</p> <p>❖ Recycle 55 % - 80 % of the total packaging waste intended for material recovery</p> <p>Recycle at least the following percentages in packaging waste:</p> <ul style="list-style-type: none"> <li>● 60 % of glass volume;</li> <li>● 60 % of paper and cardboard volume;</li> <li>● 50 % of metal volume;</li> <li>● 22.5 % of plastic volume, taking into account only recyclable plastic material;</li> <li>● 15 % of wood waste volume</li> </ul> <p>❖ Recycle at least 65 % of the total packaging waste volume by <b>December 31st, 2025.</b></p> <p>By December 31st, 2025, recycle at least the following percentages in packaging waste:</p> <ul style="list-style-type: none"> <li>● 50 % of plastic;</li> <li>● 25 % of wood;</li> <li>● 70 % of non-ferrous metals;</li> <li>● 50 % of aluminium;</li> <li>● 70 % of glass;</li> <li>● 75 % of paper and cardboard;</li> </ul> <p>❖ Recycle at least 70 of the packaging waste volume by no later than <b>December 31st, 2030.</b></p> <p>By December 31st, 2030, recycle at least</p>	<p>the Republic of Croatia</p> <p>Measure nr. 1. Improvement of the system for separate collection of municipal waste and infrastructure (capacity and technology) for recycling and other methods of the recovery of municipal waste</p> <p>Measure nr. 2. Raising awareness, informing and educating the public on waste management and products</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 7. Improvement of the packaging waste management system and establishment of a system for managing single-use plastic products and fishing gear containing plastic.</p>	<p>WPP A 6.2., WPP A 6.4. – 6.6.; WPP A 8.1. – A 8.5., WPP A 9.1</p> <p>A 1.1. – A 1.4.; A 2.1. – A2.5.; A 6.1., A 6.3., A 6.8.; A 7.1. (A 1.2. – A 1.4.); A 7.3.</p>	<p>generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>❖ Separately collect and recover, through material or energy recovery processes, at least 60 % of the total packaging waste generated in Croatia.</p> <p>❖ Recycle 55 % - 80 % of the total packaging waste intended for material recovery</p> <p>Recycle at least the following percentages in packaging waste:</p> <ul style="list-style-type: none"> <li>● 60 % of glass volume;</li> <li>● 60 % of paper and cardboard volume;</li> <li>● 50 % of metal volume;</li> <li>● 22.5 % of plastic volume, taking into account only recyclable plastic material;</li> <li>● 15 % of wood waste volume</li> </ul> <p>❖ Recycle at least 65 % of the total packaging waste volume by <b>December 31st, 2025.</b></p> <p>By December 31st, 2025, recycle at least the following percentages in packaging waste:</p> <ul style="list-style-type: none"> <li>● 50 % of plastic;</li> <li>● 25 % of wood;</li> <li>● 70 % of non-ferrous metals;</li> <li>● 50 % of aluminium;</li> <li>● 70 % of glass;</li> <li>● 75 % of paper and cardboard;</li> </ul> <p>❖ Recycle at least 70 of the packaging waste volume by no later than <b>December 31st, 2030.</b></p>	<p>Directive 2008/98/EC</p> <p>Directive 94/62/EC</p>
--	--	---	--	---

<p>the following percentages in packaging waste:</p> <ul style="list-style-type: none"> <li>• 55 % of plastic;</li> <li>• 30 % of wood;</li> <li>• 80 % of non-ferrous metals;</li> <li>• 60 % of aluminium;</li> <li>• 75 % of glass;</li> <li>• 85 % of paper and cardboard;</li> </ul>			<p>By December 31st, 2030, recycle at least the following percentages in packaging waste:</p> <ul style="list-style-type: none"> <li>• 55 % of plastic;</li> <li>• 30 % of wood;</li> <li>• 80 % of non-ferrous metals;</li> <li>• 60 % of aluminium;</li> <li>• 75 % of glass;</li> <li>• 85 % of paper and cardboard;</li> </ul>	
<b>Goal nr. 3. – Waste single-use plastic products</b>				
<ul style="list-style-type: none"> <li>• <b>By 2025</b>, ensure <b>separate collection</b> for recycling of the quantities of beverage bottles (up to 3L, including their caps and lids) made of polyethylene terephthalate as the main component ('PET bottles'), amounting to <b>77%</b> of the market placement for the year, achieving a <b>90%</b>.</li> <li>• <b>By 2025</b>, ensure that 'PET bottles' contain at least 25% of recycled plastic, calculated as an average for all PET bottles placed on the market in Croatia; and from 2030 onwards, reach a minimum of 30% of recycled plastic.</li> </ul>	<p>Measures and activities specified in the Waste Prevention Programme of the Republic of Croatia</p> <p>Measure nr. 1. Improvement of the system for separate collection of municipal waste and infrastructure (capacity and technology) for recycling and other methods of the recovery of municipal waste</p> <p>Measure nr. 2. Raising awareness, informing and educating the public on waste management and products</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 7. Improvement</p>	<p>Activities specified in the WPP:</p> <p>WPP A 5.1. - WPP A 5.4.; WPP A 6.1., WPP A 6.2., WPP A 6.4. – 6.6.; WPP A 8.1. – WPP A 8.5., WPP A 9.1</p> <p>A 1.1. -A 1.4.; A 2.1. – A 2.3.; A 6.1., A 6.3., A 6.8.; A 7.3.</p>	<p>Take appropriate measures to encourage the design of products and product components that reduce the environmental impact of products and waste generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>By 2025, ensure separate collection for recycling of quantities of beverage bottles (up to 3L, including their caps and lids) made of polyethylene terephthalate as the main component ('PET bottles'), amounting to 77% of such individual products - based on plastic products placed on the market in a given year by weight, and reach a 90% target by 2029.</p> <p>From 2025 onwards, ensure that 'PET bottles' contain at least 25 % of recycled plastic, calculated as an average for all PET bottles placed on the market in the Member State; and from 2030 onwards, reach a minimum of 30 % of recycled plastic.</p>	<p>Circular Economy Action Plan - For a Cleaner and More Competitive Europe (Brussels, March 11th, 2020, COM(2020) 98 final)</p> <p>Directive 2008/98/EC</p> <p>Directive 2019/904</p>



	of the packaging waste management system and establishment of a system for managing single-use plastic products and fishing gear containing plastic.			
Achieve a measurable quantitative reduction in the consumption of single-use plastic products (beverage cups, including their caps and lids, food containers, such as boxes, with or without lids, used for storing food) by 2026 compared to 2022.	<p>Measures and activities specified in the Waste Prevention Programme of the Republic of Croatia</p> <p>Measure nr. 1. Improvement of the system for separate collection of municipal waste and infrastructure (capacity and technology) for recycling and other methods of the recovery of municipal waste</p> <p>Measure nr. 2. Raising awareness, informing and educating the public on waste management and products</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 7. Improvement of the packaging waste</p>	<p>Activities specified in the WPP: WPP A 5.1. - WPP A 5.4.; WPP A 6.1., WPP A 6.2., WPP A 6.4. – 6.6.; WPP A 7.1.; WPP A 8.1. – WPP A 8.5., WPP A 9.1</p> <p>A 2.1. – A2.3; A 6.3.; A 7.3.</p>	<p>Take appropriate measures to encourage the design of products and product components that reduce the environmental impact of products and waste generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>Member States shall take the necessary measures to achieve an ambitious and lasting reduction in the consumption of single-use plastic products listed in Part A of the Annex to Directive (EU) 2019/904, in accordance with the Union's general waste policy objectives, particularly in preventing waste generation, in order to achieve a significant reversal of consumption growth trends. Through these measures, Member States shall, by 2026, in comparison to 2022, on their national territories, achieve a significant measurable quantitative reduction in the consumption of the single-use plastic products listed in Annex A to Directive (EU) 2019/904.</p>	<p>Circular Economy Action Plan - For a Cleaner and More Competitive Europe (Brussels, March 11th, 2020, COM(2020) 98 final)</p> <p>Directive 2008/98/EC</p> <p>Directive 2019/904</p>

	management system and establishment of a system for managing single-use plastic products and fishing gear containing plastic.			
Achieve a minimum annual collection rate for discarded fishing gear containing plastic intended for recycling <sup>30</sup>	<p>Measures and activities specified in the Waste Prevention Programme of the Republic of Croatia</p> <p>Measure nr. 2. Raising awareness, informing and educating the public on waste management and products</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 7. Improvement of the packaging waste management system and establishment of a system for managing single-use plastic products and fishing gear containing plastic.</p>	<p>Activities specified in the WPP: WPP A 5.1. - WPP A 5.4.; WPP A 6.1., WPP A 6.2., WPP A 6.4. - 6.6.; WPP A 8.1. - WPP A 8.5., WPP A 9.1</p> <p>A 2.1. - A2.3; A 6.4.; A 7.3.</p>	<p>Take appropriate measures to encourage the design of products and product components that reduce the environmental impact of products and waste generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>Member States with marine waters as defined in Article 3(1) of Directive 2008/56/EC shall establish a national minimum annual collection rate for discarded fishing gear containing plastic intended for recycling.</p>	<p>Circular Economy Action Plan - For a Cleaner and More Competitive Europe (Brussels, March 11th, 2020, COM(2020) 98 final)</p> <p>Directive 2008/98/EC</p> <p>Directive 2019/904</p>
<b>Goal nr. 4. – Construction waste</b>				
Recover through recycling, preparation for re-use, and other	Measures and activities specified in the	Activities specified in the WPP:	Take appropriate measures to encourage the design of products and product	Circular Economy Action Plan - For a Cleaner and More Competitive Europe

<sup>30</sup> Minimum annual rate prescribed by the Regulation issued by the Government of the Republic of Croatia

<p>methods of material recovery, including backfilling where waste is used as a substitute for other materials, at least 70% by weight of non-hazardous construction and demolition waste, except for naturally occurring material classified under key waste code 17 05 04 - soil and stones other than those mentioned in 17 05 03,</p>	<p>Waste Prevention Programme of the Republic of Croatia</p> <p>Measure nr. 2. Raising awareness, informing and educating the public on waste management and products</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 8. Improvement of the construction waste and asbestos-containing waste management system</p> <p>Measure nr. 13. Remediation of the sites contaminated by waste discarded in the environment</p> <p>Measure nr. 14. Development and/or upgrade of applications within the waste management IT system</p>	<p>WPP A 1.1. – WPP A 1.3; WPP A 6.1. – 6.6.; WPP A 7.1 WPP A 8.1. – WPP A 8.5., WPP A 9.1</p> <p>A 2.4., A 2.5., A 6.6.; A 6.7., A 6.8.; A 8.1. – A 8.3.; A 13.2.; A 13 3.; A 14.8; A 14.11;.</p>	<p>components that reduce the environmental impact of products and waste generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>Prepare for re-use, recycle, and recover other materials, including backfilling, 70% of non-hazardous construction and demolition waste, excluding naturally occurring material classified under key waste code 17 05 04.</p>	<p>(Brussels, March 11th, 2020, COM(2020) 98 final)</p> <p>Directive 2008/98/EC</p>
<b>Goal nr. 5. – End-of-life vehicles</b>				
<p>On an annual basis achieve the following:</p> <ul style="list-style-type: none"> <li>• The rate of reuse and recovery of end-of-life vehicles</li> </ul>	<p>Measures and activities specified in the Waste Prevention Programme of</p>	<p>Activities specified in the WPP: WPP A 6.1., WPP A 6.2., WPP A 6.4. –</p>	<p>Take appropriate measures to encourage the design of products and product components that reduce the environmental impact of products and waste</p>	<p>Circular Economy Action Plan - For a Cleaner and More Competitive Europe (Brussels, March 11th, 2020, COM(2020) 98 final)</p>

<p>submitted for treatment of at least 95% of the average vehicle weight</p> <ul style="list-style-type: none"> <li>The rate of reuse and recycling of end-of-life vehicles submitted for treatment of at least 85% of the average vehicle weight</li> </ul>	<p>the Republic of Croatia</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p>	<p>6.6.; WPP A 8.1. – WPP A 8.5., WPP A 9.1</p> <p>A 6.1., A 9.1.</p>	<p>generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>On an annual basis achieve the following:</p> <ul style="list-style-type: none"> <li>The rate of reuse and recovery of end-of-life vehicles submitted for treatment of at least 95% of the average vehicle weight</li> <li>The rate of reuse and recycling of end-of-life vehicles submitted for treatment of at least 85% of the average vehicle weight</li> </ul>	<p>Directive 2008/98/EC</p> <p>Directive 2000/53/EC</p>
<b>Goal nr. 6. – Waste batteries and accumulators</b>				
<p>Achieve an annual separate collection rate of waste batteries and accumulators of at least 45% of the average annual quantity placed on the market in the past three years.</p> <p>Achieve a minimum recycling efficiency:</p> <p>(a) recycling 65 % of the average weight of lead-acid batteries and accumulators, including the recycling of lead content to the greatest technically feasible extent while avoiding excessive costs;</p> <p>(b) recycling 75 % of the average</p>	<p>Measures and activities specified in the Waste Prevention Programme of the Republic of Croatia</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 9. Improvement of the ELV vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils management system.</p>	<p>Activities specified in the WPP: WPP A 6.1., WPP A 6.2., WPP A 6.4. – 6.6.; WPP A 8.1. – WPP A 8.5., WPP A 9.1</p> <p>A 6.1., A 9.1.</p>	<p>Take appropriate measures to encourage the design of products and product components that reduce the environmental impact of products and waste generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>Minimum collection rate is 45%.</p> <p>Recycling processes achieve a minimum recycling efficiency:</p> <p>(a) recycling 65 % of the average weight of lead-acid batteries and accumulators, including the recycling of lead content to the greatest technically</p>	<p>Circular Economy Action Plan - For a Cleaner and More Competitive Europe (Brussels, March 11th, 2020, COM(2020) 98 final)</p> <p>Directive 2008/98/EC</p> <p>Directive 2006/66/EC</p>

<p>weight of nickel-cadmium batteries and accumulators, including the recycling of cadmium content to the greatest technically feasible extent while avoiding excessive costs; and</p> <p>(a) recycling 50 % of the average weight of other waste batteries and accumulators.</p>			<p>feasible extent while avoiding excessive costs;</p> <p>(b) recycling 75 % of the average weight of nickel-cadmium batteries and accumulators, including the recycling of cadmium content to the greatest technically feasible extent while avoiding excessive costs; and</p> <p>(c) recycling 50 % of the average weight of other waste batteries and accumulators.</p>	
<b>Goal nr. 7. – Waste electrical and electronic equipment</b>				
<p>Achieve an annual rate of separate collection of waste electrical and electronic equipment of at least 65% of the average weight of electrical and electronic equipment placed on the market in the previous three years or 85% of WEEE waste generated within the territory of the Republic of Croatia.</p> <p>Recover WEEE with an annual rate of at least:</p> <ul style="list-style-type: none"> <li>• 85 % or by means of preparation for reuse and recycling, at least 80% by weight of collected heating and cooling equipment or large equipment with external dimensions greater than 50 cm</li> <li>• 80 % or by means of preparation for reuse and recycling, at</li> </ul>	<p>Measures and activities specified in the Waste Prevention Programme of the Republic of Croatia</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 9. Improvement of the ELV vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils management system</p>	<p>Activities specified in the WPP: WPP A 7.1; WPP A 6.1., WPP A 6.2., WPP A 6.4. – 6.6.; WPP A 8.1. – WPP A 8.5., WPP A 9.1;</p> <p>A 6.1.; A 9.1.</p>	<p>Take appropriate measures to encourage the design of products and product components that reduce the environmental impact of products and waste generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>Achieve an annual rate of separate collection of waste electrical and electronic equipment of at least 65% of the average weight of electrical and electronic equipment placed on the market in the three previous years or 85% of WEEE waste generated within the territory of the Republic of Croatia.</p> <p>Recover WEEE with an annual rate of at least:</p> <ul style="list-style-type: none"> <li>• 85 % or by means of preparation for reuse and recycling, at least 80% by weight of collected heating and cooling equipment or</li> </ul>	<p>Circular Economy Action Plan - For a Cleaner and More Competitive Europe (Brussels, March 11th, 2020, COM(2020) 98 final)</p> <p>Directive 2008/98/EC</p> <p>Directive 2012/19/EC</p>

<p>least 70% by weight of collected screens, monitors, and equipment containing screens with a screen area larger than 100 cm<sup>2</sup></p> <ul style="list-style-type: none"> <li>• 75 % or by means of preparation for reuse and recycling, at least 55% by weight of collected small equipment with no external dimension exceeding 50 cm or small IT and telecommunications equipment with no external dimension exceeding 50 cm</li> <li>• 80 % by weight of collected light bulbs by means of recycling</li> </ul>			<p>large equipment with external dimensions greater than 50 cm</p> <ul style="list-style-type: none"> <li>• 80 % or by means of preparation for reuse and recycling, at least 70% by weight of collected screens, monitors, and equipment containing screens with a screen area larger than 100 cm<sup>2</sup></li> <li>• 75 % or by means of preparation for reuse and recycling, at least 55% by weight of collected small equipment with no external dimension exceeding 50 cm or small IT and telecommunications equipment with no external dimension exceeding 50 cm</li> <li>• 80 % by weight of collected light bulbs by means of recycling</li> </ul>	
--	--	--	---	--

**Goal nr. 8. – Waste tyres and waste oils**

<p>Ensure:</p> <ul style="list-style-type: none"> <li>• Systematic separate collection of waste tyres</li> <li>• Processing of all separately collected waste tyres</li> <li>• Recycling at least 80% by weight of separately collected waste tyres in the calendar year in Croatia</li> </ul>	<p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 9. Improvement of the ELV vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils management system</p>	<p>A 6.1.; A 9.1.</p>	<p>Protection of human health and the environment</p>	<p>Directive 2008/98/EC</p>
<p>Goal nr. 9. Improve the waste management system for all other special categories of</p>	<p>Measures and activities specified in the Waste</p>	<p>Activities specified in the WPP: WPP A 1.1. –</p>	<p>Take appropriate measures to encourage the design of products and product components that reduce</p>	<p>Circular Economy Action Plan - For a Cleaner and More Competitive Europe (Brussels, March 11th, 2020,</p>

waste not covered by objectives 1-8.	<p>Prevention Programme of the Republic of Croatia</p> <p>Measure nr. 6. Analysis of the efficiency of the special waste management system with improvement proposals</p> <p>Measure nr. 7. Improvement of the packaging waste management system and establishment of a system for managing single-use plastic products and fishing gear containing plastic.</p> <p>Measure nr. 8. Improvement of the construction waste and asbestos-containing waste management system</p>	<p>WPP A 1.2. (asbestos); WPP A 6.1., WPP A 6.2., WPP A 6.4. – 6.6.; WPP A 7.1.; WPP A 8.1. – WPP A 8.5., WPP A 9.1</p> <p>A 6.1., A 6.2.; A 6.5.; A 6.6.; A 7.2; A 8.1.;</p>	<p>the environmental impact of products and waste generation during production and further use of products, and ensure that the recovery and disposal of products that have become waste are carried out in accordance with Articles 4 and 13 of Directive 2008/98/EC.</p> <p>Protection of human health and the environment.</p> <p>Preventing marine litter.</p> <p>Halting the creation of marine litter as a contribution to UN Sustainable Development Goal nr. 14 (SDG 14 - Conserve and sustainably use the oceans, seas, and marine resources for sustainable development).</p> <p>Establish an extended producer responsibility program for tobacco products with filters and filters placed on the market for use in combination with tobacco products.</p> <p>Take measures to inform consumers and promote responsible consumer behaviour in order to achieve a reduction in the littering of waste from tobacco products with filters and filters placed on the market for use in combination with tobacco products.</p>	<p>COM(2020) 98 final)</p> <p>Directive 2008/98/EC</p> <p>Directive 2019/904</p>
Goal nr. 10. Improve the waste management system	<p>Measure nr. 10. Implementation of the project entitled 'The Feasibility Study of the Existing and the Required Capacities for Hazardous Waste Treatment and a Study for Identifying New Locations Contaminated</p>	<p>A 10.1.; A10.2.</p>	<p>Protection of human health and the environment.</p>	<p>Directive 2008/98/EC</p>

	with Hazardous Waste ('Hot Spots')			
Goal nr. 11. Remediate sites contaminated with waste	<p>Measure nr. 11. Remediation and closure of non-hazardous waste landfills</p> <p>Measure nr. 12. Remediation of sites contaminated with hazardous waste ('Hot Spots')</p> <p>Measure nr. 13. Remediation of sites contaminated with waste dumped into the environment</p>	A 11.1.; A 12.1.; A 13.1.; A 13.2.	<p>Protection of human health and the environment.</p> <p>By 2020, dispose of less than 35% of biodegradable municipal waste produced in 1997 in landfills.</p> <p>By 2035, reduce landfill disposal to a maximum of 10% of the total municipal waste generated (by weight).</p>	<p>Directive 2008/98/EC</p> <p>Directive 1999/31/EC</p>
Goal nr. 12. Improve the waste management IT and monitoring systems	<p>Measure nr. 14. Development and/or upgrade of applications that are part of the waste management information system.</p> <p>Measure nr. 15. Development of the EPEEF information system for the preparation and implementation of projects</p> <p>Measure nr. 16. Development of a plan for monitoring the implementation of the Waste Management Plan</p>	A 14.1. – A 14.13.; A 15.1., A 16.1	<p>Monitoring and verification of compliance with EPR obligations. Record-keeping. Registration.</p>	<p>Directive 2008/98/EC</p>
Goal nr. 13. Improve waste management supervision	Measure nr. 17. Training of	A 17.1.	<p>Inspection. Issuing licences and exemptions from licence requirements.</p>	<p>Directive 2008/98/EC</p>



	the participants in the waste management supervision			
--	--	--	--	--

## 12.1. Measures for the improvement of reuse, recycling and other procedures of the recovery of the municipal waste and the reduction of waste disposal in landfills

The group of measures and activities in this subsection is aimed at achieving Goal nr. 1, which is to increase the separate collection of municipal waste, its recycling and preparation for reuse, and reduce the amount of municipal waste disposed of in landfills.

