

GOVERNMENT OF THE REPUBLIC OF CROATIA

WASTE MANAGEMENT PLAN OF THE REPUBLIC OF
CROATIA FOR THE PERIOD 2017-2022

Zagreb, January 2017

ABBREVIATIONS

The following abbreviations were used in this document:

ASWM	Act on Sustainable Waste Management
BAT	Best available techniques
CAEN	Croatian Agency for Environment and Nature
CCE	Croatian Chamber of Economy
CCTC	Croatian Chamber of Trades and Crafts
CS	Civil society
CW	Croatian Waters
CEIS	Croatian Environmental Information System
EE	Electrical and electronic devices and equipment
EPEEF	Environmental Protection and Energy Efficiency Fund
EPR	Environmental Pollution Register
GDP	Gross domestic product
LSGU	Local self-government units
MA	Ministry of Agriculture
MBT	Mechanical-biological treatment
MCP	Ministry of Construction and Physical Planning
MEE	Ministry of Environment and Energy
MEEC	Ministry of Economy, Entrepreneurship and Crafts
MH	Ministry of Health
MI	Ministry of the Interior
MINFIN	Ministry of Finance
MMW	Mixed municipal waste
MSTI	Ministry of the Sea, Transport and Infrastructure
MW	Municipal waste
OG	Official Gazette
OPCC	Operational Programme Competitiveness and Cohesion
PCB	Polychlorinated biphenyls and terphenyls
PI	Private investments
RC	Republic of Croatia
RDF	Combustible waste (Refuse-derived fuel)
RSGU	Regional self-government units
SCW	Special categories of waste
WMC	Waste management centres

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1. WASTE MANAGEMENT STATUS IN THE REPUBLIC OF CROATIA

1.1 ORIGIN, COMPOSITION, CATEGORIES AND TYPES OF WASTE

1.1.1 Total quantities of waste¹

In 2014 the total reported quantities of produced waste (municipal and production waste) were around 3.7 million tonnes which is a 10.5% increase compared to 2012. Of the total amount of waste, non-hazardous waste constitutes 97%, while hazardous waste constitutes the remaining 3%.

Regarding the origin of the waste, the largest portion is household waste (31%), which includes different types of waste produced by citizens, from municipal waste to other types of waste like, for example, end-of-life vehicles. As regards business and industry activities, the biggest producers of waste are the service sector and the construction sector, each with a portion of 17%. After that comes the processing industry with a portion of 12% and waste collection, treatment, disposal and recovery activities with a portion of 11%. The remaining business activities comprise 12% of the total quantities of produced waste, but it is important to note that the data on reported quantities of waste from certain sectors are still of insufficient quality (construction, agriculture etc.) In addition, a part of the remains, e.g. from agriculture, forestry or from extraction of mineral resources is not considered waste and hence is not reported.

Together with certain kinds of municipal waste (e.g. mixed municipal waste), in the total quantities of produced waste, the most numerous types are waste metals (13%), soil (9%), mineral construction waste (9%), animal faeces, urine and manure (7%) and waste paper (6%).

According to reported data from recovery or waste disposal entities, in 2014, a total of around 3.4 million tonnes of waste has been treated (production and municipal waste), of which 3.1 million is waste from within Croatia, while 315,000 tonnes are imported waste. The data pertain to “finishing operations”, after which no further waste treatment takes place. The remaining quantities of produced waste are subjected to pre-treatment procedures, i.e preparation for finishing operations or exported to be processed outside of the Republic of Croatia (hereinafter: RC).

A view of the portion of finishing operations on waste collected in the RC and treated in 2014 is shown in Image 1.

¹ At the time of the creation of the Plan, the data on production waste for 2015 have not yet been processed, so the view of total quantities of waste and production waste quantities is based on official data by CAEN for the year 2014.