Measures aimed at achieving Goal nr. 1 – MSW	
Measure	Measure description
<p><b>Measure nr. 1. Improvement of the separate collection system of municipal waste and infrastructure (capacity and technology) for the recycling and other recovery processes of municipal waste</b></p>	<p>Increasing the capacity for the collection and recovery of municipal waste:</p> <ul style="list-style-type: none"> <li>- Procurement of equipment, vehicles, and vessels for separate collection of paper, metal, plastic, glass, textiles, and bio-waste;</li> <li>- Construction and equipping of recycling centres</li> <li>- Construction and equipping of new facilities, and where necessary, expanding the capacity and improving the technology of existing facilities for sorting separate fractions from municipal waste (waste paper, cardboard, metal, glass, plastic, etc.)</li> <li>- Construction and equipping of new facilities, and/or increasing the capacity and improving the technology of existing recycling facilities, including facilities for the biological treatment of separately collected biowaste using aerobic or anaerobic processes.</li> </ul> <p>It is recommended that procurement activities (A 1.1.) be carried out as comprehensive projects in conjunction with activities to increase and improve sorting and recovery capacity (A 1.2., A 1.4., A 1.5.).</p>
<p><b>Measure nr. 2. Raising awareness, providing information and education about waste management and products</b></p>	<p>Drafting of educational and information materials, organising and conducting informational and educational activities at the national and local levels.</p> <p>Strengthening collaboration and the capacities of local and regional self-government units.</p> <p>Supporting the implementation of 'key implementation elements' for environmentally friendly waste management in waste management facilities and the application of technical guidelines for environmentally friendly waste management.</p>
<p><b>Measure nr. 3. Determining the national composition of municipal waste</b></p>	<p>Conducting periodical waste composition analyses using a regional concept to determine the national composition of municipal waste – determining the average composition through sampling.</p>
<p><b>Measure nr. 4. Introducing a landfill tax</b></p>	<p>Introducing a landfill tax to encourage the reduction of waste sent to landfills and increase the amount of separately collected waste.</p>
<p><b>Measure nr. 5. Construction of waste management centres</b></p>	<p>Constructing buildings for the processing of the mixed municipal waste, non-hazardous waste remaining after material recovery, and other non-hazardous waste.</p> <p>When planning the capacity of the said facilities, it is necessary to prepare a feasibility study that considers the objectives set by Croatian and EU legislation and the National Waste Management Plan. The study should outline all the measures required within the project area to achieve the objectives and justify the required capacity.</p>

	<p>Additionally, when planning the required facilities, it is essential to explore the possibility of including facilities for processing construction waste, asbestos-containing waste, bulky waste, and biodegradable waste, as well as a sorting facility for separately collected paper/cardboard, glass, metal, and plastic within the same facility.</p> <p>The envisaged facilities must be designed to incorporate cutting-edge technologies that can be adapted in the future to process separately collected waste fractions, including biodegradable waste, in order to increase recycling rates and biological treatment of municipal waste.</p>
--	--

### **Measure nr. 1. Improvement of the separate collection system of municipal waste and infrastructure (capacity and technology) for the recycling and other recovery processes of municipal waste**

The implementation of this measure, through the increase and improvement of capacity for separate collection and recovery of municipal waste, will lead to a broader application of advanced waste treatment processes. This primarily includes increasing the preparation for reuse and recycling of municipal waste. Indirectly, this approach will also lead to a reduction in the disposal of municipal waste. These efforts contribute to achieving the objectives of preparing waste for reuse and recycling, including the ensuring of high-quality waste recycling and establishing separate collection and biodegradable waste recycling systems. Additionally, the implementation of this measure and its associated activities will contribute to the reduction of municipal waste disposal, including both the total MW and the biodegradable waste.

The activities prescribed by this Measure are demanding in terms of their technical requirements and financial resources since the Measure involves the establishment of new infrastructure and the upgrade of the existing facilities for separate collection and waste treatment. The construction of infrastructure and the procurement of equipment for separate waste collection (vehicles, vessels, bins, recycling centres, etc.) ensure a high rate of separately collected waste fractions suitable for reuse and recycling. This increases the value of these fractions and their potential for market placement. The essential links between separate waste collection and ensuring its maximum utilisation are waste sorting facilities.

By constructing and equipping new facilities and/or expanding the capacity and technologically upgrading the existing recycling facilities, as well as building and equipping facilities for the biological treatment of separately collected biodegradable waste, a circular approach to sustainable waste management and greater overall resource efficiency will be achieved.

### **Measure nr. 2. Raising awareness, providing information and education about waste management and products**

The implementation of educational and informational activities and campaigns at all levels (local, regional, and national) makes a significant contribution to strengthening the application of waste management priorities from the perspective of their strong impact on the behaviour of targeted stakeholders and motivating changes in waste and product handling practices with the purpose of preventing and reducing waste generation. This represents one of the tools for achieving objectives related to waste reduction, reuse, recycling of municipal waste, and the reduction of waste disposal.

Since the tourism sector in the Republic of Croatia represents one of the most important branches of the economy, the implementation of this measure, together with the measures and activities defined

in the Waste Prevention Plan, will be designed and organised in a way as to actively engage with relevant stakeholders from this sector. This is especially important due to the specific characteristics of the tourism sector related to strengthening of the circular waste management on islands.

Furthermore, active and targeted communication will be carried out regarding the importance and benefits of separate collection of biodegradable waste and the use of compost.

Education and collaboration activities will be conducted between the Ministry and local and regional authorities by organising communication platforms in the form of roundtable discussions. Given the obligation to develop waste management plans by regional and local self-government units and the City of Zagreb by January 1st, 2024, during 2023, these activities will focus on enhancing capacities and cooperation to ensure planning in line with the principles of the circular economy. This measure includes the implementation of roundtable discussions.

The measure also includes the providing of support for the introduction of the 'key implementation elements' of environmentally sound waste management (OECD guideline 0329) in waste management facilities, as well as support for the application of OECD technical guidelines and other guidelines for environmentally sound waste management. This will be done through the publication of guidelines with information on their implementation published on the official website of the Ministry of Economy and Sustainable Development.

### **Measure nr. 3. Determining the national composition of municipal waste**

Understanding the composition of municipal waste is a prerequisite for the successful dimensioning of a municipal waste management system. Furthermore, reliable data on the composition of municipal waste are an essential tool for monitoring the progress of establishing the waste management system and its effectiveness. The existing data on the national composition of municipal waste for Croatia are unreliable and based on a limited number of waste composition analyses (at the level of regional waste management centres and/or local authorities) that are over 20 years old.

This measure includes field research, sorting, and the analysis of municipal waste composition using a regional approach.

### **Measure nr. 4. Introducing a landfill tax**

This measure directly encourages the reduction of waste disposed of in landfills, thereby increasing the separate collection of municipal waste, contributing to the objectives of waste preparation for reuse and recycling, as well as the objectives of reducing the landfilling of municipal waste.

The introduction of the landfill tax will contribute to intensifying the activities of local government units aimed at strengthening the waste management hierarchy's implementation, and is expected to increase the amounts of separately collected and recovered waste, particularly organic waste.

The prerequisite for introducing a waste disposal fee is the adoption of a regulation based on the Waste Management Act, which will regulate unit fees.

### **Measure nr. 5. Construction of waste management centres**

An efficient waste management system requires appropriate treatment of mixed municipal waste remaining after the separation of useful fractions in quantities sufficient to achieve the objectives of

waste preparation for reuse and recycling. This measure will directly contribute to achieving the objectives of reducing the landfilling of biodegradable municipal waste and total municipal waste.

This measure includes the construction of eight additional waste management centres (WMCs).

The activities prescribed by this measure are demanding in terms of their technical requirements and financial resources. Consideration will be given to the best available technology that is economically and environmentally efficient and can be adapted to the processing of separately collected waste fractions in the future, including organic waste, in order to increase the recycling rate of municipal waste.

The development of WMCs will involve close and transparent collaboration between relevant institutions at all levels (national, regional, and local) and the interested public. The communication aspect with residents will be taken into account. Residents will be informed and acquainted with all aspects of the planned projects (planned capacity and technology, investment and operating costs, the project's impact on the price of municipal waste collection services, potential environmental and public health effects, and the planned waste prevention and reduction measures).

Measures and activities aimed at achieving Goal nr. 1 – MSW							
Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
<b>Measure nr. 1. Improvement of the separate collection system of municipal waste and infrastructure (capacity and technology) for the recycling and other recovery processes of municipal waste</b>							
A 1.1. Procurement of equipment, vehicles, and vessels for separate collection of paper, cardboard, metal, plastic, glass, textiles, and organic waste.	LSGU	RSGU/MESD	LSGU/EP EEF/EU	LSGUs that have established a system for separate collection of paper, cardboard, metal, plastic, glass, textiles, and organic waste	Pc.	556	2028
A 1.2. Construction and equipping of new facilities for the sorting of separately collected paper, cardboard, metal, glass, plastic, and other types of waste (sorting facility), and/or increasing of the capacity and a technological improvement of the existing facilities.	LSGU/OTHER	RSGU	LSGU/EU /OTHER	Constructed or improved and operational sorting facility	Capacity in t/y	586,876	2028
A 1.3. Construction and equipping of recycling centres and procurement of mobile recycling centres	LSGU	-	LSGU/EU	Constructed and equipped recycling centres	Pc.	100	2028
A 1.4. Construction and equipping of new facilities and/or increasing the capacity and technological upgrade of the existing recycling facilities	PI		PI/EU	Increased share of recycled waste at the national level	%	Goal achievement	2028
A 1.5. Construction and equipping of facilities for the biological treatment of separately collected	LSGU	RSGU/MESD	LSGU/EU /OTHER	Built facilities for the biological treatment of	Capacity in t/y	249,855	2028

organic waste				separately collected organic waste–			
<b>Measure nr. 2. Raising awareness, providing information and education about waste management and products</b>							
A 2.1. Implementation of national campaigns and other informational-educational activities on waste management in Croatia	EPEEF	MESD	EPEEF/EU	Implemented informational and educational activities	Number	6	2028
A 2.2. Implementation of waste management information activities at the LSGU level	LSGU	-	LSGU	Held public forums	Number /year	556	2028
				Produced and distributed publications on waste management	Number /year	556	
				Establishment and maintenance of websites containing waste management information	Number	556	
A 2.3. Organisation of events aimed at strengthening of the collaboration and increasing the capacity of local and regional government	MESD	RSGU	MESD/EU	Conducted professional roundtable discussions	Number	7	2028
A 2.4. Supporting the introduction of 'key implementation elements' in waste management facilities	MESD	Waste management entities	MESD	Publication of guidelines and information on 'key implementation elements' on the MESD's website	Number	1	2024
A 2.5. Application of technical guidelines for environmentally sound waste management	MESD	Waste management entities	MESD	Publication of information on the application of technical guidelines for environmentally sound waste management on the MESD's website	Number	1	2024
<b>Measure nr. 3. Determining the national composition of municipal waste</b>							
A 3.1. Sorting and analysis of the composition of municipal waste using a regional concept with the aim of determining the national composition of municipal waste	MESD	EPEEF	EPEEF	Determined national composition of MSW	Number	1	2024
<b>Measure 4. Introduction of the landfill tax</b>							
A 4.1. Application of the landfill tax	MESD	Waste management entities, State Inspectorate of the RoC	-	Landfill tax collection	Number	1	2025
<b>Measure nr. 5. Construction of WMCs</b>							
A 5.1. Construction of Biljane Donje WMC	Zadar County and part of the Lika-Senj County	MESD	RSGU/EP EEF/EU	Biljane Donje WMC	Number	1	2023

A 5.2. Construction of Lučino razdolje WMC for the processing of max. 40,000 t of MMW per year.	Dubrovnik-Neretva County	MESD	RSGU/EP EEF/EU	Lučino razdolje WMC	Number	1	2026
A 5.3. Construction of Lečevica WMC for the processing of max. 110,000 t of MMW per year.	Split-Dalmatia County	MESD	RSGU/EP EEF/EU	Lečevica WMC	Number	1	2028
A 5.4. Construction of Piškornica WMC for the processing of max. 110,000 t of MMW per year. *)	Krapina-Zagorje County, Varaždin County, Koprivnica-Križevci County, Međimurje County, Bjelovar-Bilogora County	MESD	RSGU/EP EEF/EU	Piškornica WMC	Number	1	2028
A 5.5. Construction of Babina gora WMC for the processing of max. 30,000 t of MMW per year.	Karlovac County, part of the Lika-Senj County and part of the Sisak-Moslavina County	MESD	RSGU/EP EEF/EU	Babina Gora WMC	Number	1	2026
A 5.6. Project preparation and construction of Šagulje WMC for the processing of max. 55,000 t of MMW per year.	Požega-Slavonia, Savonski Brod-Posavina, part of the Sisak-Moslavina County and Virovitica-Podravina County	MESD	RSGU/EP EEF/EU	Šagulje WMC	Number	1	2028
A 5.7. Project preparation and construction of Orlovnjak WMC for the processing of max. 60,000 t of MMW per year.	Osijek-Baranja and Vukovar-Srijem counties	MESD	RSGU/EP EEF/EU	Orlovnjak WMC	Number	1	2028
A 5.8. Project preparation and construction of Zagreb WMC for the processing of max. 180,000 t of MMW per year.	City of Zagreb/ Zagreb County	MESD	RSGU/EP EEF/EU	Zagreb WMC	Number	1	2028

\*) Piškornica WMC will be built in such a way as to include the Koprivnica-Križevci County, the Krapina-Zagorje County, the Međimurje County and the Varaždin County in the first phase, and the Bjelovar-Bilogora County in the second phase, in line with the objectives of increasing the separately collected waste collection rate.

## 12.2. Measures for the improvement of the special waste categories management system

A group of measures and activities in this subchapter is aimed at achieving the **Objectives 1-9** of the National Waste Management Plan, i.e., improving the system for managing special categories of waste.

**Measures designed to achieve Goal nr. 2. – Packaging waste, Goal nr. 3. – Waste plastic single-use products, Goal nr. 4. – Construction waste, Goal nr. 5. – ELV, Goal nr. 6. – Waste batteries and accumulators, Goal nr. 7. – Waste electrical and electronic equipment, Goal nr. 8. – Waste tyres and Goal nr. 9. – Other special categories of waste**

Measure	Measure description
<p><b>Measure nr. 6. Analysis of the efficiency of the system for managing special categories of waste with proposals for improvement</b></p>	<p>These measures and activities are aimed at ensuring continuous improvement of the system for managing special categories of waste through appropriate planning. In order to achieve this, it is necessary to prepare expert analyses and recommendations that will ensure the improvement and optimisation of the system, as follows:</p> <ul style="list-style-type: none"> <li>- Preparation of analyses (reports) with recommendations for further improvement of the system for managing special categories of waste in the extended producer responsibility system, including an action plan for the future development of the waste management system for the following waste categories: packaging waste, waste tyres, waste oils, waste batteries and accumulators, end-of-life vehicles, waste electrical and electronic equipment, plastic waste, and textile waste;</li> <li>- Preparation of an analysis for improving the monitoring of the health care waste flow and the existing medical waste treatment system;</li> <li>- Preparation of an analysis of the single-use plastic product waste management system with recommendations for system improvement and for establishing an extended producer responsibility system for products not covered by the existing system;</li> <li>- Preparation of a waste quantity assessment study for fishing gear containing plastic and waste fishing gear handling for the purpose of establishing a plastic-containing fishing gear waste management system;</li> <li>- Preparation of a waste quantity assessment study for fishing gear containing plastic for each county and an analysis of the required number, locations, and capacities of the areas for disposing of construction waste containing asbestos;</li> <li>- Preparation of a waste quantity assessment study for produced construction waste, including an action plan for the future development of the waste management system for this waste category.</li> </ul>
<p><b>Measure nr. 7. Improvement of the system for managing packaging waste and the establishment of a system for managing single-use plastic products waste and fishing gear containing plastic.</b></p>	<p>This measure needs to be implemented in synergy with <i>Measure nr. 1 - Improvement of the system for separate collection of municipal waste and infrastructure (capacity and technology) for recycling and other recovery processes of municipal waste</i>, which also includes activities intended to increase the capacity and enhance the technology of facilities for sorting and recycling separate fractions from municipal waste. Additionally, during the implementation of <i>Measure nr. 2 - Raising awareness, providing information and education on waste management</i>, it is necessary to cover the topic concerning the management of these waste categories.</p> <p>This measure also includes specific activities that encompass the following:</p> <ul style="list-style-type: none"> <li>- Implementation of projects designed to improve the management of packaging waste, single-use plastic products waste, and fishing gear containing plastic;</li> </ul>



	<ul style="list-style-type: none"> <li>- Organisation of educational workshops for the private sector designed to improve data monitoring and reporting in accordance with the provisions of Directive 94/62/EC and Directive 2019/904</li> </ul>
<b>Measure nr. 8. Improvement of the system for managing construction waste and asbestos-containing waste</b>	<p>Improvement of the system for managing construction waste and asbestos-containing waste will be achieved through the implementation of measures aimed at strengthening collaboration between stakeholders and ensuring adequate capacities for waste collection. This measure needs to be implemented in synergy with <i>Measure nr. 13 - Remediation of sites contaminated by discarded waste</i>, which includes the procurement of technological equipment (such as surveillance cameras) for a more effective prevention of illegal waste dumping, and <i>Measure nr. 14 - Development and/or improvement of applications that are part of the waste management information system</i>, which involves improving the integration of e-ONTO (Electronic Register on Waste Creation and Transport) and the Environmental pollution register (PER) for the purpose of collecting data on the quantities of the collected and processed waste, as well as enabling the utilisation of the Records of Discarded Waste Locations (RDWL, Cro. abbrev. ELOO) application on mobile devices for the purpose of facilitating the anonymous reporting of illegal waste dumping.</p>
<b>Measure nr. 9. Improvement of the system for managing end-of-life vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils</b>	<p>The improvement of the system for managing end-of-life vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils is planned by promoting separate collection, expanding and improving the existing recovery and/or recycling systems, and upgrading the existing or constructing new facilities for waste and materials for which there are currently no recycling or recovery capacities.</p>

### **Measure nr. 6. Analysis of the efficiency of the system for managing special categories of waste with proposals for improvement**

The Extended Producer Responsibility (EPR) is an economic model aimed at strengthening waste prevention, reuse, recycling, and other waste recovery measures, in accordance with Directive 2008/98/EC and specific regulations (directives) that separately regulate individual special categories of waste (packaging waste, waste batteries and accumulators, end-of-life vehicles, etc.), including single-use plastic waste. In order to implement the measures and achieve the objectives prescribed by relevant EU regulations that require continuous improvement and optimisation of the existing systems and the establishment of new ones, this measure prescribes the need for the preparation of expert analyses, foundations, and recommendations that will serve as preparatory activities for further development of waste management systems for these categories. This will also result in reduced amounts of non-recycled plastic packaging waste, and consequently, lower fees for non-recycled plastic packaging waste, which were introduced to all EU Member States in 2021 by Council Decision (EU, Euratom) 2020/2053 of 14 December 2020 on the system of the European Union's own resources, repealing Decision 2014/335/EU, Euratom.

The measure includes the preparation of analyses (studies) with recommendations for further improvement of the waste management system for special categories of waste within the extended producer responsibility scheme, including an action plan for the future development of waste

management for these categories: packaging waste, waste tyres, waste oils, waste batteries and accumulators, end-of-life vehicles, waste electrical and electronic equipment, plastic waste, and textile waste.

In addition to improving waste management within the EPR system, this measure also involves activities for the preparation of analyses and studies for other types of special categories of waste, such as health care waste, fishing gear containing plastic, single-use plastic products, waste containing asbestos, and construction waste.

#### **Measure nr. 7. Improvement of the system for managing packaging waste and the establishment of a system for managing single-use plastic products waste and fishing gear containing plastic**

In synergy with the measures and activities aimed at achieving the Goal nr. 1 - Municipal waste, additional activities for implementing this measure will be specifically targeted at improving the waste management system for packaging waste, single-use plastic products, and fishing gear containing plastic.

Therefore, activities will be carried out to reduce the environmental impact caused by the disposal of waste generated after the consumption of tobacco products with plastic filters. Preparation and implementation of pilot projects for the managing of waste from tobacco product filters will be conducted, within which special waste collection infrastructure will be established at specific locations (e.g., receptacles for cigarette butts at sites where littering is most common, labelling of containers with warnings about the negative environmental impact and the type of waste).

In addition to improving the waste management system, organising workshops for the private sector on the topic of preparing reports and submitting data to competent authorities, including the preparation of educational materials, will contribute to the implementation of EU regulations that impose an obligation on Member States to report on the compliance with regulations and the achievement of the set objectives.

#### **Measure nr. 8. Improvement of the system for managing construction waste and asbestos-containing waste**

In synergy with Measure nr. 13 - Remediation of Sites Contaminated by Waste Dumped in the Environment and Measure nr. 14 - Development and/or Enhancement of Applications within the Waste Management Information System, the implementation of this measure will contribute to the efficient application of materials and the circular material lifecycle, strengthening the priority of waste management, a better monitoring of construction waste, and reducing disposal and littering of construction waste in the environment.

By strengthening the network of facilities for collection, and building and equipping municipal and regional recycling centres for construction waste, it will foster collaboration between the public and private sectors in the field of construction waste management.

In order to improve the process of granting the end-of-waste status to construction waste, guidelines will be prepared, including standard document formats for approvals and examples of procedures for the granting of the end-of-waste status to construction waste. This will help reduce distrust in the quality of recycled materials obtained from construction and demolition waste, which limits the demand for such recycled materials and hinders the development of the infrastructure required for the management of this type of waste.

Additionally, in line with the concept of the circular economy, guidelines will be provided for the segregation and disposal of hazardous construction waste during building removal, as part of the 'Building Removal Project' carried out in accordance with the Building Act (Official Gazette nr. 153/13, 20/2017, 39/19, 125/19).

**Measure nr. 9. Improvement of the system for managing end-of-life vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils**

In order to improve the system for the managing of special categories of waste and for the purpose of achieving the Goal nr. 5 - End-of-Life Vehicles, Goal nr. 6 - Waste Batteries and Accumulators, Goal nr. 7 - Waste Electrical and Electronic Equipment, and Goal nr. 8 - Waste Tyres and Waste Oils, a feasibility study will be conducted to determine the capacity required for the processing of special categories of waste. This study will define the required processing capacities, methods for waste treatment, and activities aimed at improving the system for managing end-of-life vehicles, waste batteries and accumulators, waste electrical and electronic equipment, and waste tyres. The study will also determine the investment amount, potential funding sources, and provide recommendations for the measures and activities necessary to enhance the waste management system for these specific waste categories.

Furthermore, for a comprehensive alignment with OECD standards and best practices, possibilities will be analysed to identify the most suitable way to implement waste management technical guidelines in an environmentally acceptable manner, as specified in Appendix III of the Recommendation on Environmentally Sound Management of Waste [OECD/LEGAL/0329]. Guidelines for the publication on the Ministry's website will be prepared as well.

**Measures designed to achieve Goal nr. 2. – Packaging waste, Goal nr. 3. – Waste plastic single-use products, Goal nr. 4. – Construction waste, Goal nr. 5. – ELV, Goal nr. 6. – Waste batteries and accumulators, Goal nr. 7. – Waste electrical and electronic equipment, Goal nr. 8. – Waste tyres and Goal nr. 9. – Other special categories of waste**

Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
<b>Measure nr. 6. Analysis of the efficiency of the system for managing special categories of waste with proposals for improvement</b>							
A 6.1. Preparation of the analyses of the existing systems for the management of special categories of waste within the extended producer responsibility scheme, including an action plan for future development of waste management systems	EPEEF	MESD	EPEEF/EU	The analyses of the existing systems for the management of special categories of waste within the extended producer responsibility scheme have been prepared.	Number	1	2024
A 6.2 Development of an analysis of the medical waste management system	MESD	MHSW	MESD/MHSW/healthcare centres/PI	An analysis of the medical waste management system has been developed.	Number	1	2024

**Measures designed to achieve Goal nr. 2. – Packaging waste, Goal nr. 3. – Waste plastic single-use products, Goal nr. 4. – Construction waste, Goal nr. 5. – ELV, Goal nr. 6. – Waste batteries and accumulators, Goal nr. 7. – Waste electrical and electronic equipment, Goal nr. 8. – Waste tyres and Goal nr. 9. – Other special categories of waste**

Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
A 6.3. Preparation of an analysis of the single-use plastic product management system	EPEEF	MESD	EPEEF	An analysis of the single-use plastic product management system has been prepared.	Number	1	2023
A 6.4. Development of a study intended to assess the quantities of waste originating from fishing gear containing plastic and its management methods	EPEEF	MESD	EPEEF/MESD/EU	The study intended to assess the quantities of waste originating from fishing gear containing plastic and its management methods has been developed.	Number	1	2023
A 6.5. Preparation of a Study intended to assess the quantities of waste containing asbestos for each county.	EPEEF	MESD/RS GU/LSGU	MESD/EPEEF/EU	The Study intended to assess the quantities of waste containing asbestos has been prepared for each county.	Number	1	2023
A 6.6. Preparation of an analysis determining the required number, locations, and capacities of disposal sites for asbestos-containing construction waste.	EPEEF	MESD	EPEEF	An analysis with the determined number, locations, and capacities of disposal sites for asbestos-containing construction waste has been prepared.	Number	1	2024
A 6.7. Preparation of an estimation of the quantities of generated construction waste, including an action plan for the future development of its management system.	MESD	-	MESD/EPEEF/EU	An estimation of the quantities of generated construction waste has been prepared.	Number	1	2025
A 6.8. Preparation of an analysis on the implementation of the guidelines from Appendix III of the Recommendation on Environmentally Sound Management of Waste	MESD	-	MESD/EPEEF/EU	An analysis on the implementation of the guidelines from Appendix III of the Recommendation on Environmentally Sound Management of Waste [OECD/LEGAL/0329] has been prepared.	Number	1	2024

Measures designed to achieve Goal nr. 2. – Packaging waste, Goal nr. 3. – Waste plastic single-use products, Goal nr. 4. – Construction waste, Goal nr. 5. – ELV, Goal nr. 6. – Waste batteries and accumulators, Goal nr. 7. – Waste electrical and electronic equipment, Goal nr. 8. – Waste tyres and Goal nr. 9. – Other special categories of waste

Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
[OECD/LEGAL/0329].							
<b>Measure nr. 7. Improvement of the packaging waste management system and the establishment of a system for managing single-use plastic waste products and fishing gear containing plastic.</b>							
A 7.1. Measure nr. 1. Activity A 1.2. and Activity 1.4.	-	-	-	-	-	-	2028
A 7.2. Preparation and implementation of pilot projects for the management of waste from cigarette filters	EPEEF	MESD/RSGU/LSGU	EPEEF/MESD/RSGU/LSGU/ EU	Conducted pilot projects for the management of waste from cigarette filters.	Number	6	2028
A 7.3. Organisation of workshops for the private sector on the topic of preparing reports and submitting data to the relevant authorities regarding packaging and packaging waste, single-use plastic waste products, and fishing gear containing plastic (including the preparation of educational materials)	EPEEF	MESD	EPEEF/MESD/EU	Conducted workshops for the private sector on the topic of preparing reports and submitting data to the relevant authorities regarding packaging and packaging waste, single-use plastic waste products, and fishing gear containing plastic (including the preparation of educational materials).	Number	2	2024
<b>Measure nr. 8. Improvement of the system for managing construction waste and waste containing asbestos</b>							
A 8.1. Preparation of guidelines for the selection and disposal of hazardous construction waste	MESD		MESD	Prepared guidelines for the selection and disposal of hazardous construction waste	Number	1	2027

A 8.2. Preparation of guidelines for the application of the criteria for the end-of-waste status for construction waste	MESD		MESD	Prepared guidelines for the application of the criteria for the end-of-waste status for construction waste	Number	1	2026
A 8.3. Construction and equipping of recycling centres for construction waste on the mainland and islands.	MESD		LSGU/PI	Constructed and equipped recycling centres for construction waste on the mainland (30) and on the islands (20)	Number	50	2027

Measure nr. 9. Improvement of the waste management system for end-of-life vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils							
A 9.1. Preparation of a feasibility study for the required capacity intended to process special categories of waste and the improvement of the waste management system for end-of-life vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils.	EPEEF	MESD	EPEEF		Number	1	2028

### 12.3. Measures for the improvement of the hazardous waste management

In order to achieve the **Goal nr. 10.** - Improve the hazardous waste management system, in accordance with the Waste Management Plan of the Republic of Croatia for the period 2017-2022, a project is currently underway for the purpose of conducting a Feasibility Study of the existing and required capacities for the treatment of hazardous waste and a study is being prepared the purpose of which is to identify new locations contaminated with hazardous waste ('hot spots'). As part of this project, a feasibility study is being prepared to define the necessary capacities and methods for the treatment of hazardous waste generated in the Republic of Croatia, as well as the investment amount, funding sources, and other recommendations for the measures and activities necessary to improve the hazardous waste management system. Additionally, within the scope of this project, a study is being conducted aimed at analysing the status of the existing locations contaminated with hazardous waste ('hot spots') (Goal nr. 11 of this Waste Management Plan). The methodology and criteria for identifying new 'hot spots' and potential methods for site remediation will be defined in this study. The study will also outline measures and activities for the identified 'hot spots', along with the required financial resources. The planned completion date for the implementation of this project is in the year 2023.

Measure taken to achieve Goal nr. 10 - Improvement of the hazardous waste management system	
Measure	Measure description
<b>Measure nr. 10. Implementation of the project 'Feasibility Study of Existing and Required Capacities for Hazardous Waste Treatment and Study for the Identification of New Locations Contaminated with Hazardous Waste ('Hot Spots')'</b>	<ul style="list-style-type: none"> <li>- Preparation of a feasibility study that will analyse the existing capacities for hazardous waste treatment and determine the necessary additional capacities and provide recommendations for system improvement;</li> <li>- Preparation of a study intended to identify new locations contaminated with hazardous waste ('hot spots').</li> </ul>

Measure taken to achieve Goal nr. 10 - Improvement of the hazardous waste management system							
Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
<b>Measure nr. 10. Implementation of the project entitled 'Feasibility Study of the Existing and Required Capacities for Hazardous Waste Treatment and Study for the Identification of New Locations Contaminated with Hazardous Waste ('hot spots')'</b>							
Activity 10.1. Preparation of a feasibility study for the necessary capacities for hazardous waste treatment and improvement of the hazardous waste management system	EPEEF	MESD	EPEEF	Completed feasibility study for the necessary capacities for hazardous waste treatment and improvement of the hazardous waste management system	Number	1	2024
Activity 10.2. Preparation of a study to identify new locations contaminated with hazardous waste ('hot spots')	EPEEF	MESD	EPEEF	Preparation of a study to identify new locations contaminated with hazardous waste ('hot spots')	Number	1	2024

#### 12.4. Measures for the remediation of the sites affected by waste disposal

The group of measures and activities defined in this subsection is aimed at achieving the **Goal nr. 11 - Remediate sites contaminated by waste**. By implementing the said measures and activities, the remediation of non-hazardous waste landfills, sites contaminated with hazardous waste ('hot spots'), and locations contaminated due to uncontrolled waste disposal in the environment will be ensured. Measures to prevent waste disposal in the environment will also be implemented.

Measures taken to achieve Goal nr. 11. - Remediate sites contaminated by waste	
Measure	Measure description
<b>Measure nr. 11. Remediation and Closure of Non-Hazardous Waste Landfills</b>	Remediation and Closure of Non-Hazardous Waste Landfills Implementation of the remediation of non-hazardous waste landfills in accordance with the revised Non-Hazardous Waste Landfill Closure Plan, specifying the landfills that will continue to operate until full capacity or the opening of a new disposal facility (Central Waste Management Centre).
<b>Measure nr. 12. Remediation of Sites Contaminated with Hazardous Waste ('hot spots')</b>	Resuming of activities carried out for the purpose of remediation of sites contaminated with hazardous waste, the so-called 'hot spots', as defined in this Waste Management Plan, and the 'hot spots' recently identified through Measure nr. 10 intended to achieve Goal nr. 10 - <i>Improvement of the hazardous waste management system</i> .
<b>Measure nr. 13. Remediation of Sites Contaminated by Waste Discarded in the Environment</b>	Removal of waste discarded in the environment, including speleological sites, and prevention of illegal waste dumping in the environment, including measures taken to prevent repeated dumping on remediated sites. This measure will also contribute to achieving Goal nr. 4 - <i>Construction Waste</i> .

For the purpose of remediation and closure of non-compliant landfills in Croatia, measures for the remediation and closure of landfills in accordance with the revised Non-Hazardous Waste Landfill Closure Plan will be implemented. This plan determines which waste landfills will continue to operate until they reach full capacity or until the opening of the Central Waste Management Centre (Central Waste Management Centre, CWMC).

The activities for the remediation of sites contaminated with hazardous waste, the so-called 'hot spots', will continue, as well as the activities for the removal of waste, including construction waste, from sites contaminated by waste discarded in the environment. Measures to prevent repeated dumping, such as the procurement and installation of equipment at remediated sites (signs, barriers, video surveillance, etc.), which are the responsibility of local government units, will also continue.

Furthermore, the promotion of the application entitled 'Locations of Illegally Dumped Waste' (Cro. abbrev. ELOO) is planned in order to raise the citizens' awareness of the amount of waste being illegally dumped into the environment and to restore the citizens' trust in local government when it comes to waste management.

Measures taken to achieve Goal nr. 11 - Remediate Waste-Contaminated Sites							
Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
<b>Measure nr. 11. Remediation of non-hazardous waste landfills</b>							
A 11.1. Preparation of documentation and remediation work at non-hazardous waste landfills	LSGU	-	LSGU/EPE EF/EU/NR RP	Remediated non-hazardous waste landfills	Number	80	2028
<b>Measure nr. 12. Remediation of Sites Contaminated with Hazardous Waste ('hot spots')</b>							
A 12.1. Preparation of documentation and remediation work for sites contaminated with hazardous waste ('hot spots') as defined in the Waste Management Plan and recently identified 'hot spots' through Measure nr. 10.	Depending on the project	Depending on the project	Depending on the project	Remediated site contaminated with hazardous waste ('hot spot')	Number	8	2028
<b>Measure nr. 13. Remediation of Sites Contaminated by Waste Discarded in the Environment</b>							
A 13.1. Removal of waste from sites contaminated by waste discarded in the environment and measures to prevent repeated disposal, as well as the procurement and installation of equipment at remediated sites contaminated again with discarded waste	LSGU	-	LSGU/EPE EF/EU	Remediated sites contaminated by waste discarded in the environment	Number /year	200	2028
A 13.2. Procurement of technological equipment (surveillance cameras) for a more effective prevention of illegal waste disposal	MESD	LSGU/RSG U	MESD	Purchased technological equipment (surveillance cameras) for a more effective prevention of illegal waste disposal	Number	5	2028
A 13.3. Promotion of the LIDW (Cro.	MESD	-	MESD	Promotional campaigns	Number	4	2026



abbrev. ELOO) application				conducted on the topic of the LIDW application			
---------------------------	--	--	--	--	--	--	--

## 12.5. Measures for the improvement of the waste management information system

The group of measures and activities defined in this subsection is aimed at achieving the **Goal nr. 12. – Improve the information system and the waste management monitoring.** By improving the information system and monitoring the implementation of the provisions set out in the Waste Management Plan, a more efficient waste data monitoring will be provided, and a more comprehensive and reliable data obtained that will facilitate the issuing of waste management reports and the meeting of reporting obligations towards the European Commission, as well as the planning of waste management systems.

Measures taken to achieve Goal nr. 12. – Improve the IT system and waste management monitoring	
Measure	Measure description
<p><b>Measure nr. 14. Development and/or upgrade of applications that are part of the waste management information system</b></p>	<p>Building and/or improving of databases and applications forming an integral part of the MESD's waste management IT system:</p> <ul style="list-style-type: none"> <li>- Electronic Register on Waste Creation and Transport (e-ONTO);</li> <li>- Application of the Waste Management Activity Register;</li> <li>- Application of the Pollutant Emission Register (Cro. abbrev. ROO);</li> <li>- Application for the cross-border waste shipment;</li> <li>- application for Locations of Illegally Dumped Waste (Cro. abbrev. ELOO);</li> <li>- Application for Service Provider Performance Reporting;</li> <li>- Application for landfill operators and monitoring of biodegradable MW disposal;</li> <li>- Waste prevention website (portal) and application for the monitoring of waste prevention projects and activities, waste reuse and educational and information activities;</li> <li>- Register of Extended Producer Responsibility;</li> <li>- Application for data on by-products and the granting of the end-of-waste status;</li> <li>- Application for data on the use of sludge in agriculture and on the biological treatment of waste at the waste generation site</li> <li>- Improving the integration of e-ONTO and PER (Cro. abbrev. ROO)</li> <li>- Application for the assessment of the Waste Management Plan and the Waste Management Act impacts</li> <li>- Common waste management IT platform in the Republic of Croatia</li> </ul> <p>The measure will also contribute to the achievement of Goal nr. 4. – <i>Construction waste</i></p>
<p><b>Measure nr. 15. Development of the EPEEF information system for the preparation and implementation of</b></p>	<p>Development of an information system for the preparation and implementation of projects by the Croatian</p>

projects	Environmental Protection and Energy Efficiency Fund (FZOEU). The information system should be connected to the Ministry of Economy and Sustainable Development (Cro. abbrev. MINGOR) information system, as well as other institutions associated with the EPEEF for the purpose of data control, exchange, and coordination related to specific waste categories and other EPEEF projects.
<b>Measure nr. 16. Development of a plan for monitoring the implementation of the Waste Management Plan</b>	Drafting of a plan that ensures the monitoring of the implementation of measures and activities specified in the Waste Management Plan.

#### **Measure nr. 14. Development and/or upgrade of the applications forming part of the waste management information system**

Reliable data is essential for an efficient planning and monitoring of waste management systems, and therefore indirectly for achieving EU objectives. The measure mandates the development of new applications and the upgrading of the existing ones, enabling better control over waste shipment, including cross-border waste shipment. This will simplify the reporting, monitoring, and data collection processes related to waste, while also eliminating duplicate reporting requirements and reducing the administrative burden on businesses. Furthermore, through the Waste Management Activity Register application, the access to information on authorised waste management companies will be facilitated, thus accelerating and modernising the exchange of information between relevant authorities in the process of issuing waste management licences and approvals. Additionally, it will establish an automated monitoring of the permissible capacities for the disposal of biodegradable municipal waste to ensure that the targeted value prescribed by law is not exceeded. The establishment of a Register of Special categories of waste is necessary for the implementation and monitoring of the extended producer responsibility obligations. A separate application must be developed for the purpose of assessing the WMA and the WMP impacts.

The data on construction waste poses a particular problem for small producers of construction waste and waste processors, as it can result in incomplete information about the generation and treatment of construction waste. In order to avoid incomplete information about construction waste, this measure includes the implementation of the integration of the Electronic Register on Waste Creation and Transport (e-ONTO) and the Environmental pollution register (ROO) applications. This will standardise the management of data on the reuse and recycling of construction waste, as well as data on other construction waste processing methods. The sharing of common data between the two applications will help reduce data input errors and facilitate the cross-checking of data on all types of waste. When implementing this activity, the deficiencies identified in the project entitled 'The Improvement of the Construction and Extractive Waste Data Flow in the Republic of Croatia' (2017, CAEN, University of Zagreb, Faculty of Civil Engineering).

Data analysis from the Locations of Illegally Dumped Waste (Cro. abbrev. ELOO) application has confirmed the existence of a large number of illegal dumping sites for construction and municipal waste in the Republic of Croatia. It is necessary to improve the existing application by enhancing the user interface of the current mobile application in order to help the users report the locations of illegal dumping sites.

Within the applications of the waste management information system that have a spatial component, it is essential to enable data exchange with information systems related to spatial data infrastructure.

#### **Measure nr. 15. Development of the EPEEF information system for the preparation and implementation of projects**

This measure will establish an efficient system in order to improve the business processes of the EPEEF. It includes the providing of effective support to the EPEEF internal processes, as well as facilitating communication with information systems of the MESD and other institutions for the purpose of integrating the business processes carried out by the EPEEF. Additionally, it will simplify and modernise communication with taxpayers and users through a public website.

**Measure nr. 16. Development of a plan for monitoring the implementation of the Waste Management Plan**

A plan for the monitoring of the implementation of measures and activities defined in the WMP is to be developed. The plan will outline the method for the monitoring of the progress of each defined measure and activity, including the procedure for collecting relevant data, the assessment of the implementation status and, where applicable, the impact of implementation. Additionally, a committee composed of members from relevant authorities and institutions is to be established. This committee will be responsible to systematically and continuously monitor the implementation of the WMP, coordinating and aligning the activities of the implementers of the WMP to ensure that waste management measures and activities are executed in accordance with the timeframes stipulated by the WMP.

Measures taken to achieve Goal nr. 12. – Improve the IT system and waste management monitoring							
Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
<b>Measure nr. 14. Development and/or upgrade of the applications forming part of the waste management information system</b>							
A 14.1. Establishment of the Extended Producer Responsibility Register	EPEEF	MESD	EPEEF	Active Extended Producer Responsibility Register	Number	1	2023
A 14.2. Establishment of the Public Service Records Application	MESD	-	MESD	Functional Public Service Records Application	Number	1	2024
A 14.3. Upgrade of the Waste Prevention Website	MESD	-	MESD	Upgraded and functional Waste Prevention Website	Number	1	2025
A 14.4. Establishment of the By-Products and End-of-Waste Status Application	MESD	-	MESD	Functional Application for By-Products and End-of-Waste Status	Number	1	2025
A 14.5. Establishment of the Agricultural Sludge Utilisation and On-Site Biological Waste Treatment Application	MESD	-	MESD	Functional Application for Agricultural Sludge Utilisation and On-Site Biological Waste Treatment	Number	1	2025
A 14.6. Upgrade of the Environmental pollution register	MESD	-	MESD	Upgraded and functional	Number	1	2027

Measures taken to achieve Goal nr. 12. – Improve the IT system and waste management monitoring							
Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
				Environmental Pollution Register			
A 14.7. Establishment and enhancement of the central digital application for the conducting of procedures related to cross-border waste shipment	MESD	-	MESD/EU	Functional central digital application for the conducting of procedures related to cross-border waste shipment	Number	1	2027
A 14.8. Improvement of the electronic Waste Generation and Flow Records (e-ONTO)	MESD	-	MESD	Improved and fully functional electronic Waste Generation and Flow Records (e-ONTO)	Number	1	2028
A 14.9. Upgrade of the Waste Management Activity Register	MESD	-	MESD	Upgraded and functional Waste Management Activity Register	Number	1	2028
A 14.10. Building e-ONTO and ROO integration for the purpose of gathering data on the quantities of the collected and processed waste, including construction waste	MESD	-	MESD	Upgraded and functional e-ONTO and ROO integration for the purpose of gathering data on the quantities of the collected and processed waste, including construction waste	Number	1	2024
14.11. Upgrade of the ELOO application designed for the mapping of illegal waste landfills	MESD	LSGU	MESD	Improved and functional ELOO application with mobile device functions for an easier anonymous reporting of illegal waste dumping	Number	1	2024
A 14.12. Improvement of the integrated IT waste management platform in Croatia, as part of the national environmental protection platform	MESD	-	MESD	Improved and functional integrated IT waste management platform in Croatia, as part of the national environmental protection platform	Number	1	2028
A 14.13. Developing an application for the WMP and WMA impact assessment	MESD	-	MESD	Functional application for the WMP and WMA impact assessment	Number	1	2024

Measures taken to achieve Goal nr. 12. – Improve the IT system and waste management monitoring							
Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
<b>Measure nr. 15. Development of the EPEEF Information System for Project Preparation and Implementation</b>							
A 15.1. Development of a functional uniform information system of the EPEEF for project preparation and implementation	EPEEF	-	EPEEF	Functional uniform information system of the EPEEF for project preparation and implementation	Number	1	2024
<b>Measure nr. 16. Development of a plan for monitoring the implementation of the Waste Management Plan</b>							
A 16.1. Development of the WMP implementation monitoring	MESD	-	MESD	Developed WMP implementation monitoring plan	Number	1	2023
A 16.2. Establishment of the WMP implementation monitoring Committee	MESD	-	MESD	Established WMP implementation monitoring Committee	Number	1	2023

## 12.6. Measures for the improvement of waste management supervision

The measure and activities defined in this subchapter are aimed at achieving the **Goal nr. 13. – Improve waste management supervision** by providing education for relevant stakeholders in the field of waste management supervision.

Measures taken to Achieve Goal nr. 13. - Improve waste management supervision	
Measure	Measure description
<b>Measure nr. 17. Training of Participants Involved in Waste Management Supervision</b>	Implementation of training activities for employees of municipal inspection services and environmental protection inspectors.

Measures taken to Achieve Goal nr. 13. - Improve waste management supervision							
Activity (A)	Holder	Co-holder	Potential funding sources	Performance indicator			Implementation deadline
				Name	UoM	Target value	
<b>Measure nr. 17. Education of participants involved in waste management supervision</b>							
A 17.1. Implementation of training for participants involved in waste management supervision	MESD	SIRC / LSGU / RSGUJP(R)LS	MESD / SIRC	Conducted training	Number	6	2028

## 13. FINANCIAL RESOURCES FOR THE IMPLEMENTATION OF THE WMP MEASURES

### 13.1. Potential funding sources

The financing of measures outlined in the WMP can come from various sources. These include public sources such as the state budget, budgets of local self-government units (LSGUs) and public companies (RSGUs), the Environmental Protection and Energy Efficiency Fund (FZOEU), and EU funds. In addition to public sources, potential financial sources can also include bank loans and private investments (Table 67).

**Table 67.** Potential funding sources

Public funding	State budget
	LSGU and RSGU budgets
	EPEEF
	EU funds (National Recovery and Resilience Plan 2021-2026, Competitiveness and Cohesion Operational Programme 2014-2020, Competitiveness and Cohesion Programme 2021-2027, Modernisation Fund, etc.)
Bank loans	World Bank, European Bank for Reconstruction and Development, European Investment Bank, etc.
Private investments	Private Investments In the construction of civic amenity sites (including those for construction waste), sorting facilities, recycling plants, composting facilities, reuse centres, sites contaminated with hazardous waste ('hot spots')
	Public and Private Partnerships (PPPs) if applicable

Considering the limitations of the state budget and the budgets of local self-government units (LSGUs) and public companies (RSGUs), EU funds are anticipated to serve as a significant source of financing for the measures outlined in the WMP. These funds will be accessible through the National Recovery and Resilience Plan 2021-2026 (NRRP 2021-2026), the Operational Programme Competitiveness and Cohesion 2014-2020 (OPCC 2014-2020), and the Competitiveness and Cohesion Programme 2021-2027 (CCP 2021-2027).

In the case of funds from the OPCC 2014-2020, the eligibility of expenditures concludes at the end of 2023, meaning these funds will only be used for previously approved projects that are still in progress. The available EU funding through OPCC 2014-2020 amounted to 276,039,587 EUR.

Through the NRRP 2021-2026, Croatia has access to non-repayable funds and loans from the Recovery and Resilience Facility under the 'NextGenerationEU' instrument, totalling 672 billion euros. The framework of the Recovery and Resilience Facility requires that at least 20% of the funds from national recovery and resilience plans be directed towards digital transformation through investments and reforms, while a minimum of 37 % should be allocated to green transition and climate action. In line with these requirements, the Croatian NRRP 2021-2026 consists of five components (Economy, Public Administration, Justice and State Property, Education, Science and Research, Labour Market and Social Welfare, Health) and one initiative (Building Renovation).

Within the Economy component, which receives 54 % of all funds, representing over 26 billion Croatian kunas, there are six sub-components, with sub-component C1.3 'Water Management and Waste Management' and Reform C1.3 R2 'Implementation of projects for sustainable waste

management' serving as a potential source of funding for the implementation of measures outlined in the WMP.

Within the framework of Reform C1.3 R2 'Implementation of projects for sustainable waste management', funding of the activities involving the construction of infrastructure for separate collection, sorting, and recovery of recyclable waste, as well as the remediation of closed landfills and locations contaminated with hazardous waste, is to be allocated at 165,903,511 EUR (1,250 million HRK) by June 2026. Possibilities for cross-border and multinational projects are not anticipated.

On November 9th, 2022, the European Commission approved the Competitiveness and Cohesion Programme 2021-2027 for Croatia. With this approval, the foundation for using 5.203 billion euros has been established, including 4.020 billion euros from the European Regional Development Fund (ERDF) and 1.182 billion euros from the Cohesion Fund (CF). These funds will be implemented through six priorities designed to promote balanced development in Croatia. For projects in the waste management sector, non-repayable funds totalling 166.944.804 euros are available.