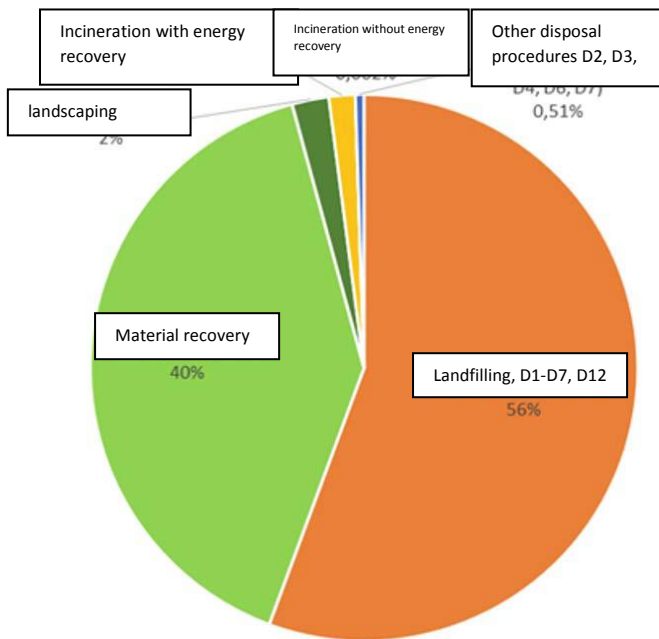


Image 1 Percentage of recovery/disposal of total waste (production and municipal) in the RC in 2014 according to the reports by waste treatment facilities (CAEN, 2016)

56% of total processed waste (production and municipal) collected in the RC was landfilled, while 44% was recovered. In comparison to 2012, a 10% decrease in waste disposal procedures was noted, as well as an 8% increase in recovery.

In recovery (44%), the biggest part is material recovery (40%), while a very small fraction refers to energy recovery (2%) and procedures such as using construction and demolition waste at landfills for technical purposes in landscaping or as cover material (2%). The portion of waste processed via incineration without energy recovery is negligible, and constitutes a mere 0.002%.

1.1.2 Municipal waste

The Act on Sustainable Waste management (hereinafter: ASWM) (OG 94/13) defines *municipal waste* as waste produced in households and waste which is in its nature and composition similar to household waste, excluding production waste and agriculture and forestry waste.

Mixed municipal waste is waste from households and waste from stores, industry and institutions which is in its properties and composition similar to household waste, and which has not been subjected to special procedures of extraction of certain materials (e.g. paper, glass etc.), and carries the code 20 03 01 in the Waste catalogue (Ordinance on the waste catalogue, OG 90/15).

The public service of collecting municipal waste in 2015 was utilized by 99% of the population in the RC, and it was not available in one municipality.

In 2008, the long-standing growth of produced quantities of municipal waste was stopped, after which there is a decrease in reported quantities until 2010, which can be explained by the economic crisis. From 2010 onwards, the quantities are mostly stagnant, with the exception of 2013, when the illegal landfills remediation caused somewhat higher quantities of produced municipal waste in the reports. From 2011 onwards, the total quantities of municipal waste also include the quantities originating from the service sector, and which are considered municipal waste (waste paper and cardboard, packaging waste etc.).

The efficacy of resource use or of sustainable development of the economy and society is a measure of the environmental protection policy that represents a challenge on the European as well as the Croatian level. According to the data by the Croatian Agency for the Environment and Nature (hereinafter: CAEN), despite the activities implemented in this area (fees regarding the use of natural resources and environmental degradation, the need to follow the states and trends in various sectors of the economy, the development of green economy and others), the separation of resource use and economic growth has not yet been achieved fully, nor has the separation of waste production and economic growth been achieved, as defined by the Sustainable Development Strategy of the Republic of Croatia (OG 30/09). The separation between waste production and economic growth, which is shown as the relationship between the quantity of waste, in this case municipal, produced per capita and gross domestic product (GDP), per year (kg/EUR), is shown in Image 2.