Activities eligible for financing from this source should contribute to increased waste separation, separate waste collection, recycling (glass, paper and cardboard, metal, plastic, wood, and biodegradable waste), and reduced waste disposal.

Investments planned under the Competitiveness and Cohesion Programme 2021-2027 will complement the investments through the National Recovery and Resilience Plan 2021-2026. Within the National Recovery and Resilience Plan 2021-2026, landfills that are prepared for remediation activities at the time of the publication of the calls for tenders will be addressed. Only after the allocation of funds from the National Recovery and Resilience Plan 2021-2026 will a call for landfill remediation under the Competitiveness and Cohesion Programme 2021-2027 be published, and applicants whose landfill remediation projects have previously been approved for EU co-financing under the National Recovery and Resilience Plan 2021-2026, as well as earlier operational programmes, will not be able to apply.

When financing the measures from the Waste Management Plan, the provisions of Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund (JTF) (SL L 231., 30.6.2021) shall be taken into account. This regulation specifies that waste incineration should not receive support, considering that this activity belongs to the lower part of the waste hierarchy in a circular economy. The JTF supports only investment activities related to the remediation and decontamination of industrial sites, land restoration, and, if necessary, green infrastructure and repurposing projects, taking into account the 'polluter pays principle' and investments in improving the circular economy, including waste prevention, reduction, resource efficiency, reuse, repair, and recycling.

Furthermore, Regulation (EU) 2021/1058 of the European Parliament and of the Council of 24 June 2021 on the European Regional Development Fund and the Cohesion Fund (OG L 231, 30.6.2021) specifies that the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) do not support the following:

- Investments in waste disposal in landfills, except:
  - I. in the outermost regions, only in duly justified cases, or
  - II. for investments in decommissioning, conversion, or securing of existing landfills, provided that such investments do not increase their capacity.
- Investments in increasing the capacity of residual waste treatment facilities, except:



- I. in the outermost regions, only in duly justified cases, or
- II. for investments in technologies for material recovery from residual waste for circular economy purposes.

However, in accordance with Article 2 of Regulation (EU) 2022/2039, if an operation with a total cost exceeding 1 million EUR was selected for support and commenced before 29 June 2022, in accordance with Regulation (EU) 1303/2013 and specific regulations for individual funds (EU) 1301/2013, (EU) 1304/2013, (EU) 1300/2013, (EU) 1299/2013, and (EU) 508/2014 of the European Parliament and of the Council, such an operation is considered eligible for support under Regulation (EU) 2021/2039 and the relevant regulations for individual funds in the programming period 2021-2027.

The estimated costs specified in the WMP do not encompass operational and maintenance expenses; these will be determined on a project-specific basis for each project.

## 13.2. Assessment of financial allocations necessary for the implementation of WMP measures

Indicative funding ratios by source and year are provided in Table 68, and the estimation of the financial resources required for the implementation of WMP measures is presented in Table 69.

**Table 68.** Indicative ratios of funding by financial resource and year

		State budget	EU funds	LSGU	EPEEF	PPP	CF	Private investments	Total
2023	HRK	32,148,672	581,062,477	235,797,981	238,801,635	-	124,257	237,407,764	1,325,342,786
	EUR	4,266,862	77,120,244	31,295,770	31,694,424	-	16,492	31,509,425	175,903,217
2024	HRK	12,192,027	547,994,040	252,906,733	290,705,030	-	248,514	558,199,668	1,662,246,012
	EUR	1,618,160	72,731,308	33,566,492	38,583,188	-	32,983	74,085,828	220,617,959
2025	HRK	6,895,682	668,318,780	306,897,725	322,011,117	-	248,514	783,897,807	2,088,269,625
	EUR	915,214	88,701,145	40,732,328	42,738,220	-	32,983	104,041,119	277,161,009
2026	HRK	5,176,902	878,960,584	394,234,789	408,579,147	-	248,514	948,052,896	2,635,252,832
	EUR	687,093	116,658,117	52,323,948	54,227,772	-	32,983	125,828,243	349,758,156
2027	HRK	5,482,319	929,094,995	443,850,788	513,973,302	567,000,000	248,514	1,470,987,057	3,930,636,975
	EUR	727,629	123,312,097	58,909,123	68,215,980	75,253,832	32,983	195,233,533	521,685,177
2028	HRK	4,410,332	930,536,091	491,112,282	570,873,152	567,000,000	124,257	2,227,474,357	4,791,530,471
	EUR	585,352	123,503,363	65,181,801	75,767,888	75,253,832	16,492	295,636,652	635,945,380
Total:	HRK	66,305,933	4,535,966,967	2,124,800,298	2,344,943,383	1,134,000,000	1,242,568	6,226,019,549	16,433,278,698
	EUR	8,800,310	602,026,274	282,009,462	311,227,472	150,507,665	164,917	826,334,800	2,181,070,900

**Table 69.** Assessment of financial allocations necessary for the implementation of WMP measures

WMP / WPP	Measure nr.	Measure name	Estimate of the necessary funds (HRK)	Estimate of the necessary funds (EUR)
WMP	Measure 1.	Improvement of the system for separate collection of municipal waste and infrastructure (capacity and technology) for recycling and other methods of the recovery of municipal waste	6,874,131,280	912,354,009

WMP	Measure 2.	Raising awareness, informing and educating the public on waste management and products	221,300,000	29,371,558
WMP	Measure 3.	Establishing the MW composition at national level	5,625,000	746,566
WMP	Measure 4.	Application of the landfill tax	0	0
WMP	Measure 5.	Construction of waste management centres	5,488,090,636	<b>728,394,802</b>
WMP	Measure 6.	Analysis of the efficiency of the special waste management system with improvement proposals	6,200,000	822,881
WMP	Measure 7.	Improvement of the packaging waste management system and establishment of a system for managing single-use plastic products and fishing gear containing plastic	14,300,000	1,897,936
WMP	Measure 8.	Improvement of the construction waste and asbestos-containing waste management system	174,800,400	23,200,000
WMP	Measure 9.	Improvement of the ELV vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils management system	2,000,000	265,446
WMP	Measure 10.	Implementation of the project entitled 'The Feasibility Study of the Existing and the Required Capacities for Hazardous Waste Treatment and a Study for Identifying New Locations Contaminated with Hazardous Waste ('Hot Spots')'	1,723,625	228,764
WMP	Measure 11.	Remediation and closure of non-hazardous waste landfills	1,331,168,700	176,676,448
WMP	Measure 12.	Remediation of sites contaminated with hazardous waste ('Hot Spots')	1,421,806,803	188,706,192
WMP	Measure 13.	Remediation of the sites contaminated by waste discarded in the environment	639,904,500	84,929,922
WMP	Measure 14.	Development and/or upgrade of applications within the waste management IT system	19,024,150	2,524,939
WMP	Measure 15.	Development of the EPEEF information system for the preparation and implementation of projects	15,000,000	1,990,842
WMP	Measure 16.	Development of a plan for monitoring the implementation of the Waste Management Plan	300,000	39,817
WMP	Measure 17.	Training of the participants in the waste management supervision	0	0
WPP	Measure 1.	Strengthening policy frameworks for the transition to a circular economy in the construction sector	2,260,350	300,000
WPP	Measure 2.	Enhancing policy frameworks designed to prevent food waste	0	0
WPP	Measure 3.	Improving the data tracking system for organic waste	1,900,000	252,173
WPP	Measure 4.	Promoting home composting	107,500,000	14,267,702
WPP	Measure 5.	Encouraging the reduction of single-use plastic product consumption	35,953,450	4,771,843
WPP	Measure 6.	Promoting the purchase of environmentally friendly products and services	2,682,245	355,995
WPP	Measure 7.	Raising awareness, providing education on waste prevention, and exchanging best practices	24,000,000	3,185,347
WPP	Measure 8.	Promoting eco-design (systematic integration of environmental aspects into product design to enhance the product's environmental performance throughout its life cycle)	18,304,140	2,429,377
WPP	Measure 9.	Encouraging certified environmental management systems, including EMAS and ISO 14001	452,070	60,000
WPP	Measure 10.	Developing a Waste Prevention Plan	0	0
WPP	Measure 11.	Fostering product exchange and reuse of scrap products	24,851,350	3,298,341
<b>Total:</b>			<b>16,433,278,699</b>	<b>2,181,070,900</b>

## **14. TIME SCHEDULE OF THE IMPLEMENTATION OF THE WMP**

**Table 70. Time schedule of the implementation of the Waste Management Plan**

Activities and measures	Activity holder	Activity co-holder	Potential funding sources	Time schedule/indicators						Indicator name/(UoM)	
				2023	2024	2025	2026	2027	2028		
<b>MEASURES AND ACTIVITIES AIMED AT ACHIEVING GOAL NR. 1. WMP – MSW</b>											
<b>WMP Measure 1.</b>	<b>Improvement of the system for separate collection of municipal waste and infrastructure (capacity and technology) for recycling and other methods of the recovery of municipal waste</b>										
WMP A 1.1.	Procurement of equipment, vehicles, and vessels for the separate collection of paper, cardboard, metal, plastic, glass, textiles, and bio-waste	LSGU	RSGU/MESD	LSGU/EPEEF/EU/PI	28	44	56	83	139	206	Local authorities (LSGUs) that have established a separate collection system for paper, cardboard, metal, plastic, glass, textiles, and organic waste (number of LSGUs)
WMP A 1.2.	Construction and equipping of new facilities for the sorting of separately collected paper, cardboard, metal, glass, plastic, and other waste (sorting facility) and/or increasing the capacity and technological improvement of the existing facilities	LSGU	RSGU	LSGU/EU/PI	29,344	46,950	58,688	88,031	146,719	217,144	Constructed or upgraded and fully operational sorting facilities (capacity, t/year)
WMP A 1.3.	Construction and equipping of recycling centres and the procurement of mobile recycling centres	LSGU	-	LSGU/EU/PI	5	8	10	15	25	37	Constructed and equipped recycling centres (number of recycling centres)
WMP A 1.4.	Construction and equipping of new facilities and/or increasing the capacity and technological improvement of the existing recycling facilities	PI	-	PI/EU	5	10	15	15	20	35	Increase in the percentage of recycled waste at the national level (achieving national targets, %)
WMP A.1.5.	Construction and equipping of new facilities for the biological treatment of separately collected bio-waste and/or increasing the capacity and technological improvement of the existing facilities	LSGU	RSGU/MESD	LSGU/EU/EU/PI	12,493	19,988	24,986	37,478	62,464	92,446	Constructed facilities for the biological treatment of separately collected organic waste (capacity, t/year)
<b>WMP Measure 2.</b>	<b>Raising awareness, informing and educating the public on waste management and products</b>										
WMP A 2.1.	Implementation of national campaigns and other waste management awareness-raising activities in Croatia	EPEEF	MESD	EPEEF/EU	1	1	1	1	1	1	Conducted information and education activities (number)
WMP A 2.2.	Implementation of waste management information activities at the local authority/LSGU level	LSGU	-	LSGU	556	556	556	556	556	556	Held public forums; Developed and distributed waste management publications (556 per year)
WMP A 2.3.	Organisation of events designed to enhance collaboration and build the capacity of local and regional authority / self-government	MESD	RSGU	MESD	1	1	1	2	1	1	Held professional roundtable discussions (number)
WMP A 2.4.	Providing support to the implementation of the 'key implementation elements' in waste management facilities	MESD	-	MESD		1					Published guidelines and information on 'key implementation elements' on the MESD's official website
WMP A 2.5.	Application of technical guidelines for environmentally sound waste management	MESD	-	MESD		1					Published information on the application of technical guidelines for environmentally sound waste management on the MESD's official website
<b>WMP Measure 3.</b>	<b>Determining the national MW composition</b>										
WMP A 3.1.	Sorting and analysing of the MW composition by applying the regional principle for the purpose of determining the national MW composition	MESD	EPEEF	EPEEF		1					Identified national MW composition
<b>WMP Measure 4.</b>	<b>Introduction of the landfill tax</b>										
WMP A 4.1.	Application of the landfill tax	MESD	Landfill operator, SIRC	-			1				Collection of the landfill tax
<b>WMP Measure 5.</b>	<b>Construction of WMCs</b>										
WMP A 5.1.	Construction of Biljane Donje WMC	ZC and part of LSC	MESD	RSGU/EPEEF/EU	1						Biljane Donje WMC
WMP A 5.2.	Construction of Lučino razdolje WMC for the processing of up to 40,000 t of MMW per year.	DNC	MESD	RSGU/EPEEF/EU				1			Lučino razdolje WMC
WMP A 5.3.	Construction of Lečevica WMC for the processing of up to 110,000 t of MMW per year.	SDC	MESD	RSGU/EPEEF/EU						1	Lečevica WMC
WMP A 5.4.	Construction of Piškornica WMC *) for the processing of up to 110,000 t of MMW per year.	KZC, VC, KKC, MC, BBC	MESD	RSGU/EPEEF/EU						1	Piškornica WMC
WMP A 5.5.	Construction of Babina WMC for the processing of up to 30,000 t of MMW per year.	KC, part of LSC, part of SMC	MESD	RSGU/EPEEF/EU				1			Babina gora WMC
WMP A 5.6.	Project preparation and construction of Šagulje WMC for the processing of up to 55,000 t of MMW per year.	PSC, SBPC, part of SMC and VPC	MESD	RSGU/EPEEF/EU						1	Šagulje WMC
WMP A 5.7.	Project preparation and construction of Orlovnjak WMC for the processing of up to 60,000 t of MMW per year.	OBC and VSC	MESD	RSGU/EPEEF/EU						1	Orlovnjak WMC
WMP A 5.8.	Project preparation and construction of Zagreb WMC for the processing of up to 180,000 t of MMW per year.	City of Zagreb and ZC	MESD	RSGU/EPEEF/EU						1	Zagreb WMC
<b>MEASURES AND ACTIVITIES aimed at achieving Goal nr. 2. WMP – Packaging waste, Goal nr. 3. WMP- Waste single-use plastic products, Goal nr. 4. WMP Construction waste, Goal nr. 5. WMP – ELVs, Goal nr. 6. WMP – Waste batteries and accumulators, Goal nr. 7. WMP – WEEE, Goal nr. 8. WMP – waste tyres and Goal nr. 9. WMP – Other special categories of waste</b>											
<b>WMP Measure 6.</b>	<b>Analysis of the efficiency of the special waste management system with improvement proposals</b>										

<b>WMP A 6.1.</b>	Preparation of analyses and action plans for the future development of the existing waste management systems within the extended producer responsibility system, including an action plan for the future development of waste management for these categories	<b>EPEEF</b>	MESD	EPEEF/EU		1						Prepared analyses and action plans for the future development of the existing waste management systems within the extended producer responsibility system, including an action plan for the future development of waste management for these categories
<b>WMP A 6.2.</b>	Preparation of the analysis of the medical waste management system	<b>MESD</b>	MHSW	MESD		1						Prepared analysis of the medical waste management system
<b>WMP A 6.3.</b>	Preparation of the analysis of the single-use plastic products waste management system	<b>EPEEF</b>	MESD	EPEEF	1							Prepared analysis of the single-use plastic products waste management system
<b>WMP A 6.4.</b>	Preparation of a study designed to assess the amount of waste originating from fishing gear containing plastic and the methods of waste management	<b>EPEEF</b>	MESD	EPEEF /EU	1							Prepared study designed to assess the amount of waste originating from fishing gear containing plastic and the methods of waste management
<b>WMP A 6.5.</b>	Preparation of a study designed to assess the amount of asbestos-containing waste by county	<b>EPEEF</b>	MESD /RSGU/LSGU	EPEEF /EU	1							Prepared study designed to assess the amount of asbestos-containing waste by county
<b>WMP A 6.6.</b>	Preparation of an analysis of the required number, locations, and capacities of disposal sites for asbestos-containing construction waste	<b>EPEEF</b>	MESD	EPEEF		1						Prepared analysis of the required number, locations, and capacities of disposal sites for asbestos-containing construction waste
<b>WMP A 6.7.</b>	Preparation of assessments of the amount of generated construction waste, including an action plan for the future development of waste management for this category	<b>MESD</b>	-	MESD / EPEEF /EU		1	1					Prepared assessments of the amount of generated construction waste, including an action plan for the future development of waste management for this category
<b>WMP A 6.8.</b>	Preparation of an analysis on the implementation of guidelines from Appendix III of the Recommendation on Environmentally Sound Management of Waste [OECD/LEGAL/0329]	<b>MESD</b>	-	MESD / EPEEF /EU		1						Prepared analysis on the implementation of guidelines from Appendix III of the Recommendation on Environmentally Sound Management of Waste [OECD/LEGAL/0329]
<b>WMP Measure 7.</b>	<b>Improvement of the packaging waste management system and establishment of a system for managing single-use plastic products and fishing gear containing plastic</b>											
<b>WMP A 7.1.</b>	Measure 1. Activity A 1.2. and Activity 1.4.	-	-	-								-
<b>WMP A 7.2.</b>	Preparation and implementation of pilot projects for cigarette filter waste management	<b>EPEEF</b>	MESD /RSGU/LSGU	EPEEF /MESD/RSGU/LSGU/ EU							6	Implemented pilot projects for managing waste from cigarette filters (number)
<b>WMP A 7.3.</b>	Organising workshops for the private sector on the topic of preparing reports and submitting data to relevant authorities on packaging and packaging waste, waste single-use plastic products, and plastic-containing fishing gear (including the preparation of educational materials)	<b>EPEEF</b>	MESD	EPEEF / MESD /EU		2						Conducted workshops for the private sector on the preparation of reports and submission of data to competent authorities regarding packaging and packaging waste, single-use plastic products, and fishing gear containing plastic (including the preparation of educational materials) (number)
<b>WMP Measure 8.</b>	<b>Improvement of the construction waste and asbestos-containing waste management system</b>											
<b>WMP A 8.1.</b>	Drafting of guidelines for the selection and separation of hazardous construction waste	<b>MESD</b>		MESD							1	Drafted guidelines for the selection and separation of hazardous construction waste
<b>WMP A 8.2.</b>	Drafting of guidelines for the application of criteria for the end-of-waste status for construction waste	<b>MESD</b>		MESD						1		Drafted Guidelines for the application of criteria for the end-of-waste status for construction waste
<b>WMP A 8.3.</b>	Construction and equipping of recycling centres for construction waste on the mainland and islands	<b>MESD</b>		LSGU /PI	6	10	10	10	14			Constructed and equipped 30 recycling centres for construction waste on the mainland and 20 on islands
<b>WMP Measure 9.</b>	<b>Improvement of the ELV vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils</b>											
<b>WMP A 9.1.</b>	Drafting of a feasibility study for the required capacities for processing special categories of waste and improvement of the waste management system for ELV vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils	<b>EPEEF</b>	MESD	EPEEF							1	Drafted feasibility study for the required capacities for processing special categories of waste and improvement of the waste management system for ELV vehicles, waste batteries and accumulators, waste electrical and electronic equipment, waste tyres, and waste oils
<b>MEASURES AND ACTIVITIES AIMED AT ACHIEVING Goal nr. 10 of the WMP - Improve the hazardous waste management system</b>												
<b>WMP Measure 10.</b>	<b>Implementation of the project entitled 'The Feasibility study of the existing and the required capacities for the treatment of hazardous waste and the study aimed at identifying new locations contaminated with hazardous waste ('hot spots')'.</b>											
<b>WMP A 10.1.</b>	Drafting of the feasibility study for the required capacities for the processing hazardous waste and improvement of the hazardous waste management system	<b>EPEEF</b>	MESD	EPEEF		1						Drafted feasibility study for the required capacities for the processing hazardous waste and improvement of the hazardous waste management system
<b>WMP A 10.2.</b>	Preparation of the study designed to identify new locations contaminated with hazardous waste ('hot spots')	<b>EPEEF</b>	MESD	EPEEF		1						Preparation of the study designed to identify new locations contaminated with hazardous waste ('hot spots')
<b>MEASURES AND ACTIVITIES AIMED AT ACHIEVING Goal nr. 11 of the WMP - Remediate locations contaminated with waste</b>												
<b>WMP Measure 11.</b>	<b>Remediation and closing of the non-hazardous waste landfill</b>											
<b>WMP A 11.1.</b>	Documentation preparation and remediation works at the non-hazardous waste landfill	<b>LSGU</b>	-	LSGU/EPEEF/EU/PI	8	8	12	12	16	24		Remediated and closed non-hazardous waste landfills (number)
<b>WMP Measure 12.</b>	<b>Remediation of locations contaminated with hazardous waste ('hot spots')</b>											
<b>WMP A 12.1.</b>	Documentation preparation and remediation works for locations contaminated with hazardous waste ('hot spots') as defined by the WMP and newly identified 'hot spot' sites through Measure 12.		Depending on the project								8	Remediated site contaminated with hazardous waste ('hot spot') (8 'hot spot' sites)
<b>WMP Measure 13.</b>	<b>Remediation of locations contaminated with waste discarded to the environment</b>											
<b>WMP A 13.1.</b>	Removal of waste from illegally discarded waste sites and measures to prevent re-dumping, as well as the procurement and installation of equipment at remediated waste disposal sites	<b>LSGU</b>	-	LSGU/EPEEF/EU	33	33	33	33	33	35		Remediated sites contaminated with illegally dumped waste; Equipment installed (surveillance cameras, warning signs, etc.) at remediated sites contaminated with illegally dumped waste. (number, a total of 200)

WMP A 13.2.	Procurement of technological equipment (surveillance cameras) INTENDED to enhance the prevention of illegal waste dumping	MESD	LSGU/RSGU	MESD	1	1	1	1	1	1	Procured technological equipment (surveillance cameras) for A more efficient prevention of illegal waste dumping
WMP A 13.3.	Promotion of the LIDW (ELOO) application	MESD	-	MESD	1	1	1	1			Conducted promotional campaigns on the topic of the LIDW (ELOO) application (number 4)
<b>MEASURES AND ACTIVITIES TAKEN TO ACHIEVE GOAL NR. 12. WMP – Improve the IT system and waste management monitoring</b>											
WMP Measure 14.	<b>Development and/or upgrade of the applications forming part of the waste management IT system</b>										
WMP A 14.1.	Establishment of the Extended Producer Responsibility Register	EPEEF	MESD	EPEEF	1						Functional Register of producers with extended responsibility
WMP A 14.2.	Establishment of the Public Service Record Application	MESD	-	MESD		1					Functional Public Service Records application
WMP A 14.3.	Upgrading the Waste prevention website	MESD	-	MESD			1				Upgraded and functional Waste Prevention Website
WMP A 14.4.	Development of an application for by-products and end-of-waste status	MESD	-	MESD			1				Functional application for by-products and the end-of-waste status
WMP A 14.5.	Development of an application for the use of sludge in agriculture and on-site waste treatment	MESD	-	MESD			1				Functional application for the use of sludge in agriculture and on-site biological waste treatment
WMP A 14.6.	Upgrading the Environmental pollution register (ROO)	MESD	-	MESD					1		Upgraded and functional Environmental pollution register
WMP A 14.7.	Establishment and upgrading of a central digital application for cross-border waste management procedures	MESD		MESD/EU					1		Functional central digital application for cross-border waste management procedures
WMP A 14.8.	Enhancement of the Electronic Register on Waste Creation and Transport (e-ONTO)	MESD	-	MESD						1	Improved and functional Waste Generation and Movement e-Register (e-ONTO)
WMP A 14.9.	Upgrade of the Waste Management Activity Register	MESD	-	MESD						1	Upgraded and functional Waste Management Activity Register
WMP A 14.10.	Enhancing the integration of EWFR (e-ONTO) and PER (ROO) for data collection on the quantities of collected and processed waste, including construction waste	MESD		MESD		1					Enhanced and functional integration of Waste Generation and Movement e-Register and Environmental pollution register for the purpose of collecting data on the quantities of collected and treated waste, including construction waste
WMP A 14.11.	Improvement of the LIDW (ELOO) application for the recording the locations of dumped waste	MESD	LSGU	MESD		1					Improved and functional LIDW (ELOO) application with mobile device compatibility for easier anonymous reporting of illegal waste dumping
WMP A 14.12.	Enhancement of the shared waste management IT platform in Croatia, as part of the national environmental protection platform	MESD	-	MESD						1	Enhanced and functional joint waste management IT platform in Croatia, as part of the national environmental protection platform
WMP A 14.13.	Development of an application for assessing the impact of Integrated Waste Management Act and the Waste Management Plan	MESD	-	MESD		1					Functional application for assessing the impact of Integrated Waste Management Act and the Waste Management Plan
WMP Measure 15.	<b>Development of the EPEEF IT system for project preparation and implementation</b>										
WMP A 15.1.	Establishment of a functional integrated EPEEF IT system for project preparation and development	EPEEF	-	EPEEF		1					Functional integrated EPEEF IT system for project preparation and development
WMP Measure 16.	<b>Development of the WMP implementation monitoring plan</b>										
WMP A 16.1.	Develop a plan for the monitoring of the implementation of the Waste Management Plan (WMP)	MESD	-	MESD	1						A developed plan for the monitoring of the implementation of the Waste Management Plan (WMP)
WMP A 16.2.	Establishment of the Commission for the Monitoring the Implementation of the WMP	MESD	-	MESD	1						Established Commission for the Monitoring the Implementation of the WMP
<b>MEASURES AND ACTIVITIES TAKEN TO ACHIEVE Goal nr. 13. WMP – Improve waste management supervision</b>											
WMP Measure 17.	<b>Measure 19. Training of participants in the waste management supervision</b>										
WMP A 17.1.	Conducting of the training of participants in the waste management supervision	MESD	SIRC / LSGU / RSGU	-	1	1	1	1	1	1	Conducted training (number)

\*) Piškornica WMC will be built in such a way as to include the Koprivnica-Križevci County, the Krapina-Zagorje County, the Međimurje County and the Varaždin County in the first phase, and the Bjelovar-Bilogora County in the second phase, in line with the objectives of increasing the separately collected waste collection rate.

## 15. WASTE PREVENTION PROGRAMME

### 15.1. Introduction

The increasing global demand for products is exerting greater pressure on natural resources, significantly contributing to the acceleration of climate change. As a result, the rising volume of waste is becoming an increasingly prominent issue. The limitations of the existing resources (raw materials) and the adverse environmental impacts resulting from their consumption require the improvement of current models and the development of new ones for a more efficient and sustainable utilisation.

One of the fundamental objectives of the EU is to continually promote the enhancement of the economic system in terms of a more efficient resource and energy utilisation, along with extending the lifespan of materials and products. The main aim of the entire economic system is to minimise waste generation, not only within the manufacturing processes but throughout the entire product lifecycle and its components.

The transition to a circular economy requires changes to be made throughout the value chain, including an efficient resource management, product design, new business and market models, innovative waste-to-resource conversion methods, and shifts in consumer behaviour. This entails a complete transformation of the existing economic system, which is already underway, as well as innovations in organisation, society, financing methods, and policies.

Sustainable consumption, embodied in the UN's sustainable consumption and production policy (Goal 12, <https://sdg12hub.org/>), and the implementation of the Global Strategy for Sustainable Consumption and Production 2023-2030, are pivotal in achieving this change. Efficient resource utilisation is one of the main pillars of this sustainable development goal, with waste prevention playing a crucial role. Waste prevention is often the most effective means of addressing these pressures, as it reduces unnecessary production and processing, and thus the associated costs and emissions.

Waste prevention holds significant potential since products and materials need not become waste. Products can be designed to support extended lifecycles and enable reuse and repair. Progress in this direction allows everyone to make substantial contributions to both economic efficiency and environmental impact. One of the most significant challenges faced by today's society is the lack of awareness or understanding regarding the necessary quantity of resources (materials, energy, working hours, etc.) required for the production and distribution of any product in the market. Without this understanding, it is challenging on an individual basis to recognise the effects of consuming or abstaining from a particular product, or the benefits of choosing a more environmentally friendly product (one with a smaller environmental footprint).

In order to encourage changes in behaviour for the purpose of achieving sustainable resource and waste management, activities aimed at raising awareness and sensitising the public play a vital role. The public needs to comprehend the transition from a linear to a circular economy, how it will be implemented, and the financial frameworks for establishing circular economy principles.

The successful implementation of waste prevention measures requires a combination of regulatory, economic, technical, and communication mechanisms. Within this priority area, these activities include targeted actions to change consumption and production patterns, such as using educational

and informational tools and incentives, like investments in raising public awareness and motivating consumers to shift their consumption patterns towards sustainability. This also involves a return to traditional consumption patterns, including the reducing of reusability and product repair.

In order to understand the importance of waste prevention, as well as the role and benefit of individuals in the waste management chain, it is crucial that the public is adequately informed and educated about waste prevention, waste separation, sorting and recycling technologies, as well as projects and costs associated with treating residual waste in the mixed municipal waste treatment facilities (Municipal Waste Treatment Plants and power plants).

Sustainable use of natural resources aims to reduce the environmental impact of resource utilisation in a growing economy, with a focus on environmental impacts representing a decisive factor in achieving sustainable development. Emphasis is placed on increasing efficient resource management for the sustainable development of economic systems, and supporting the transition to economic growth with low greenhouse gas emissions.

In terms of implementing waste management policies that support waste reduction through the development of a functional waste management system, which aims to use waste as a valuable resource, Directive 2008/98/EC, in line with environmental benefits/costs, clearly defines the waste management hierarchy by ranking waste management options in terms of their environmental impacts. At the top of this hierarchy is waste prevention, representing the most efficient and sustainable resource utilisation method. As Croatia has harmonised its legislation with EU legal frameworks, it has also adopted this waste management hierarchy through provisions in the Waste Management Act.

Moving towards a circular economy is achieved through various measures in the production and consumption chain of natural and manufactured goods, and consequently in waste management, with the aim of returning waste to the economic cycle. This is accomplished by following the waste management hierarchy, where particular emphasis is placed on waste prevention as the first step in this hierarchy.

According to the Waste Management Act, waste prevention involves measures taken before a substance, material, or product becomes waste, with the purpose of reducing waste quantities. This includes the reuse of products and extending their lifespan, reducing the negative environmental and health impacts of generated waste, and minimising hazardous substance content in materials and products.

Waste prevention leads to a reduction in waste quantities and the negative environmental and health impacts of waste before any other recovery or disposal method becomes necessary.

The area of product design and the development of intersectoral collaboration and action is of special interest.

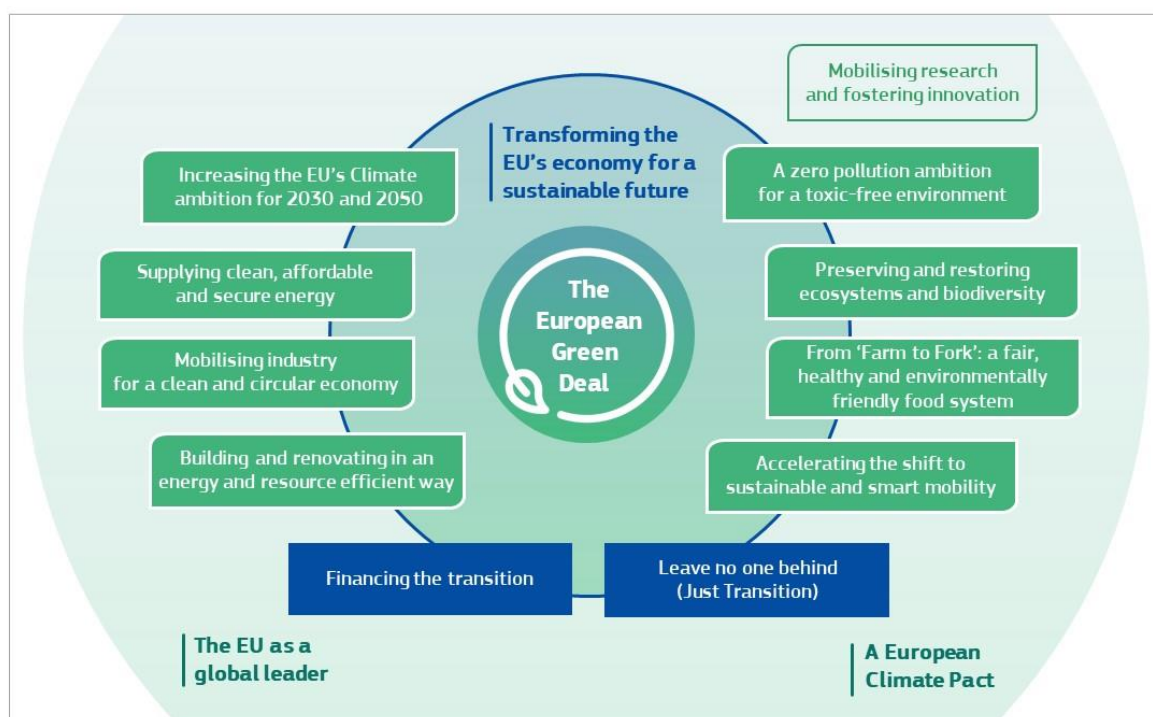
One of the significant waste prevention activities is the reuse of items and products that have not been declared as waste and have not entered the waste management system.

As for new priority topics, such as organic waste, electrical and electronic waste, plastic waste, construction waste, textile and footwear waste, marine litter, and single-use plastic products, it will be essential to ensure the effective implementation of waste prevention measures and develop appropriate monitoring methodologies in the upcoming period.



## 15.2. EU plans and strategies

The European Green Deal COM(2019) 640 final proposes a new growth strategy with the aim of transforming the EU into a just and prosperous society with a modern, resource-efficient, and competitive economy where, by 2050, there will be no net greenhouse gas emissions and where economic growth is not associated with resource use. This plan seeks to protect, preserve, and enhance the EU's natural capital while safeguarding the health and well-being of its citizens from environmental risks and the impacts of the environment on them (Figure 71).



**Figure 71.** European Green Deal

The European Green Deal states, among other things: *'Sustainable product policies could significantly reduce waste. If waste is unavoidable, its economic value should be recovered, and its environmental and climate impact should be minimised. This requires new legislation, including targets and measures to address the problems of over-packaging and waste generation. Concurrently, EU companies should benefit from a strong and integrated single market for secondary raw materials and by-products. This requires a deeper collaboration throughout value chains, as seen in the Circular Plastics Alliance.'*

As a key component of the European Green Deal, the European Commission has introduced a new Circular Economy Action Plan - For a Cleaner and More Competitive Europe COM(2020) 98 final, which represents a new EU plan for sustainable growth. This Action Plan will contribute to the modernisation of the EU economy and harness the potential of the circular economy.

One of the main provisions of the new Action Plan is to focus on designing and producing products for the circular economy in order to ensure that used resources are kept in the EU economy for as long as possible, thereby decoupling waste generation from economic growth. Introducing a policy for sustainable products, including the design of sustainable products, strengthening the position of

consumers and public procurers, and incorporating circular principles into manufacturing processes and specific legislation, will be crucial for making progress in waste prevention. This Plan proposes measures in sectors that use the most resources and where significant waste generation occurs, such as: electronics, information and communication technology, batteries and vehicles, packaging, plastics, textiles, construction, as well as food and water.

Sustainable products should become the norm in the EU, and in this regard, the Commission will propose legislation on sustainable product policy to ensure that products placed on the EU market are designed to last longer, are more easily reusable, repairable, and recyclable, and include as much recycled material as possible instead of primary raw materials. Single-use products will be restricted, the issue of premature product obsolescence will be addressed, and the destruction of unsold durable goods will be prohibited. Furthermore, in order to promote the reuse, repair, and recycling of products and waste, it is crucial to ensure clean material streams through the encouragement of substituting harmful substances and the development of criteria to promote safe and sustainable materials right from the design phase.

In relation to waste reduction, the emphasis will be on complete waste avoidance and its transformation into high-quality secondary resources that benefit from a well-functioning secondary raw material market. Consideration will be given to establishing a harmonised model for separate waste collection and labelling at the EU level, as well as taking a series of measures to minimise waste exports from the EU and address the issue of illegal shipments.

Waste prevention is the most effective way to improve resource efficiency and reduce the environmental impact of waste. Therefore, it is important to take appropriate measures to prevent waste and monitor and evaluate the progress of their implementation. As part of these measures, it is necessary to facilitate innovative models of production, business, and consumption that reduce the presence of hazardous substances in materials and products, promote product lifespan extension, and encourage reuse. This includes establishing and supporting networks for reuse and repair, deposit-refund systems for product return and replenishment, as well as remanufacturing, reprocessing, and, where appropriate, re-purposing of products, along with sharing platforms.

Promoting sustainability in production and consumption can significantly contribute to waste prevention, and steps should be taken to make consumers aware of this contribution and encourage them to actively participate in improving resource efficiency. Measures to reduce waste should include ongoing communication and educational initiatives aimed at raising awareness about the issues surrounding waste prevention and should involve deposit-refund systems for product returns, the establishment of quantitative targets, and, where necessary, providing appropriate economic incentives to manufacturers.

Manufacturers of products should be encouraged to develop, produce, market, and use products and components that are suitable for multiple uses, contain recycled materials, are technically durable, repairable, and, when they become waste, suitable for reuse and recycling preparation. All of this is to facilitate the proper implementation of the waste hierarchy without compromising the free movement of goods in the internal market.

When assessing incentives, it is necessary to consider the product's environmental impact throughout its entire lifecycle, waste management hierarchy, and, where appropriate, the potential for multiple recycling. Manufacturers of products should, through extended producer responsibility schemes, cover the costs required to meet waste management objectives, including waste prevention. Holders of products or product waste covered by extended producer responsibility schemes should be

informed about waste prevention measures, reuse and preparation for reuse centres, waste collection and return systems, and measures to prevent waste from being discarded into the environment.

In the context of waste prevention, Directive 94/62/EC establishes measures with the primary aim of preventing the generation of packaging waste, and as additional fundamental principles, it promotes the reuse of packaging, recycling, and other forms of packaging waste recovery, thereby reducing the final disposal of such waste as the least preferable waste management activity. Packaging must be designed, produced, and marketed in a way that allows for its reuse or recovery, including recycling, in accordance with the waste management hierarchy, and which minimises its environmental impact as much as possible during the disposal of packaging waste or remnants left after waste management measures have been implemented. Measures should be taken to encourage an increase in the proportion of reusable packaging placed on the market and systems that enable packaging reuse, as well as other preventive measures to prevent the generation of packaging waste and reduce the environmental impact of packaging.

Directive 2019/904 promotes circular approaches that prioritise sustainable and non-toxic products that can be reused and reuse systems over single-use products, primarily with the goal of reducing the amount of waste generated. This waste prevention is at the top of the waste hierarchy established in Directive 2008/98/EC and is crucial for achieving the objectives of this Directive, including preventing and reducing the impact of certain plastic products on the environment, especially the aquatic environment and human health, and promoting the transition to a circular economy with innovative and sustainable business models, products, and materials. Plastic products need to be produced with consideration for their entire lifecycle, and the design of plastic products must take into account the manufacturing and usage phases, as well as the potential for product reuse and recycling. This Directive was adopted within the framework of the European Strategy for Plastics in a Circular Economy COM(2018) 28 final, which the European Commission adopted on January 16th, 2018. This strategy represents a step towards establishing a circular economy where the design and production of plastics and plastic products fully respect the needs of reuse, repair, and recycling. It also aims to develop and promote more sustainable materials. Among other objectives, the strategy aims to ensure that by 2030, all plastic packaging placed on the EU market can be reused or easily recycled.

In order to encourage the implementation of waste prevention activities, all EU member states, including Croatia, are required to develop a Waste Prevention Plan in accordance with Annex IV (Examples of waste prevention measures) and Annex IV(a) (Examples of economic instruments and other measures to incentivise the application of the waste hierarchy) of Directive 2008/98/EC, which have been transposed into national legislation through the Waste Management Act (ZGO).

### **15.3. Status analysis in the area of waste prevention**

Waste prevention encompasses measures taken before a substance, material, or product becomes waste, aiming to reduce: waste quantities, including product reuse or extending the product's lifespan. the harmful impact of waste on the environment and human health. the presence of hazardous substances in materials and products. It represents the most desirable option in the waste management hierarchy.

While there has been a positive shift in Croatia's waste management hierarchy in recent years, with an increase in recycling rates and a decrease in waste disposal rates, there is still a growing trend in the overall waste generation. Moreover, there has been no observable decrease in the quantities of

municipal waste generated due to its significant share in total waste volumes (approximately 30%), its complex composition, and the potential for reduction and/or prevention of its generation.

Similar to trends at the EU level, these trends are primarily driven by economic growth. However, waste quantities are growing to a lesser extent than economic indicators, indicating a relative decoupling of waste generation from economic growth. For the period from 2017 to 2021, during which the average monthly net salary in Croatia increased by a total of 17%, municipal waste generation increased by only 3%. This suggests a mild decoupling of the connection between municipal waste generation and economic development (Figure 72).

Source: MESD

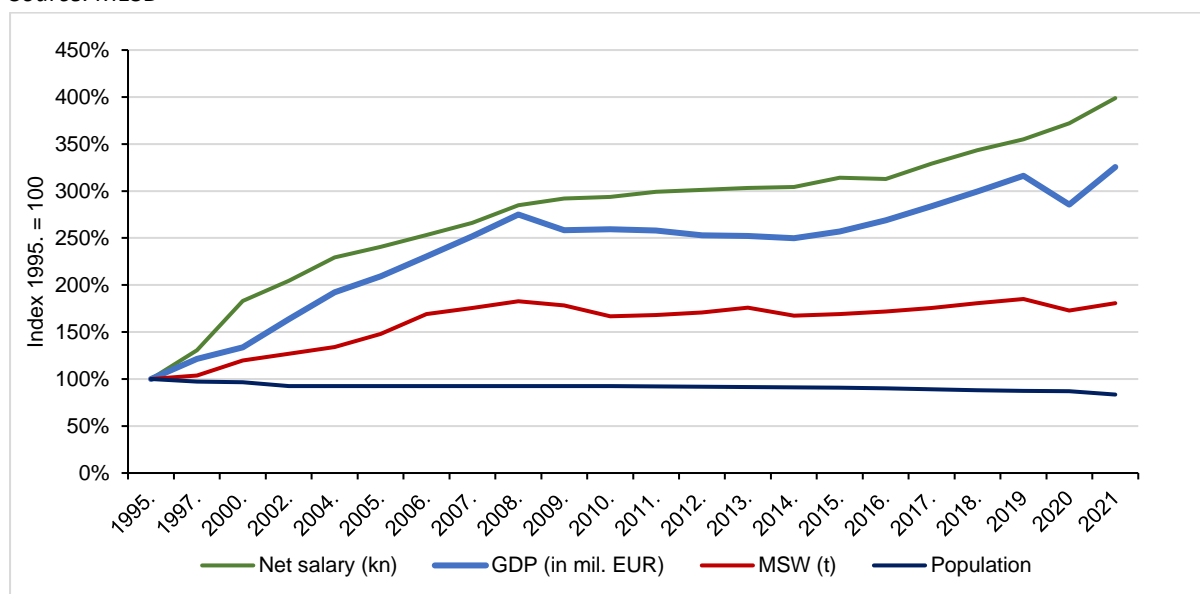


Figure 72. Disconnection of the link between the municipal waste production and economic development

## 15.4. The existing measures and their contribution to the waste prevention

The existing measures and activities for waste prevention are aimed at preventing the generation of the following waste categories: municipal waste, food waste, electrical and electronic waste, paper and cardboard waste, and construction waste. These measures and activities address all stages of the product life cycle, from design, production, and distribution to consumption and use, including the regulatory framework related to waste generation.

### 15.4.1. Implementation of measures of planning and other economic instruments promoting the efficient use of resources and a more responsible user behaviour towards the environment

The Croatian government has adopted the Food Waste Prevention and Reduction Plan of the Republic of Croatia for the period from 2023 to 2028. This plan includes measures and activities that will contribute to further progress in preventing and reducing food waste at all stages of the production and supply chain, including primary production, processing, and production to retail, hospitality, institutional kitchens, and households. The main objective is to achieve the United Nations Sustainable

Development Goal of reducing food waste per capita at the retail and consumer levels by 50% and reducing food loss in production and supply chains by 2030.

In Croatia, the Regulation on Packaging and Packaging Waste (Official Gazette No. 88/15, 78/16, 116/17, 14/20, and 144/20) imposes an obligation on retailers to charge consumers for lightweight plastic carrier bags from January 2019. Lightweight plastic bags are those with a wall thickness less than 50 microns. An exception is made for very lightweight plastic carrier bags (with a wall thickness less than 15 microns) that are used for hygiene purposes or serve as primary packaging for loose food items to prevent food waste. For these bags, a visible notice 'USE BAGS SPARINGLY' must be displayed at the location where they are made available free of charge.

The consumption of lightweight plastic carrier bags (including very lightweight ones) was 138 per person in 2019 and 90 per person in 2020, indicating a decrease in consumption by 35%. For very lightweight plastic bags, consumption decreased by 36%, and for lightweight plastic bags, it decreased by 30% (Table 71).

**Table 71. Consumption of plastic bags in Croatia**

Types of plastic bags	(tonnes)		(1,000 pieces)	
	2019	2020	2019	2020
a) very light plastic carrier bags, wall thickness < 15 µm	1,420	906	450,980	287,738
b) light plastic carrier bags, wall thickness ≥ 15 < 50 µm	1,658	1,163	110,330	77,402
all (a+b) light plastic carrier bags, wall thickness < 50 µm	3,078	2,069	561,310	365,140
Other plastic carrier bags, wall thickness ≥ 50 µm	591	581	8,836	8,693

Source: EPEEF, edited by MESD

In 2021, the Waste Management Act introduced a ban on placing lightweight plastic carrier bags with a wall thickness of 15 to 50 µm on the market, which came into effect in 2022.

As for construction waste, a project for developing an Action Plan for the circular economy in the management of construction waste in the Republic of Croatia was initiated at the end of 2021.