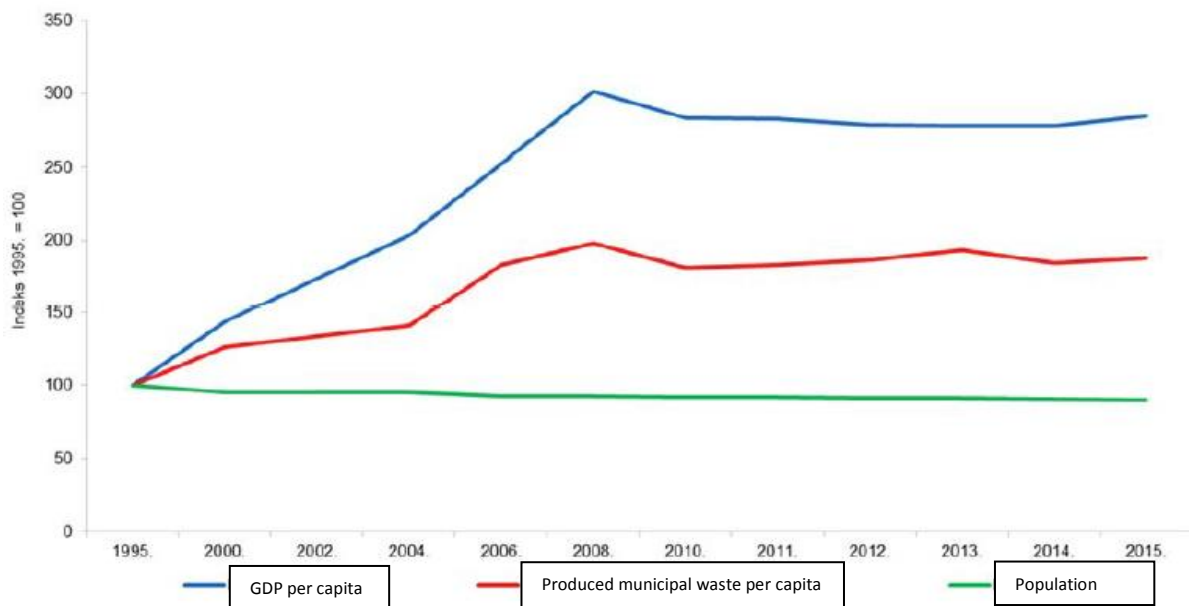


Image 2 Intensity of waste production in the RC in the period from 1995 to 2015 (CAEN, 2016)

Total quantity of produced municipal waste in 2015 was 1,653,918 tonnes, or 386 kilogrammes per capita. Annual quantities of produced municipal waste in the RC for the period of 1995 to 2015 are shown in Image 3.