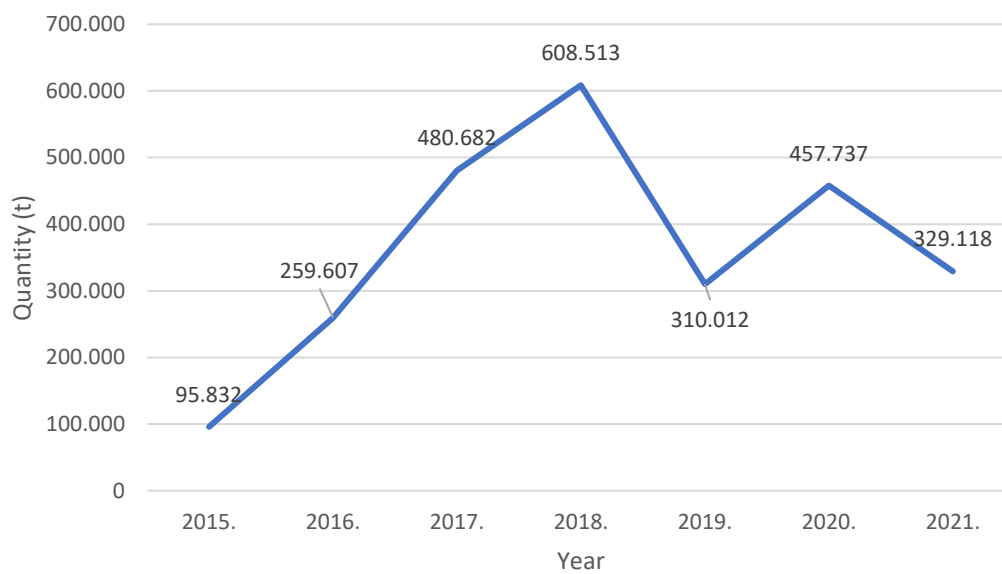
In order to ensure the quality reuse of construction materials and the recycling of waste generated after the strong earthquake that hit the Sisak-Moslavina County in December 2020, the 'Plan for the Implementation of Waste Management Measures after the Earthquake in the Sisak-Moslavina County' and its amendment were adopted at the beginning of 2021. Special instructions for handling the demolition sites and the method of recording construction material resulting from the earthquake were also prepared. Temporary storage facilities for construction materials generated due to the earthquake were established. Approximately 220,000 m<sup>3</sup> of such material was delivered to these temporary storage sites during 2021, including 59,573 m<sup>3</sup> (71,487 tonnes) that were used by the end of 2021. Additionally, from January to May 2022, another 62,390 m<sup>3</sup> (74,868.0 tonnes) were used. A part of these quantities, approximately 44,600 m<sup>3</sup> (53,520 tonnes) was used for site remediation. It is estimated that the proportion of separated non-usable material or residual waste amounted to about 15% of the total incoming quantities of construction material delivered to the temporary storage sites.

Regarding the development of the secondary raw materials market, activities to establish common quality criteria or standards for specific categories of secondary raw materials are underway. One significant development is the adoption of the Waste Management Regulation (Official Gazette No. 106/22), which provides detailed conditions and procedures for obtaining the status of a **by-product**.

Considering that in every production process, besides the intentionally manufactured products or materials, one or more substances/materials are generated which are not the primary objective of the

production process, and their generation cannot be avoided, it is extremely important to recognise at what point a specific material truly becomes waste or a by-product in order to avoid environmental harm and unnecessary business costs. The increase in the number of registered by-product producers and the growth in by-product quantities during the period from 2015 to 2020 show that more and more businesses are aware of these advantages.

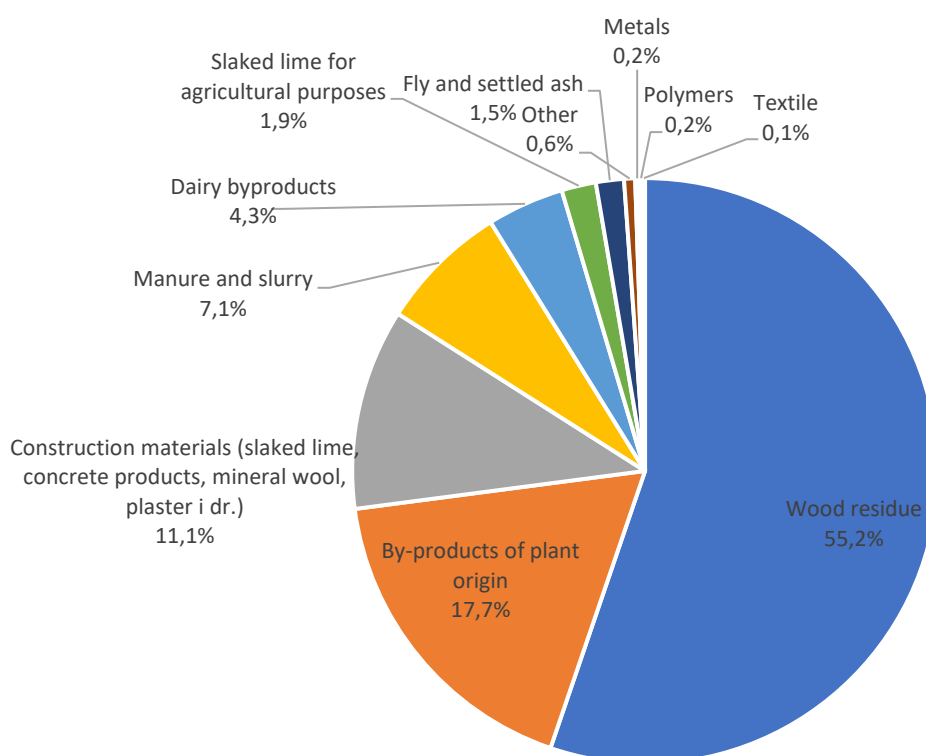
From 2015 to 2018, there was an annual increase in reported by-product quantities, averaging 20%, followed by a 49% decrease in 2019 compared to the previous year. In 2020, there was again an increase of 48%, and in 2021, there was a 28% decrease in quantities (Figure 73.).



Source: MESD

**Figure 73.** Overview of reported amounts of by-products from 2015 to 2021

In 2021, within the total quantity of by-products (329,118 tonnes), the majority of waste consisted of wood residues (55.2%), by-products of plant origin (17.7%), such as fruit and vegetable parts, spent grains, and others, and by-products intended for use in construction, including concrete by-products, stone wool, gypsum, broken bricks, etc. (Figure 74).



Source: MESD

**Figure 74.** Composition of individual types of by-products in the total generated waste in 2021

The application of planning measures or other economic instruments to promote the efficient use of resources and encourage a more responsible consumer behaviour towards the environment is defined as an example of waste prevention measures in Appendix IV, paragraphs (1) and (11) of Directive 2008/98/EC.

#### 15.4.2. Improvement of the monitoring of waste prevention measures

For topics such as food waste, plastic waste, and marine litter, the MESD is undertaking activities to develop appropriate monitoring methodologies for the implementation of regulations and data collection through administrative methods and statistical research. Based on this, the MESD aims to ensure better implementation and monitoring of waste prevention measures.

An example is a statistical study on food waste conducted by the MESD during 2021. The statistical research was carried out in accordance with the methodology prescribed by Commission Delegated Decision (EU) 2019/1597 of May 3rd, 2019, amending Directive 2008/98/EC.

This study revealed that in 2020, a total of 286,379 tonnes of food waste were generated in Croatia, equivalent to 71 kg per capita, including 216,345 tonnes (76%) generated in households, amounting to 54 kg per capita, while the remaining 70,034 tonnes (24%) were produced by the business sector. The edible portion of waste that could have been avoided accounts for as much as 40% of the total food waste generated, which is equivalent to 106,037 tonnes (Table 72).

**Table 72.** Amount of generated food waste in 2020 by origin

	Households	Business sector	Total
RoC – per year	216,345 t	70,034 t	286,379 t
Resident/year	54 kg	17 kg	71 kg
Resident/day	147 g	48 g	195 g
Edible part of food waste – per year	86,726 t	19,311 t	106,037 t
Resident/year	22 kg	5 kg	26 kg
Resident/day	59 g	13 g	72 g
Non-edible part of food waste – per year	129,619 t	50,723 t	180,342 t
Resident/year	32 kg	13 kg	45 kg
Resident/day	88 g	34 g	122 g

Source: MESD

Approximately 33% of household food waste ends up in mixed municipal waste, 23% is used for animal feed, around 17% is separately collected and sent for processing, 16% is composted on-site (using home composters), 10% ends up in waste water in drainage systems, while 1% is handled in some other way.

Regarding the issue of marine pollution by plastics and the implementation of Directive 2019/904, the project entitled 'Improving Data on Plastic Waste in Croatia' is relevant and currently underway. Its goal is to enhance the existing statistics and establish new data on plastics and plastic waste, including single-use plastics.

Enhancing data quality, developing methodology, and efficiency indicators are essential for assessing the effectiveness of waste prevention measures and activities. These indicators are crucial for monitoring the performance of these measures and for defining any necessary changes or improvements to them and/or the introduction of new measures, activities, and indicators. Directive 2008/98/EC defines the development of efficient and meaningful environmental impact indicators associated with waste production as one of the examples of waste prevention measures (Appendix IV, paragraph (3)).

### 15.4.3. Promoting of the recognised eco-labels and waste management system

The EU Ecolabel environmental protection logo is a driver of the circular economy as it promotes sustainable production and consumption. Only products and services with a lower environmental footprint than conventional ones can obtain this prestigious European mark of excellence in accordance with prescribed criteria. Parameters evaluated when setting thresholds include resource consumption, chemicals, energy consumption, greenhouse gas emissions, and waste generation.

During the validity period of the Waste Management Plan of the Republic of Croatia for the period 2017-2022, there was a significant interest from the business sector in Croatia in certifying products and services with the EU Ecolabel environmental protection logo. They recognised the environmental and economic advantages of certified products and services when introducing them to the market in the Republic of Croatia and the EU single market (Table 73). As of September 2022, the EU Ecolabel has been awarded to 34 products and 9 tourist accommodation services<sup>31</sup>. Entrepreneurial interest in

<sup>31</sup> National register of EU Ecolabel products and services is publicly available at: <https://mingor.gov.hr/nacionalni-registar-eu-ecolabel-proizvoda-i-usluga/8145>



this eco-label continues to grow and is monitored through inquiries to the relevant Ministry of Economy and Sustainable Development (email address: [ecolabel@mingor.hr](mailto:ecolabel@mingor.hr)).

In order to further encourage the certification of products and services, relevant regulations have been amended to eliminate the annual fee for the EU Ecolabel logo. Holders of the EU Ecolabel automatically receive the national Environmental Friend logo. Educational programmes on the EU Ecolabel environmental protection logo have been initiated, with authorised experts who prepare compliance reports for the EU Ecolabel, the tourism sector, and others. Information and updates related to the EU Ecolabel are regularly provided through social media (Facebook EU Ecolabel Croatia).

**Table 73.** Number of awarded EU Ecolabel certifications in the Republic of Croatia in the period from 2017 to 2022

	2017	2018	2019	2020	2021	2022*	Total*
Total number of certificates awarded to organisations	/	7	3	1	11	4	20
Total number of products	/	3	7	8	12	4	34
Total number of services	/	6	0	0	7	2	9

*status on September 12th, 2022; Source: MESD*

When it comes to promoting certified environmental management systems, a positive shift has been observed concerning the ISO 14001 system, which is recognised as crucial for the efficient operations of an increasing number of companies. However, this measure has not been extensively applied yet in order to result in waste prevention.

The EMAS (Eco-Management and Audit Scheme) is a certification indicating that an organisation has implemented an environmental management system with independent assessment. The rules are defined by Regulation (EC) No 1221/2009, while the Environmental Protection Act and the Regulation on the voluntary participation of organisations in the Eco-Management and Audit Scheme (EMAS) system (Official Gazette No. 131/2020) have enabled the establishment of a national scheme. EMAS was developed by the European Commission with the purpose of encouraging organisations to apply high environmental protection standards and continually measure and monitor their impact on the environment and climate. It is based on ISO 14001, but the requirements to obtain EMAS are more comprehensive. The EMAS system obliges organisations to monitor energy and water consumption (energy efficiency), waste generation, greenhouse gas emissions, and impact on biodiversity. It contributes to risk reduction due to the obligation to establish operational procedures, enhances relationships with employees (EMAS training) and external partners and suppliers. Environmental statements are verified and publicly disclosed. It establishes ongoing compliance monitoring and contributes to reducing operational costs. The EMAS system is intended for all types of organisations, both private and public, that wish to monitor and reduce their environmental impact. Implementation guides for EMAS have been developed for public administration and sectors such as waste management, tourism, retail, food and beverage production, agriculture, and more. The Ministry of Economy and Sustainable Development, as the competent authority, manages the EMAS certification system, oversees the EMAS Commission, the national EMAS website, and the register, and conducts information and education activities. Positive progress has been noted regarding the implementation of the EMAS system. Three EMAS organisations were registered in Croatia during the period from 2019 to 2020.

Promoting the use of eco-labels is recognised as an important and effective tool for implementing EU green policies. Directive 2008/98/EC defines this measure as useful for waste prevention (Annex IV, paragraph (13)). Additionally, the promotion of certified environmental management systems, EMAS and ISO 14001, is defined in Annex IV, paragraph (10), of Directive 2008/98/EC.

#### 15.4.4. Green and sustainable public procurement

The implementation of green public procurement practices promotes sustainable consumption and the development of markets for green products and services, which involves purchasing products and services with a lower environmental footprint compared to conventional ones. The criteria evaluated when defining thresholds include resource consumption, chemicals, energy consumption, renewable energy sources, greenhouse gas emissions, waste generation, reduction in packaging volume, the proportion of recycled materials, product repairability, and more.

The Public Procurement Act (Official Gazette No. 120/16, 114/22) prescribes exclusively the most economically advantageous tender as the criterion for the selection of an offer, allowing the inclusion of green public procurement criteria in public procurement procedures. Furthermore, during a government session held in May 2021, the Decision on Green Public Procurement in central public procurement procedures (Official Gazette 49/2021) was adopted. This decision obliges the Central State Office for Central Public Procurement, as the fourth-largest public contracting authority in Croatia, to implement green public procurement, particularly for office supplies, consumables, computers and computer equipment, motor vehicles, and the supply of electric energy.

The statistical report on public procurement has been compiled since 2007, with separate tracking of green public procurement data starting from 2015. The number of contracts employing green public procurement criteria experienced rapid growth until 2019, followed by a slight 2% decline in 2020 compared to the previous year but with a 45% increase in the value of such contracts. In 2021, there was a further increase in the number of 'green contracts'. Compared to 2020 (1,692 contracts), 800 more contracts were published, representing a 47% increase. The share of 'green contracts' in the total number of concluded contracts for 2021 is 9%. However, there was an 8% decrease in the value of contracts in 2021 compared to the value of 'green contracts' concluded the previous year (the value of 'green contracts' in 2020 was 815,421,664.21 EUR or 6,143,794,529 HRK, while in 2021, it was 752,960,358.09 EUR or 5,673,179,818 HRK, excluding VAT).

Despite the increase in the number of concluded contracts, the value of contracts that utilised green public procurement criteria accounts for only 9% of the total number of public procurement contracts in 2021, which falls far below the target set for 2020, i.e., 50%. The Ministry of Economy and Sustainable Development manages the national Green Procurement website, where they publish updates, educational materials, project results, and examples of best practices. The Ministry of Economy and Sustainable Development manages the national website for green procurement, where it publishes news, educational materials, project results, and examples of best practices.

Strengthening green and sustainable public procurement is an important tool for promoting sustainable consumption and production, ultimately reducing environmental pressures, including waste generation and the presence of hazardous substances. Green public procurement also plays a crucial role in achieving climate objectives (a measure within the Low Carbon Economy Strategy of the Republic of Croatia by 2030 with a perspective towards 2050 and a measure within the National Action Plan for Energy Efficiency). The European Green Deal and the Circular Economy Action Plan (2020) recognise public procurement as an essential tool systematically contributing to the achievement of the EU's green transition. Additionally, Directive 2008/98/EC (Annex IV, paragraph (15), and Annex IVa, paragraph (7)) defines the integration of environmental protection and waste prevention criteria in public and corporate procurement procedures as an example of measures for waste prevention and the efficient application of waste management hierarchy.

#### 15.4.5. Implementation of education and information activities and improvement of the availability and transparency of waste prevention-related information

During the period from 2017 to 2021, following the adoption of the first National Waste Prevention Plan for the 2017-2022 period, intensive educational and awareness-raising activities were carried out with the purpose of increasing awareness and responsibility of both the professional community and the general public. These activities included promoting the reuse of products, monitoring waste prevention, and creating conditions for the development of secondary raw material markets, at the local, regional, and national levels.

At the national level, the Environmental Protection and Energy Efficiency Fund (Cro. abbrev. FZOEU) implemented and prepared several national campaigns and projects aimed at **educating and informing the public**. These initiatives focused on promoting reuse, reducing waste generation, minimising the use of single-use plastic bags, reducing waste during holidays, and encouraging waste separation, among other objectives (Table 74).

**Table 74.** Overview of campaigns and projects addressing the issue of waste prevention organised by the EPEEF (Cro. abbrev. FZOEU)

Campaign/project name	Year of implementation	Goal/purpose
Campaign entitled 'Even Without Paper Decoration, a Gift Will Fill Your Heart and Imagination'	2019	Focused on reducing waste during holidays and encouraging reuse and waste separation
Campaign entitled 'For a More Beautiful Homeland'	From 2019 onwards	<p>This campaign aimed to raise awareness about the importance of sustainable waste management and encourage citizens to handle waste correctly and responsibly. As part of this campaign, a Facebook page was established and is currently followed by nearly 12,000 users.</p> <p>Through communication on this social media platform, citizens are encouraged to engage in proper waste separation, reduce waste generation (all types of waste, including food waste) by promoting reuse and responsible purchasing and handling of items. The page also serves as a platform for sharing ideas and tips on environmentally responsible behaviour.</p> <p>In 2022, the campaign was extended to include advertising spaces in primary and secondary schools. It is planned to run until the end of 2022.</p>
Campaign entitled 'Old Made New for a Gift from the Heart'	2020/2021	Designed for elementary and secondary school children, the campaign aims to inspire them to discover the value of old and discarded items in a fun and engaging way. The goal is to encourage them to use these items multiple times, contributing to waste reduction. The campaign takes the form of a competition involving schools.
Campaign entitled 'Don't Forget Me'	2021	Focused on reducing the use of single-use plastic bags
Campaign entitled 'My World. My Responsibility.'	2021	Focused on raising awareness about environmental conservation.
The campaign aims at raising the citizens' awareness about the negative impact of the excessive use of plastic bags.	October 2022	Under the slogan 'If You Love Fashion, Make it Sustainable' (Translator's Note, Cro. abbrev. 'Ako si u modi, održivost te vodi'), a survey will be conducted on the average consumption of plastic bags at a marketplace in Zagreb on a typical Saturday morning. Based on this survey, an estimate will be made of the

		total consumption of such bags in Croatia, with the aim of presenting a more sustainable alternative to citizens: reusable bags for fruits and vegetables and reusable bags in general, whether made of PVC or fabric. The campaign also includes activities on social media platforms such as Instagram and TikTok.
Pilot project entitled 'Reduce Food Waste, Cook for Your Guests'	2021/2022	Conducted in collaboration with the Ministry of Economy and Sustainable Development and the Ministry of Tourism and Sports. The project aimed to implement working methods in hotel kitchens to reduce bio-waste, or food waste.
Direct project co-financing aimed at promoting the 'Plastic Free Zone' initiative	2022	<p>Focused on supporting measures that contribute to limiting the use of single-use plastic products and the removal of plastic waste and other types of waste in protected natural areas.</p> <p>Apart from equipping public institutions with necessary equipment, this also includes informing, promotional activities, and educating the wider public, employees of public institutions, visitors, restorers, as well as other legal and natural persons providing their services in protected natural areas.</p>

Source: MESD

Furthermore, in 2017, the MESD developed a Programme of educational and informational activities on sustainable waste management, and in 2018, based on a public call, it began awarding non-repayable funds through the OPCC 2014-2020 programme to implement this Programme. By the end of 2021, a total of 91 projects for educational and informational activities were co-financed, with a total value of 53.6 million Croatian kunas (7.1 million euros). The beneficiaries of these projects were local self-government units, and the activities were carried out in around 300 LSGUs.

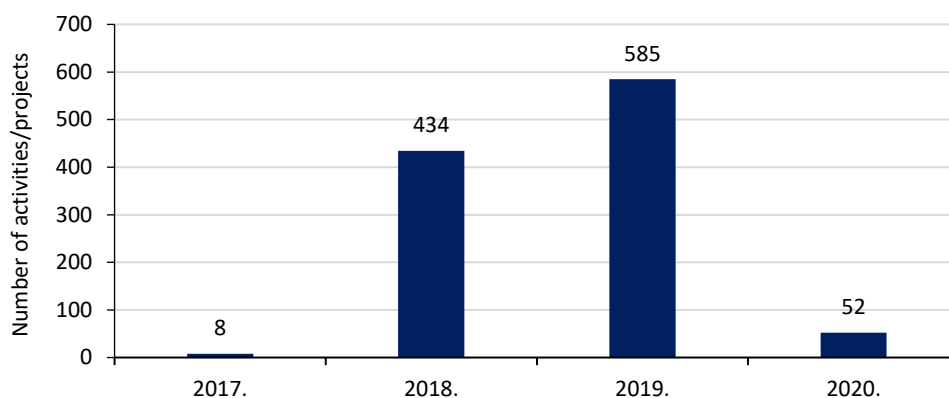
In addition to this, in collaboration with the World Bank for Reconstruction and Development, the MESD conducted an education and capacity-building programme throughout 2022 as part of the 'Technical Assistance to the Ministry of Economy and Sustainable Development for Sustainable Waste Management – Transition to a Circular Economy' project. The education programme covered a wide range of stakeholders, including the public administration, the private sector (representatives of the construction sector and waste management companies), the academic community, and non-governmental organisations.

For educational purposes, monitoring, and data collection on projects and activities related to waste prevention, the MESD developed the **Waste Prevention Website**<sup>32</sup> (hereinafter referred to as: Website) in 2017. The website contains general information on waste prevention, measures prescribed by national planning documents and regulations, as well as EU regulations. It provides information about planned and completed waste prevention projects and activities, showcases best practices, and allows for updates on this subject.

Additionally, the Website is designed in a way that allows various relevant stakeholders (local government units, competent authorities, businesses, associations, and citizens) to report the activities they undertake aimed at waste prevention, its reuse, or separate collection. This enables proactive monitoring of waste prevention activities and provides access to information about their implementation to both experts and the general public, as a summarized overview of reported activities is available through the Website.

<sup>32</sup> <http://sprjecavanjeotpada.azo.hr/>

From the establishment of the Website until the end of 2020, a total of 123 projects and 956 activities were reported. The majority of activities/projects were carried out in 2018 and 2019, mainly due to the announcement of the aforementioned public call for the implementation of the Programme for educational and informative activities on sustainable waste management. Around 95% of the activities/projects, which received co-financing from this source, were reported during 2018 and 2019. Although co-financing was available for projects conducted until the end of 2020, the COVID-19 pandemic led to a decrease in the number of activities/projects carried out in that year (Figure 75).



Source: MESD

**Figure 75.** Number of reported activities/projects carried out for the purpose of waste prevention per year

The conducted activities were informative and educational, including the production of leaflets, banners, and guides (brochures). Out of the total number of reported projects/activities, 84% of them were oriented toward all types of waste, followed by activities/projects focused on paper and cardboard waste, and plastic waste.

Additionally, among other measures that bolster the secondary raw materials market, increase information availability, and strengthen dialogue among stakeholders, the relaunch of the 'Waste Exchange' at the Croatian Chamber of Economy in 2018 should be highlighted.

Conducting of training courses and raising awareness among experts and the general public, along with ensuring information accessibility, are crucial for the successful implementation of waste prevention. This is especially significant considering the complex nature of the topic, which demands the collective engagement of a large number of stakeholders. The importance of implementing these waste prevention measures is also emphasised in Directive 2008/98/EC (Article 9, paragraph (m), and Appendices IV, paragraphs (12), and IVa, paragraphs (13) and (14)).

#### **15.4.6. Promoting reuse and/or repair of specific discarded products or their parts**

One of the important waste prevention activities is the establishment of **reuse centres**. The Waste Management Act (ZGO) stipulates the obligation to register such centres with the Reuse Centre Registry. The official registry at the Ministry of Economy and Sustainable Development will be established after the adoption of the Waste Management Regulation by-law. As a result, no reuse centres have been officially registered.