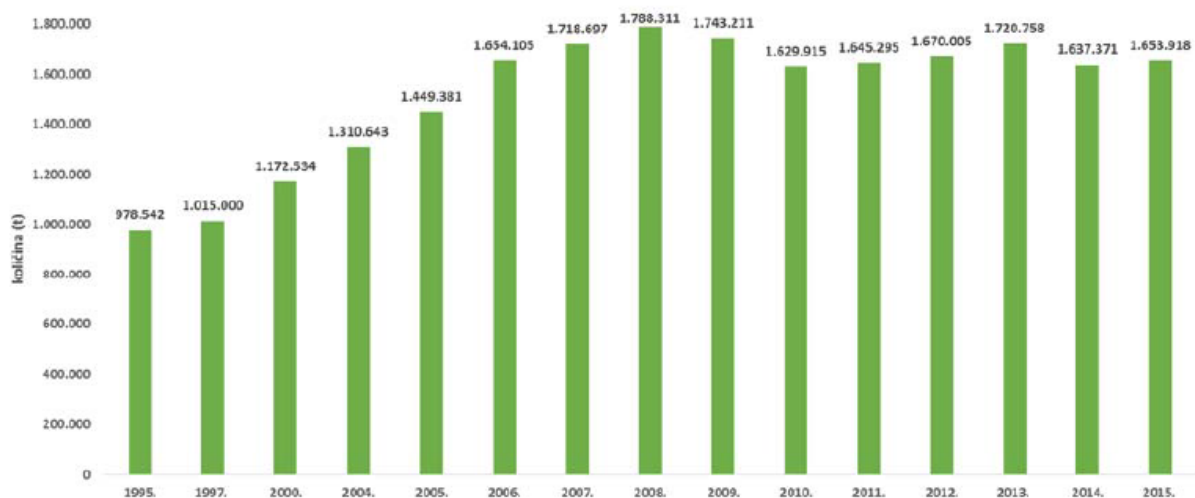


Image 3 Annual quantities of produced municipal waste in the RC in the period from 1995 to 2015 (CAEN, 2016)

When observing the quantities of produced municipal waste with regards to the origin (county), a disproportion between “continental” and “coastal” counties can be noted, mostly due to the effect of tourism (Image 4).

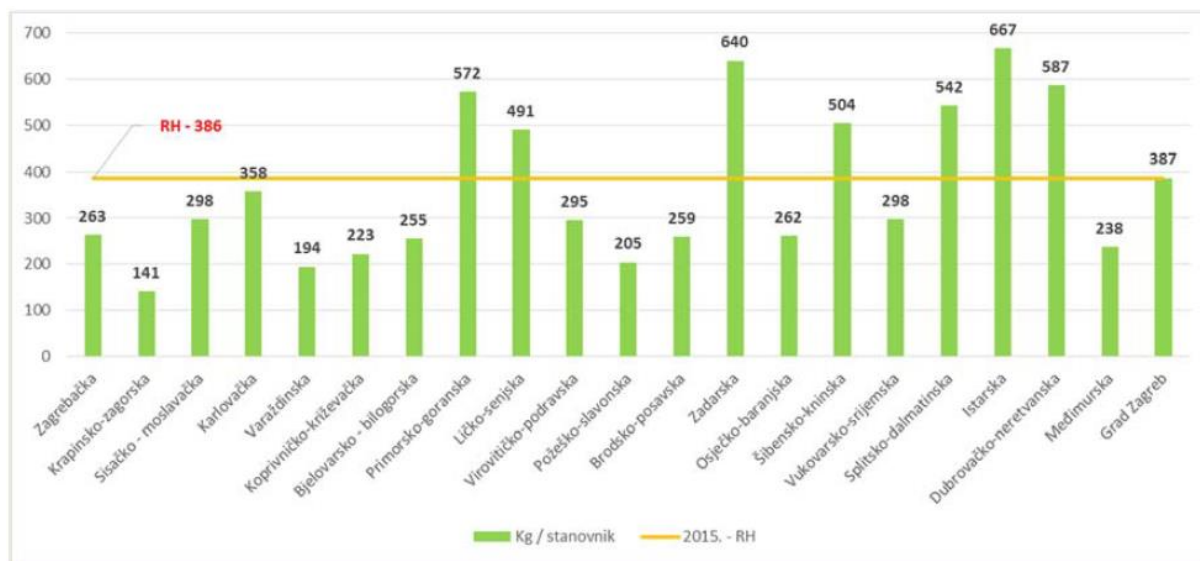


Image 4: The specific quantity of produced municipal waste in 2015, per county (CAEN, 2016).

The quantity of municipal waste from tourism in 2015 was 98,960 tonnes, constituting 6% of the total quantities of municipal waste. The largest quantities of municipal waste from tourism are produced in the county of Istria, the county of Primorje-Gorski Kotar and the county of Split-Dalmatia, while the smallest quantities are reported in the county of Koprivnica-Križevci and the county of Virovitica-Podravina.