Nevertheless, activities related to reuse and/or repair of appropriate discarded products or their components are being conducted in Croatia. A positive example of a joint initiative between the public sector and private enterprise is the 'Riperaj' workshop established for the purpose of repairing small items in Rijeka. This workshop was opened in October 2019. Citizens can repair faulty household

appliances, broken or damaged furniture, clothing, toys, and similar items for free with the assistance of skilled craftsmen.

Furthermore, in 2017, the municipal utility company PRE-KOM Ltd. based in Prelog established a Reuse Centre in Prelog, where collected furniture, dishes, toys, books, clothing, footwear, and other items that are no longer needed by citizens but are still usable are sorted. The collected items are repaired and restored in the centre and subsequently sold. In 2019 and 2020, 8,626 kg of various items were prepared for reuse at this location, including 5,100 kg of furniture, 2,307 kg of clothing, and 1,219 kg of books, which would otherwise have become waste. This prevented bulky waste generation by 15-20%.

Some used textile and footwear products are collected by charitable and other organisations for donation and reuse purposes. As a positive example that operates not only in the environmental field but also in the social and economic sectors, it is worth highlighting the Humana Nova Social Cooperative where discarded textiles are processed into high-quality products. The cooperative employs socially excluded individuals, contributing to the sustainable development of the local community. Used clothing is collected through donations and textile containers in public areas, primarily from the Međimurje County and northwestern Croatia. In 2019, 162 tonnes of textiles were collected through donations. Clean and intact clothing is sold in retail (second-hand stores) or donated within the local community. Some clothing is adapted in the sewing workshop for new products. Part of the collected textiles is used to make industrial rags, and the remaining textiles are sent to authorised recyclers. In 2019, the Humana Nova Čakovec Social Cooperative delivered 447 tonnes of textile waste for reuse and recycling, with 5 tonnes sent to second-hand stores and 19.2 tonnes turned into industrial rags.

After the establishment of the Reuse Centre Registry, it is expected that more locations involved in reuse activities, for which there is currently no information, will be recorded. Additionally, the quantities of waste/materials prepared for reuse in such centres will be documented annually.

There is certainly a need for further intensification of measures and activities related to reuse and greater integration of repairing discarded products or their components.

The importance of implementing these measures and activities is supported by the fact that promoting reuse is mentioned as an example of a measure in Article 9 (d), and Appendix IV, paragraph (16) of Directive 2008/98/EC.

## **15.5. Objectives and priorities**

The legislative and regulatory framework related to waste management in Croatia aims to establish a higher-quality waste management system based on waste prevention, reuse, and the establishment of an efficient system for separate waste collection for the purpose of recycling. The concept of waste prevention is designed to fundamentally influence planning, production, and meeting demand.

The meeting of the objectives set by the previous programme will continue in the new WPP, aimed at the following:

- Decoupling economic growth from the increase in waste generation
- Preserving natural resources
- Reducing the total volume of waste disposed in landfills
- Decreasing emissions of pollutants into the environment
- Reducing health and environmental risks

- Decreasing the presence of hazardous substances in materials and products
- Aligning with the United Nations' sustainable development goal to prevent and significantly reduce all forms of marine pollution.

Achieving these objectives will be facilitated by the achievement of the specific objectives listed in the WPP.

In order to achieve the United Nations' sustainable development goal of reducing per capita global food waste at the retail and consumer levels by 50% and decreasing food loss in production and supply chains by 2030, the implementation of the Waste Prevention and Reduction Plan of the Republic of Croatia for the period from 2023 to 2028 is planned.

### **15.5.1. Specific objectives**

Specific objectives and priority waste categories have been primarily selected based on the following:

- The proportion of individual waste categories in the total generated waste during the previous planning period
- The environmental, societal, and economic benefits of waste prevention for certain waste categories
- The potential to prevent specific products from becoming waste
- The existing objectives, measures, and ongoing activities that will be implemented in this reference period.

Specific WPP objectives are as follows:

- Preventing the generation of municipal waste
- Preventing the generation of organic waste
- Preventing the generation of electrical and electronic waste
- Preventing the generation of paper and cardboard waste
- Preventing the generation of plastic waste
- Preventing the generation of construction waste
- Preventing the generation of textile and footwear waste
- Preventing the generation of marine litter

### **15.5.2. Municipal waste prevention**

Municipal waste consists of various types of recyclable materials of different origins, but certain components of municipal waste contain hazardous substances harmful to the environment and human health. The municipal waste management system is extremely complex, involving a large number of stakeholders, requiring significant investments and the establishment of appropriate infrastructure, as well as a highly developed awareness of the importance of establishing a functional municipal waste management system and the importance of waste prevention.

Municipal waste is at the centre of interest related to waste prevention, so at the national and local levels, there is increased collaboration among all stakeholders in the implementation of waste prevention activities and the separation of individual waste fractions in households. This primarily involves educational and informational activities for citizens and the business sector through various communication channels.

An important fact that directly impacts municipal waste prevention is the adoption of the Food Waste Prevention and Reduction Plan of the Republic of Croatia for the period 2023 to 2028. This is because a significant share (>30%) of mixed municipal waste consists of biodegradable waste from kitchens and canteens.

The specific goal of Municipal waste Prevention is achieved, among other things, through activities aimed at achieving the remaining specific objectives, such as the prevention of food waste, paper and cardboard waste, plastic waste, as well as textile and footwear waste. These activities have, to some extent, contributed to the recorded reduction in the generation of municipal waste.

In 2021, the quantity of municipal waste sent for disposal amounted to 1,029,725 tonnes. When considering the amount of disposed municipal waste in the period from 2015 to 2021, there is a trend of decreasing disposed municipal waste, which can be partially attributed to the waste prevention measures implemented. During the reference period, citizens will be granted the 'right to repair' through repair centres for various products, extending their lifespan, as well as the establishment of reuse centres, which will represent new infrastructure for preventing the generation of municipal waste.

### **15.5.3. Bio-waste prevention**

Due to its significant potential for a negative impact on climate and the environment, improper management of bio-waste has raised concern in European institutional programmes. Therefore, it is necessary to ensure the separate collection of bio-waste with the intention of composting and anaerobic digestion, processing bio-waste in a way that achieves a high level of environmental protection, and the use of environmentally safe materials produced from bio-waste, among other measures.

Food waste production, besides its negative environmental effects such as inadequate utilisation of natural resources for food production, impact on soil, biodiversity, harmful emissions into the environment, also encompasses social, economic and ethical aspects.

In 2021, there was an increase in the quantities of separately collected municipal waste fractions, particularly bio-waste, compared to previous years. The share of separately collected bio-waste in the total amount of separately collected municipal waste is around 16%. In 2021, approximately 122,000 tonnes of bio-waste were separately collected with relatively high purity level (the share of unwanted materials was around 7%). However, it is concerning that in terms of municipal waste composition, the total quantity of bio-waste was around 440,000 tonnes in the observed year, indicating the potential for increasing the separate collection of bio-waste and preventing the generation of this type of waste.

Preventing food waste, as a significant component of bio-waste, is carried out through the Waste Prevention and Reduction Plan for Food Waste for the period from 2023 to 2028. This plan continues the strategic effort to increase the amount of donated food, reduce food waste, and enhance the food security of vulnerable population groups. The plan encompasses ongoing measures and activities that will further contribute to the prevention and reduction of food waste at all stages of the food chain, from primary production through processing and production, retail, hospitality, institutional kitchens to households. It also aims to achieve the United Nations' sustainable development goal of reducing food waste per capita at the retail and consumer levels by 50% and reducing food loss in production and supply chains by 2030. The measures include promoting and improving the food donation system in the Republic of Croatia, encouraging the reduction of food waste, promoting the social responsibility of the food sector, raising consumer awareness and information about food waste



prevention and reduction, monitoring the quantities of food waste, and investing in research and innovative solutions that contribute to the prevention and reduction of food waste.

In the case of monitoring waste prevention activities, one of the most effective tools is statistical research, which can assess the effectiveness of implemented activities and the need for their continuation or the identification of new activities. In this regard, it is necessary to plan measures that enable efficient data collection and processing from the most significant producers (by quantities produced) of bio-waste, including households and the business sector (services, agriculture, forestry, and fisheries).

#### **15.5.4. Electrical and electronic waste prevention**

Over the last few decades, technological advancements in electronic data management, communications, and overall production of goods have driven economic growth and improved people's lives. However, the growing dependence on electronic products in households and workplaces has posed a new environmental challenge: the management of electrical and electronic waste (e-waste).

Considering the systematic changes in computer technology and the emergence of new electronic appliances and devices, this waste stream represents one of the fastest-growing categories of waste. The increasing number of devices and equipment that become e-waste after their increasingly shorter lifespan raises two problems: environmental pollution and the loss of valuable resources. In addition to functional obsolescence, electrical and electronic devices can become waste for other reasons, such as the introduction of new technologies, aesthetic and/or emotional factors, and the financial impracticality of repairing non-functional devices or equipment.

The importance of preventing e-waste generation and systematically managing e-waste arises from the fact that electrical and electronic devices can contain (and often do contain) hazardous materials, such as lead, chromium, cadmium, mercury, phosphorus, various bromides, beryllium, barium, silicon, arsenic, and others. Mercury from electronic equipment is the primary source of mercury in municipal waste. Additionally, plastics used in electronic equipment often include bromine-based flame retardants, which, when improperly managed, can have significant negative environmental impacts.

On the other hand, e-waste contains numerous valuable materials (glass, plastic, precious metals) that can be reused. Reusing and recycling materials from discarded electronic equipment helps conserve natural resources and prevent air and water pollution and the greenhouse gas emissions associated with the manufacturing of new products.

Directive 2008/98/EC introduced the obligation to adjust the financial contributions that manufacturers pay into existing extended producer responsibility schemes for their products, including electrical and electronic equipment. These contributions should be adjusted based on specific criteria for these products, including durability, reparability, reusability, recyclability, or the presence and quantity of hazardous substances in the products, taking into account the product's life cycle. After implementation, it is expected that this tool will significantly promote the design of electrical and electronic equipment placed on the market, contributing, among other things, to the prevention and reduction of e-waste generation.

Building on this, the European Commission has launched the 'Circular Electronics Initiative', which, in line with the new policy framework for sustainable products, will promote longer product lifecycles. This initiative will include regulatory measures for electronics and information and communication

technology products within the framework of Directive 2009/125/EC of the European Parliament and of the Council establishing a framework for setting eco-design requirements for energy-related products. It will encompass measures related to consumer rights for repair and updating of outdated software, regulatory measures for mobile phone chargers and similar devices, measures to improve the collection and treatment of e-waste, including considering the possibility of a take-back system or redemption of old mobile phones, tablets, and chargers at the EU level, and a revision of EU regulations on restrictions for hazardous substances in electrical and electronic equipment.

As with other specific waste categories, product design significantly impacts the amounts of waste generated when electrical and electronic products are no longer in use. This underscores the importance of educating a broad range of consumers about the way the replacing of a still functional (or repairable) electrical and electronic device affects the necessary resources (materials, energy, working hours, etc.) for manufacturing and marketing any electrical and electronic product.

In light of all the above, it is of great importance to ensure the timely implementation of the prescribed measures for preventing the generation of e-waste through the national legislative framework, conducting educational and informative activities designed to educate the general population about resource use and waste flows, as well as measures to promote the reuse of old EE equipment by establishing centres for reuse and repair, and measures for efficient recovery and/or recycling of e-waste.

#### **15.5.5. Paper and cardboard waste prevention**

Paper is one of the most significant and widespread consumer materials with nearly unlimited applications. Producing paper requires substantial natural resources, water, and energy, and the continuous deforestation associated with paper production contributes to soil erosion and reduced soil quality, as well as diminished CO<sub>2</sub> absorption capacity in forests.

When disposed of, biodegradable waste such as paper decomposes into biogas, which contains methane, a greenhouse gas linked to global warming. Disposed paper and cardboard waste decomposes slowly, extending the lifespan of landfills and associated negative environmental impacts, as well as the financial costs of landfill maintenance and monitoring.

Considering the high proportion of this type of waste in the municipal waste volume (> 23%), the successful implementation of measures and activities designed to prevent the generation of paper and cardboard waste is important for achieving the set objectives.

In 2021, there was an increase in the quantity of separately collected municipal waste in the category of paper and cardboard waste compared to previous years. The share of separately collected paper and cardboard waste in the total quantity of separately collected municipal waste was approximately 30%, making it the heaviest category of separately collected waste. In 2021, around 228,000 tonnes of paper and cardboard waste were separately collected, with a relatively high purity level (waste materials accounting for about 5%). However, it is concerning that, in terms of the composition of municipal waste, the total quantity of paper and cardboard waste amounted to around 450,000 tonnes, indicating a significant potential for the increasing of the separate collection of paper and cardboard waste and preventing further generation of this type of waste.

Large quantities of paper and cardboard waste originate from packaging. Therefore, it is necessary to promote the production and use of reusable packaging in all applicable cases. It is also essential to encourage the production and use of packaging that is of optimal volume in relation to its content,

containing no more packaging materials than necessary ('excessive packaging') for that product and is cost-effective considering the quantity of its content. Consumers and economic entities need to be educated and encouraged to engage in electronic commerce, to purchase and use paper and cardboard products suitable for multiple uses, and to use alternative products that are more suitable for multiple uses than paper and cardboard products.

#### **15.5.6. Plastic waste prevention**

Plastic waste remains a significant and a growing problem, despite significant efforts being made. Single-use plastics pose a particular issue. Often considered cheap for one-time use, they are mostly non-biodegradable, and their decomposition can take hundreds of years. Unlike organic materials, plastic accumulates in the environment and can enter the food chain as microplastics over time, which result from the breakdown of larger plastic items such as bags, bottles, and fishing nets.

In 2021, there was an increase in the quantity of separately collected municipal waste in the category of plastic waste compared to previous years. The share of separately collected plastic waste in the total quantity of separately collected municipal waste is approximately 9%. In 2021, around 74,000 tonnes of plastic waste were separately collected, with moderate purity levels (waste materials accounting for about 10%). However, it is concerning that, in terms of the composition of municipal waste, the total quantity of plastic waste amounts to around 340,000 tonnes in the observed year, indicating a significant potential for the increasing of the separate collection of plastic waste and preventing further generation of this type of waste.

The Waste Management Act (ZGO) prohibits the placement on the market of certain single-use plastic products, which will have some impact on the generation of plastic waste. In addition to the products covered by the market placement prohibition, there are various other plastic products the use of which is allowed and are often intended for single-use purposes. Therefore, it is necessary to continue with educational and awareness-raising activities, such as producing handbooks designed to reduce the consumption of disposable plastic products and implementing other projects that encourage a reduction in the use of disposable plastic products. The success of activities carried out so far in the prevention of disposable (single-use) plastic waste is evident from the decrease in the consumption of plastic bags in the recent period, as shown in Table 71 - Plastic Bag Consumption in the Republic of Croatia.

A particular part of the problem is textile materials made from synthetic fibres such as polyester and nylon, which release microplastics through wear and tear during use. Activities promoting eco-design are planned in this area.

#### **15.5.7. Construction waste prevention**

According to the Waste Management Act (ZGO), construction waste is waste generated by construction and demolition activities that is not used on the site where it is generated.

Measures designed to prevent the generation of construction waste during reconstruction, maintenance, or the removal of a building include the separation of materials and substances, as well as construction products, that are not waste (e.g., surplus materials during construction or reconstruction of a building or removed substances, materials, or construction products such as bricks or tiles from a building being removed or reconstructed) if they can be used without processing for the same purpose for which they were produced, assuming they are used on the same construction

site. This measure is part of national waste management legislation, and in order to make it more effective, it needs to be linked to legislation in the construction sector, which will be activated in the next programming period.

Inappropriate management of construction waste not only pollutes the environment but also occupies a significant volume in waste landfills. According to the results of the waste generation analysis and estimates of the quantities of generated construction waste in Croatia and the quantities anticipated for the planning period of this document, this type of waste has a high potential for recycling, thereby working towards meeting legally established objectives and, therefore, represents a priority in waste management and waste prevention activities.

The goal of preventing construction waste generation is to promote techniques and technologies aimed at prolonging the lifespan of buildings, avoiding the use of hazardous substances, and facilitating the separation of hazardous from non-hazardous substances to ultimately reduce the amount of construction waste or its use on-site, as well as the proportion of construction and demolition waste containing hazardous substances.

As for the prevention of construction and demolition waste, significant efforts are required to reduce the use of materials and avoid those with a significant environmental impact through appropriate planning techniques and the use of suitable technologies and methods. This is done to extend the lifespan of buildings through proper maintenance measures and to facilitate the reuse of materials by identifying the possibilities of waste separation and recognition during construction, renovation, and demolition.

A particular challenge in this regard is the construction of buildings that are resource and energy-efficient throughout their entire lifecycle. Furthermore, initiatives that have proven effective must be expanded through the exchange of knowledge and practical examples. It is also necessary to create a market and incentives for the use of recycled construction waste.

In the development of innovative technologies and techniques, the goal is, on one hand, to conserve resources and achieve a high level of material efficiency and a low level of waste generation, and on the other hand, to achieve high energy efficiency.

The public sector can play a significant role in all the aforementioned objectives and, in order to achieve this, continuous education on the prevention of using construction materials containing harmful substances and the reuse of construction waste should be implemented through educational institutions. This includes professional development for experts and training for public procurers. Integrating the principles of waste prevention and reuse into professional and university education is essential.

Abandoned or unused buildings, or those with a no longer relevant original purpose, are often the first step towards demolition. Repurposing buildings and developing new usage models can prolong their lifespan. The public sector can have a crucial role in this regard, given the large number of State-owned buildings.

The prevention of waste generation and the potential for reuse in the construction sector are fundamentally determined during the planning phase. Therefore, the design and planning domain represents a crucial point in waste prevention activities. As such, the principles of waste prevention and reuse in the construction sector must be integrated into professional and university education.

In addition to immediate waste prevention, the application of planned measures aims to improve the long-term quality of construction waste and demolition waste, making it easier to reuse or recover.

With the purpose of making significant strides in construction waste management and prevention, a project was initiated at the end of 2021 to develop an Action Plan for the Circular Economy in the construction waste management sector in the Republic of Croatia.

In order to encourage the use of construction materials before they become waste and promote the reuse of demolition and other construction waste, the introduction of incentive fees for the reuse of demolition and other construction materials is planned.

#### **15.5.8. Textile and footwear waste prevention**

Despite the relatively small proportion (<3%) of textile waste in the municipal waste volume, the environmental footprint of textile products and footwear is remarkably significant. The textile industry and fast fashion sector, in particular, are one of the economic sectors with the most pronounced environmental impact. In recent decades, the 'fast fashion' model has become increasingly prevalent, leading to increased quantities of textile waste and environmental pollution throughout the production process. The production of textiles and footwear requires a substantial amount of resources (water and energy), and large quantities of harmful chemicals are released into the environment during production. There is a significant lack of public knowledge and awareness regarding these facts.

The Circular Economy Action Plan highlights that textiles represent the fourth-largest category in terms of the use of primary raw materials and water, following food, housing, and transport.

Implementing eco-design in the production of textiles and footwear and promoting eco-labels, efforts need to be made to prevent the generation of this type of waste. This will contribute to raising public awareness of the benefits of purchasing environmentally friendly products.

The establishment of reuse centres will also help reduce the generation of textile waste, and through informational and educational activities, the donation and exchange of used footwear and clothing will be encouraged.

#### **15.5.9. Marine litter prevention**

Marine litter consists of solid materials that are produced or processed and end up in the sea in some way. The most common type of waste found in the oceans is plastic, specifically single-use plastic packaging waste. This is followed by fishing nets, ropes, hygiene products, cigarette butts, and the like, which can be located on the sea surface, in the water column, on the seafloor, or washed ashore.

Sunlight, saltwater, and waves break down plastic into smaller pieces that accumulate in the seas. Moreover, cosmetic products, toothpaste, and personal care items often contain microplastics.

When marine litter is present in the sea, it does not belong to anyone, making waste management challenging.

Reducing single-use plastic products, lightweight plastic bags, packaging waste, increasing recycling rates, and improving waste water treatment would enable the prevention of marine litter.

## 15.6. Waste prevention measures

Below are the measures and a description of waste prevention measures aimed at achieving the specified targets of the National Waste Prevention Programme for this year (Table 75) (Table 76).

**Table 75. Overview of waste prevention measures and links to specific objectives**

Nr.	Measure name	Specific objective:	Link with the measure from Annex IV. of Directive 2008/98/EC
<b>Measure 1.</b>	Strengthening the policy framework for the transition to a circular economy in the construction sector	Construction waste prevention	Introducing planning or other economic instruments promoting efficient use of resources (1.) Conducting awareness-raising campaigns and providing information targeted at the general public or specific consumer groups (12.)
<b>Measure 2.</b>	Strengthening the policy framework for food waste prevention	Organic (bio-waste) prevention	Introducing planning or other economic instruments promoting efficient use of resources (1.)
<b>Measure 3.</b>	Improving the data monitoring system for organic waste (bio-waste)		Developing effective and comprehensive environmental pressure indicators related to waste generation to contribute to waste prevention at the local government (LSGU) and regional government (RSGU) levels and at the national level in Croatia (3.)
<b>Measure 4.</b>	Promoting household composting		Conducting awareness-raising campaigns and providing information targeted at the general public or specific consumer groups (12.)
<b>Measure 5.</b>	Encouraging the reduction of disposable (single-use) plastic product consumption	Plastic waste and marine litter prevention	Promoting research and development in achieving cleaner technologies and products with less waste, and disseminating and utilising the results of such research and development (2.)  Promoting ecodesign (systematic integration of environmental aspects into the product design with the aim of improving the product's environmental performance throughout its lifecycle) (4.)  Entering into voluntary agreements, organising consumer/producer forums, or sectoral negotiations to encourage relevant business or industrial sectors to develop their own waste prevention plans or objectives or to replace products or their packaging that generate excessive waste (9.)  Economic instruments such as initiatives for more environmentally responsible consumer behaviour, like purchasing products with minimal packaging or introducing a requirement for consumers to pay for packaging that is otherwise provided for free (11.)  Raising awareness and providing information to the general public or specific consumer categories through awareness-raising campaigns (12.)
<b>Measure 6.</b>	Promoting the purchase of 'green' products and services	Prevention of MSW, WEEE, paper and cardboard waste, construction waste, textile and footwear waste, and plastic waste	Integrating environmental protection and waste prevention criteria into public and corporate procurement procedures (15.)
<b>Measure 7.</b>	Raising awareness, conducting education on waste prevention, and sharing best practices	Prevention of MSW, WEEE, paper and cardboard waste, construction waste, textile and footwear waste, plastic waste and marine litter	Raising awareness and providing information to the general public or specific consumer categories through awareness-raising campaigns (12.)
<b>Measure 8.</b>	Promoting ecodesign (systematic integration of environmental aspects into product design with the aim of improving product environmental performance throughout its lifecycle)		Introducing planning or other economic instruments that promote the efficient use of raw materials and resources (1.)  Promoting research and development in achieving cleaner technologies and products with less waste, and disseminating and utilising the results of such research and development (2.)

			Promoting ecodesign (systematic integration of environmental aspects into the product design with the aim of improving the product's environmental performance throughout its lifecycle) (4.)  Organising awareness-raising campaigns and providing information targeted at the general public or specific consumer categories (12.)  Promoting recognised eco-labels (13.)
<b>Measure 9.</b>	Promoting established environmental management systems, including EMAS and ISO 14001 systems		Promoting established environmental management systems, including EMAS and ISO 14001 (10.)
<b>Measure 10.</b>	Developing a waste prevention plan		Introducing planning or other economic instruments that promote the efficient use of raw materials and resources (1.)
<b>Measure 11.</b>	Promoting the exchange and reuse of scrap products	Preventing the generation of municipal, textile, and footwear waste, WEEE	Promoting the reuse and/or repair of appropriate scrap products or their components, particularly through educational, economic, logistical, and other measures (16.)
<b>Measures that can impact the framework conditions related to waste generation</b>		<b>Measure 1., Measure 2., Measure 3., Measure 5., Measure 8., Measure 10.,</b>	
<b>Measures that can impact the design and production phases and distribution</b>		<b>Measure 1., Measure 2., Measure 5., Measure 8., Measure 9.</b>	
<b>Measures that can impact the consumption and utilisation phase</b>		<b>Measure 1., Measure 2., Measure 4., Measure 5., Measure 6., Measure 7., Measure 8., Measure 11.</b>	

### **Measure 1. Strengthening the policy framework for the transition to a circular economy in the construction sector**

This measure will influence the prevention of construction waste and its reuse, taking into account the entire lifespan of a building and the construction value chain. Reducing the generation of construction waste can be achieved by extending the lifespan of a building through the adoption of new renovation techniques. In order to do so, it is necessary to draft guidelines for the reuse of components of a building removed before demolition, repurposing, and renovating buildings in line with the concept of a circular economy, as well as strengthening the local market for these removed components. The guidelines will include a list of potential removed building components, such as doors, windows, and other non-structural elements. They will also contain a standard checklist to facilitate the assessment of reuse and improve reuse centres. The introduction of an incentive fee for reusing materials from demolition and other construction activities will increase the demand for these materials and, as a result, prevent the generation of construction waste.

By conducting a study on the prerequisites and consequences of implementing an obligation to use a certain proportion of recycled materials in the construction of public buildings and infrastructure, the justification for the potential introduction of such an obligation will be analysed.

### **Measure 2. Strengthening the policy framework for food waste prevention**

The specific objectives, measures, and activities for the implementation of food waste prevention plan are defined in the *Waste Prevention and Reduction Plan of the Republic of Croatia for the period from 2023 to 2028*, which is the responsibility of the Ministry of Agriculture.

### **Measure 3. Improving the data monitoring system for organic waste (bio-waste)**

Ensuring reliable, relevant, and consistent data on the quantities of bio-waste is an important tool for strategic planning and goal setting, not only in the waste management sector but also in the area of waste prevention.

The objective of this measure is to enhance the existing system for measuring the quantities of bio-waste generated at the national level and to establish a monitoring system for the quantities of bio-waste prevented through household composting. The monitoring of the quantities of bio-waste prevented through household composting is a requirement stipulated by the Waste Management Regulations (Official Gazette nr. 106/22).

These systems will be utilised to monitor the effectiveness of implemented measures aimed at preventing the generation of bio-waste (educational and informative activities, distribution of household composters, etc.) and to fulfil the reporting obligations of the Republic of Croatia to the European Commission.

In order to enhance the existing system for the monitoring of food waste prevention, it is necessary to establish an electronic application for the collection of data from businesses. In order to achieve a comprehensive understanding of the quantities of food waste generated at the national level, it is also mandatory to conduct a statistical survey once every four years on food waste generated in households, following the methodology of the European Commission as outlined in Commission Delegated Decision (EU) 2019/1597 and Commission Implementing Decision (EU) 2019/2000.

By Implementing Decision 2019/1004/EU, general guidelines have been established for the collection and calculation of the quantities of household composted waste in accordance with two methodologies. Based on these guidelines, there is a need to develop a unified national methodology for assessing the effectiveness of measures to prevent the generation of food waste. Following the developed methodology, a project will be conducted to assess the effectiveness of the measure for preventing the generation of food waste through household composters.

#### **Measure 4. Promoting home composting**

The aim of this measure is to encourage households to compost food waste in their own composters and obtain an organic fertiliser for free, thereby achieving savings on the purchase of fertilisers for gardening. Since the implementation of household composting depends on available areas for the utilisation of the produced compost, priority for the implementation of this measure is given to rural areas, particularly suburban areas of urban environments with a higher number of standalone residential units with yards.

By intensifying the use of household composting, it contributes to the prevention of food waste disposal in landfills, while also raising awareness of the impact of responsible consumption on waste generation. Additionally, household composting reduces the environmental footprint associated with waste transportation and management.

In order to engage local government units actively in promoting composting in households, it is necessary to organise educational workshops for these units, the programme of which can be based on educating them on how to organise and conduct quality campaigns on preventing food waste generation, including education on the importance of composting and the use of composters.

Additionally, it is possible to encourage home composting through co-financing the purchase of household composters.

#### **Measure 5. Encouraging the reduction of disposable (single-use) plastic product consumption**



Apart from producing a manual for the general public with basic information about single-use plastic products, tips, and recommendations on how to reduce their consumption, considering that tourism is one of the most important economic sectors in the Republic of Croatia, a specific training manual on preventing the generation of plastic waste from single-use products in the tourism sector needs to be developed.

Efforts will be made to promote the preparation and implementation of projects designed to prevent and/or reduce the adverse environmental impact of certain plastic products and to facilitate the transition to a circular economy. Furthermore, there are plans to regulate the prevention and/or reduction of this adverse impact through a new Regulation on Packaging and Packaging Waste. Planned projects can encompass any phase of a product's lifecycle, such as research and development for cleaner technologies and products with less non-reusable and non-recyclable material, the production and distribution of single-use plastic products, to the phase of their consumption or use. Financial resources for the preparation and implementation of these projects will be allocated through public calls based on predefined criteria.

Investing in research and innovative solutions and models that contribute to the prevention and reduction of this type of waste will also strengthen collaboration among relevant stakeholders, the scientific and academic community, the business sector, public authorities, consumers, NGOs, and others. Strengthening such a synergistic approach is one of the key prerequisites for facilitating the transition to a circular economy.

Moreover, there is a need to encourage the development and implementation of initiatives that contribute to the prevention and/or reduction and reuse of plastic packaging waste. In this way, conditions and methods for promoting the production and placement on the market of reusable packaging waste, market share targets, informative campaigns, awareness-raising campaigns, and more can be determined.

#### **Measure 6. Promoting the purchase of environmentally friendly products and services**

By incorporating environmental criteria and establishing their own public procurement policies, and by defining new specifications for goods and products that favour sustainability, the possibility of multiple uses, reduced packaging, or reduced toxicity, both the public and private sectors can direct their consumer power towards waste reduction and, consequently, waste disposal.

In addition to substituting conventional goods, services, and works with more environmentally friendly alternatives in public and corporate procurement processes, competition criteria should be defined in a way that positively values and rewards these environmentally friendly alternatives.

Activities to promote green public procurement will continue among education programme implementers so that they can further incorporate this education into their regular programmes, or certified public procurement implementers. Other informational and educational workshops and projects on the topic of green public procurement will also be conducted. Collaboration with various stakeholders will be maintained to continuously populate the database of best practices. The development and maintenance of a national website on green public procurement will continue to meet user needs (<https://zelenanabava.hr/>). The implementation of the Government's Decision on Green Public Procurement will be monitored, and reports will be prepared for national, European, and international purposes. The basic activities for implementing this measure include the following:

- Information and education workshops on green public procurement.

- Training programmes on green public procurement with new information at the European Union level related to green public procurement and examples of best practices, in line with the requirements of the Regulation on education in the field of public procurement (Official Gazette nr. 65/17).
- Maintenance of a database of best practices by procurement category.
- Management of the national website for green public procurement.

In line with the European Green Deal, which has identified the construction sector as a priority for the implementation of green public procurement, guidelines for green public procurement in the design, construction, and management of commercial buildings and the design, construction, and maintenance of roads are planned. These guidelines will adopt a lifecycle approach, where, in addition to using recycled materials in construction, the design of buildings will consider materials that can be reused and/or recycled to a significant extent after removal/disassembly.

#### **Measure 7. Raising awareness, conducting education on waste prevention, and sharing best practices**

By implementing national campaigns on waste prevention, this horizontal measure will contribute to the prevention of all specific waste prevention targets defined in the *Waste Prevention Programme for the period 2023-2028*. National campaigns are an effective tool for raising citizens' awareness of the importance of waste prevention and changing consumption patterns.

Additionally, within the project 'Technical Assistance to the Ministry of Economy and Sustainable Development for Sustainable Waste Management - Transition to Circular Economy', a *Communication Plan for the Circular Economy* was developed. As part of this communication plan, an extensive analysis and stakeholder mapping were conducted, along with a SWOT analysis<sup>33</sup>, and appropriate communication methods and tools were proposed, along with an action plan for communicating circular economy. Measures and activities related to waste prevention are also integral to this national communication plan.

#### **Measure 8. Promoting ecodesign (systematic integration of environmental aspects into product design with the aim of improving product environmental performance throughout its lifecycle)**

Ecological design is an essential element that influences waste prevention, general environmental pollution reduction, resource circularity, and raises awareness of the importance of environmental preservation.

The utility of modulating fees for products in an extended producer responsibility system is manifold, ranging from the indirect information provided to consumers about which products are 'greener' or have a lower environmental footprint due to the reduced presence or absence of hazardous substances, to the promotion of recycling and the stimulation of demand for secondary materials. The application of this economic instrument that encourages the development of eco-design should be used in conjunction with the promotion of eco-labels, ensuring consumer awareness and, in general, fostering the demand and consumption of sustainable products.

In order to establish a legal framework for implementing modulated fees within extended producer responsibility systems, it is necessary to conduct an analysis designed to determine the most

---

<sup>33</sup> Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

environmentally and economically efficient models of modulated fees for products in the extended producer responsibility system. This analysis should take into account durability, reparability, reusability, recyclability, the presence and quantity of hazardous substances in products, and the product's lifecycle. The analysis will also meet the need to expand the extended producer responsibility system to other products and materials.

Furthermore, an expert analysis will be conducted on products in the Croatian market that are relevant in terms of the proportion of critical raw materials. It will propose a methodology for monitoring and appropriate indicators to ensure comprehensive and reliable data on the proportions (quantities) and methods of managing critical raw materials in various waste flows, in line with the EU list of critical raw materials from 2020 (Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability, Brussels, 3 September 2020, COM(2020) 474 final).

The European Green Deal arising from the European Green Deal (2019) strongly supports the development and strengthening of reliable eco-labels to achieve environmental and climate objectives, as well as to protect consumers from false and misleading green labels. Therefore, the Ministry will continue to promote the visibility of the EU Ecolabel and the development of the national 'Environmentally Friendly' label. In cooperation with the Eco-label Commission, activities to promote the visibility of the EU Ecolabel and the national 'Environmentally Friendly' label in the business sector will continue by highlighting the benefits of producing green products and providing green services. Further possibilities for encouraging the economy to obtain these eco-labels will be analysed. In order to implement the new EU legislation on empowering consumers, the value of these eco-labels in the context of sustainable consumption and sustainable lifestyles will be communicated more strongly in cooperation with the relevant consumer protection authorities and other stakeholders.

Collaboration with the Ministry of Tourism and Sports will continue to promote these eco-labels so that this sector, which has significant economic importance in Croatia, makes its maximum contribution to reducing environmental and climate pressures. Information and education workshops will continue in collaboration with key stakeholders in the tourism sector. Procedures for awarding these eco-labels and the national registry will continue in accordance with regulations, and reports will be prepared for national, European, and international purposes.

Promoting the certification of sustainable products and services will also be carried out in the following manner:

- Information and education workshops aimed at the business sector
- Information and education workshops aimed at the tourism sector
- Analysis of further possibilities to encourage businesses to obtain the EU Ecolabel and the 'Environmentally Friendly' label
- Consumer-oriented campaign for choosing green products and services carrying the EU Ecolabel or the 'Environmentally Friendly' label
- Management of the Facebook page for EU Ecolabel Croatia
- Management of the national Eco-label Commission
- Development of the national 'Environmentally Friendly' label in line with national needs.

Additionally, under this measure, research and development projects in the field of eco-design and assistance to manufacturers in more efficient use of natural resources, especially critical raw materials, are planned.

**Measure 9. Promoting established environmental management systems, including EMAS and ISO 14001 systems**

Environmental management systems provide an organised and effective framework for waste prevention. Activities will be carried out to promote the importance and effectiveness of these systems, as well as to organise expert events aimed at providing support to companies in the implementation of environmental management systems.

By implementing the EMAS system, the effectiveness of organisations in improving their environmental and climate performance has been demonstrated. The EMAS focuses on six key areas: energy efficiency, sustainable resource management, water, waste, biodiversity, and greenhouse gas emissions. There is a need to increase the number of organisations in Croatia that have adopted this prestigious European label, as Croatia currently lags behind in the EU with only three certified organisations. The Ministry responsible for EMAS will collaborate with the national EMAS Commission to develop an EMAS Programme. This programme will include proposals for additional incentives and facilitation measures for organisations, guidelines for enhancing EMAS, and suggestions for promotion. Additionally, there are plans to create a co-financing programme for the implementation of EMAS in the public and private sectors with the assistance of EU funds. Information and education workshops on EMAS are also part of the plan.

#### **Measure 10. Developing a waste prevention plan**

This measure involves the development of waste prevention plans for counties in accordance with guidelines provided by the Ministry. This initiative will further strengthen the implementation of the legislative framework, particularly in the context of waste management priorities.

#### **Measure 11. Promoting the exchange and reuse of scrap products**

The national legislative framework has been adjusted to establish centres for reuse, allowing for the creation of reuse and repair centres designed for collecting, sorting, and/or repairing scrap products, as well as connecting with charitable institutions that can reuse these products. The implementation of this measure includes plans to establish new reuse and repair centres, make structural modifications to existing buildings to adapt them to their new purposes, and procure equipment for these centres. Furthermore, active promotion of reuse and repair will be conducted through the development and distribution of promotional materials, workshop organisation, and other activities. Additionally, the enhancement and strengthening of the capacity of the reuse system are planned through the introduction of an economic instrument that encourages investment in the development of reuse centres within civic amenity sites.

The implementation of this measure is directly related to the implementation of Measure 8 and the application of eco-modulation in determining fees paid by producers of products covered by extended producer responsibility systems. This takes into account sustainability, repairability, reusability, recyclability, the presence and quantity of hazardous substances in products, and the product lifecycle.

Furthermore, there are plans for increased collaboration with all economic entities in the product production and sales chain to improve existing extended producer responsibility systems and further facilitate the transfer of scrap products into existing systems, with the aim of reuse, effective recovery, and/or recycling.

**Table 76. Overview of measures and activities associated with the implementation of the Waste Prevention Plan for the period from 202 to 2028**

Activity (A)	Holder	Co-holders	Potential funding sources	Performance indicator			Measure/activity implementation timeline (Q-quarter)						
				Name	UoM	Target value	2023	2024	2025	2026	2027	2028	
<b>Specific objective: Construction waste prevention</b>													
<b>Measure 1 Strengthening policy frameworks for the transition to a circular economy in the construction sector</b>													
A 1.1.	Creation of a study on the prerequisites and consequences of introducing the obligation to use a specific proportion of recycled material in the construction of public buildings and infrastructure	MESD	MESD	PI/CEE	Creation of a study on the prerequisites and consequences of introducing the obligation to use a specified percentage of recycled materials in the construction of public buildings and infrastructure	Number	1				4K		
A 1.2.	Development of Guidelines on the possibilities of reusing non-structural building components (doors, windows, etc.)	MESD	MPPCSA	Academic community	Development of guidelines on the possibilities of reusing non-structural parts of buildings (doors, windows, etc.)	Number	1		4K				
A 1.3.	Introduction of incentive fees for reusing materials from demolition and other construction activities	MESD	MPPCSA		Implementation of the incentive fee	Number	1					4 K	
<b>Specific objective: Bio-waste prevention</b>													
<b>Measure 2. Strengthening policy frameworks for the prevention of food waste</b>													
A 2.1.	Implementation of the Waste Prevention and Reduction Plan for Food Waste in Croatia for the period 2023-2028.	MoA	Specified in the Food Waste Prevention and Reduction Plan in Croatia for the period 2023-2028										
<b>Measure 3. Improving the data tracking system for organic waste</b>													
A 3.1.	Establishment of an application for collecting and processing data on food waste originating from the business sector	MESD	-	MESD/EPEEF/EU	Functional application for collecting and processing data on food waste originating from the business sector	Number	1	4K					
A 3.2.	A statistical research project on household-originated food waste	MESD	-	MESD/EPEEF/EU	Conducted a statistical research project on food waste originating from households	Number	1		4K				
A 3.3.	Development of a methodology for assessing the effectiveness of measures to prevent bio-waste generation	MESD	-	MESD/EPEEF/EU	Development of a methodology to assess the effectiveness of measures to prevent food waste	Number	1		4K				
A 3.4.	Project to assess the effectiveness of measures to prevent bio-waste generation through home composting	MESD	LSGU	MESD/EPEEF/EU	Implemented a project to evaluate the effectiveness of food waste prevention measures through home composting	Number	1			4K			
<b>Measure 4. Promoting home composting</b>													
A 4.1.	Procurement and distribution of home composters	LSGU	EPEEF	LSGU/EPEEF/EU	Local government units promoting and implementing home composting	Number	300 (50 per year)						
A 4.2.	Development of educational and informative materials	LSGU	EPEEF	LSGU/EPEEF/EU									
A 4.2.	Organisation of educational and informative activities and events	LSGU	EPEEF	LSGU/EPEEF/EU									
<b>Specific objective: Plastic waste and marine litter prevention</b>													
<b>Measure 5. Encouraging the reduction of single-use plastic product consumption</b>													
A 5.1.	Creation of a manual for reducing the consumption of single-use plastic products	MESD	EPEEF	MESD/EPEEF/EU	Manual produced for the purpose of reducing the consumption of single-use plastic products	Number	2						
A 5.2.	Improvement of the system for reducing the consumption of very lightweight plastic carrier bags	MESD	EPEEF	MESD/EPEEF/EU	Reduced quantity of very lightweight plastic carry bags placed on the market compared to the previous year	%	5						
A 5.3.	Projects designed to promote the reduction of single-use plastic product consumption	MESD	EPEEF/MMATI/academic community/CS	MESD/EPEEF/EU	Implemented projects designed to encourage the reduction of single-use plastic products	Number	12*						
A 5.4.	Strengthening dialogue and encouraging the conclusion of voluntary agreements on the prevention, reduction, and reuse of plastic packaging waste	MESD		MESD	Number of voluntary agreements stipulated and/or initiatives implemented	Number	10						
<b>Specific objective: Prevention of MSW, WEEE, paper and cardboard waste, construction waste, waste textile and footwear, and plastic packaging waste</b>													
<b>Measure 6. Promoting the purchase of environmentally friendly products and services</b>													
A 6.1.	Promotion of Green Public Procurement through the national Green Public Procurement website	MESD	-	MESD	Functional Green Public Procurement website	Number	1						
A 6.2.	Education on Green Public Procurement	MESD	-	MESD	Conducted training on Environmentally friendly (Green) Public Procurement	Number	6						
A 6.3.	Development of guidelines for implementing Green Public Procurement for the design, construction, and maintenance of roads	MESD	MPPCSA	MESD	Developed guidelines for the implementation of Green Public Procurement for the design, construction, and maintenance of roads	Number	1		4K				
A 6.4.	Establishment of a database of best practice examples	MESD	-	MESD	Functional database of best practice examples	Number	1	4K					
A 6.5.	Creation of informative and educational materials (guides, guidelines, etc.)	MESD	-	MESD	Prepared informative and educational materials	Number	4						
A 6.6..	Promotion of the integration of environmental protection and waste prevention criteria into calls for tenders and contracts for public and corporate procurement of goods and services	MESD	-	MESD	Increased number of environmentally friendly ('green') public and corporate procurements	%	50						
<b>Specific objective: Prevention of MSW, WEEE, paper and cardboard waste, construction waste, waste textile and footwear, plastic waste and marine litter</b>													
<b>Measure 7. Raising awareness and providing education on the prevention of waste and the exchange of best practices</b>													
A 7.1.	Implementation of a national campaign on waste prevention and the circular economy. Campaigns focused on the following topics, at a minimum: the general importance and role of waste prevention, municipal waste, WEEE, paper and cardboard waste, construction waste, waste textiles and footwear, plastic waste, marine litter	MESD	EPEEF	MESD/EPEEF/EU	Implemented a national campaign on waste prevention	Number	12						
<b>Measure 8. Promoting eco-design (systematic integration of environmental aspects into product design to enhance the product's environmental performance throughout its life cycle)</b>													

A 8.1.	Development of an analysis and the definition of criteria for an eco-modulation model in determining fees that manufacturers of products covered by extended producer responsibility systems should pay	EPEEF	MESD	MESD/EPEEF/EU	Developed an analysis and criteria for an eco-modulation model to determine fees that manufacturers of products covered by extended producer responsibility systems should pay	Number	1		1K					
A 8.2.	Creation of an analysis on critical raw materials in products placed on the Croatian market and the development of a methodology for monitoring their utilisation	MESD	EPEEF	MESD/EPEEF/EU	Created an analysis of critical raw materials in products placed on the Croatian market and developed a methodology for the monitoring of their utilisation	Number	1			1K				
A 8.3.	Implementation of an eco-modulation model in determining fees that manufacturers of products covered by extended producer responsibility systems should pay	EPEEF	MESD	-	Successful implementation of the eco-modulation model in determining fees that manufacturers of products covered by extended producer responsibility systems should pay will be monitored through the achievement of national objectives for each product category	n/a	n/a							
A 8.4.	Promotion of the certification of sustainable products and services (promotion of eco-labels)	MESD	Ministry of Tourism and Sport/ EPEEF	MESD/EPEEF/EU	Entities that have received the eco-label granted by the Ministry of Economy and Sustainable Development	Number	40							
A 8.5.	Research and development projects in the field of ecological design and assistance to manufacturers in more efficiently utilising natural resources, particularly critical raw materials	MESD	EPEEF /MPPCSA/academic community/BS	MESD/EPEEF/EU	Conducted research and development projects in the field of ecological design and assisted manufacturers in more efficiently utilising natural resources, especially critical raw materials	Number	12*							
<b>Measure 9. Encouraging certified environmental management systems, including EMAS and ISO 14001</b>														
A 9.1.	Implementation of promotional activities	MESD	-	MESD/EPEEF/EU	Conducted campaigns, workshops, and roundtable discussions	Number	6							
A 9.2.	Operation of the national EMAS website	MESD	-	MESD/EPEEF	Functional national EMAS website	Number	1							
A 9.3.	Development of an EMAS Programme	MESD	-	MESD/EPEEF	Developed an EMAS Programme	Number	1	4K						
A 9.4.	Development of a co-financing programme for the introduction of EMAS	MESD	-	MESD/EPEEF	Developed a co-financing programme for the introduction of EMAS	Number	1	4K						
<b>Measure 10. Developing a Waste Prevention Plan</b>														
A 10.1.	Creation of guidelines for the preparation of waste prevention plans	MESD	-	MESD/EPEEF	Created guidelines for the preparation of waste prevention plans	Number	1							
A 10.2.	Development of a waste prevention plan	RSGU	-	L(R)SGU/EPEEF/EU	Prepared waste prevention plans for regional waste management systems	Number	21							
<b>Specific objective: Preventing MSW, WEEE, waste textile and footwear</b>														
<b>Measure 11. Fostering product exchange and reuse of scrap products</b>														
A 11.1.	Establishment of reuse centres	LSGU/CS/PI	MESD	LSGU/CS/EU/PI	Established and operational reuse centres	Number	10							
A 11.2.	Creation and distribution of promotional materials and organisation of workshops and other informative and educational activities on reuse and repair	LSGU/CS/PI	MESD	LSGU/CS/EU/PI	Number of local government units conducting activities to promote reuse	Number	556							