Besides the effects of tourism, the deviations from average quantities of waste that can be noted in some counties, municipalities and cities, can be caused additionally by not weighing the waste, which often results with subpar estimations of the quantities of waste received.

The composition estimation for mixed municipal waste in the RC for 2015 is shown in Table 1.

Table 1. Estimated composition of mixed municipal waste in the RC in 2015.

Compound	Percentage (%)
Metal	2.1
Wood	1.0
Textile/Clothing	3.7
Paper and cardboard	23.2
Glass	3.7
Plastic	22.9
Gum	0.2
Skin/bones	0.5
Kitchen waste	30.9
Garden waste	5.7
Other waste (soil, dust, sand, undefined)	6.3
Total	100

Source: CAEN, project: “Creating a unique methodology for composition analyses of municipal waste, defining the average composition of municipal waste in the Republic of Croatia and estimating quantities of municipal waste.”

In 2010 the portion of mixed municipal waste reached 86% of the total municipal waste, and from 2012 onwards the relation between mixed and other separately collected types of municipal waste is mostly without change (Image 5).

In 2015 the quantity of mixed municipal waste was 1,262,844 tonnes (76% of produced waste). Separate collection claimed 24% or 391,074 tonnes of other types of produced municipal waste.

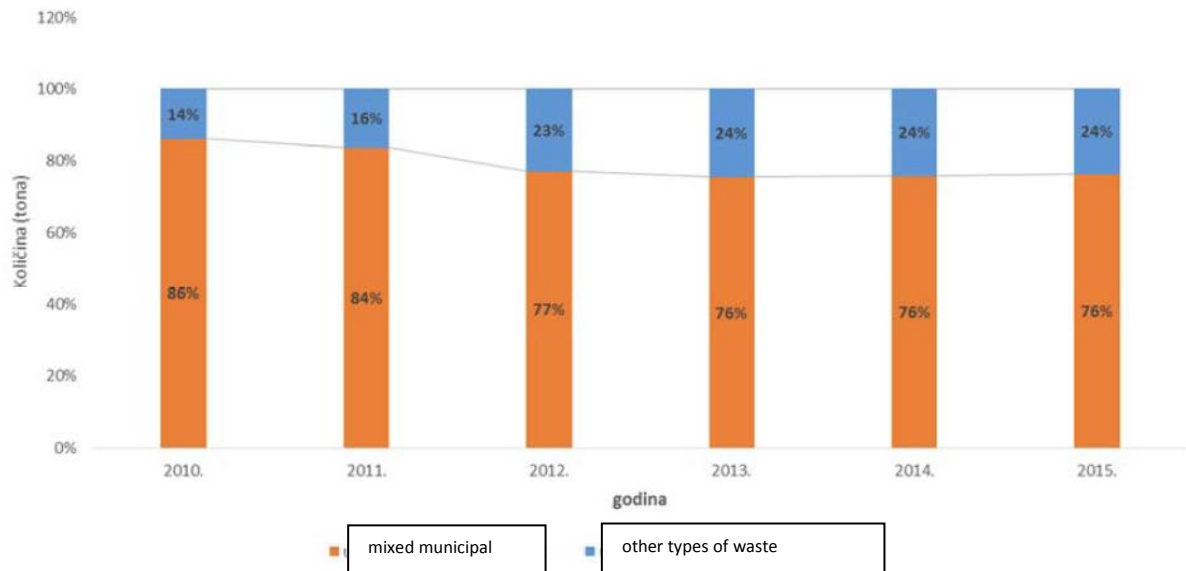


Image 5: Percentages of mixed and separately collected municipal waste in the RC in the period from 2010 to 2015 (CAEN, 2016)

After the change of methodology of calculating the quantities of municipal waste, i.e. adding the quantities of municipal waste that originate from the service sector, in 2012, there has been a sudden increase of 9% reported for separately collected municipal waste. The biggest increase of separate collection has been reported for paper, glass and plastic (Image 6).

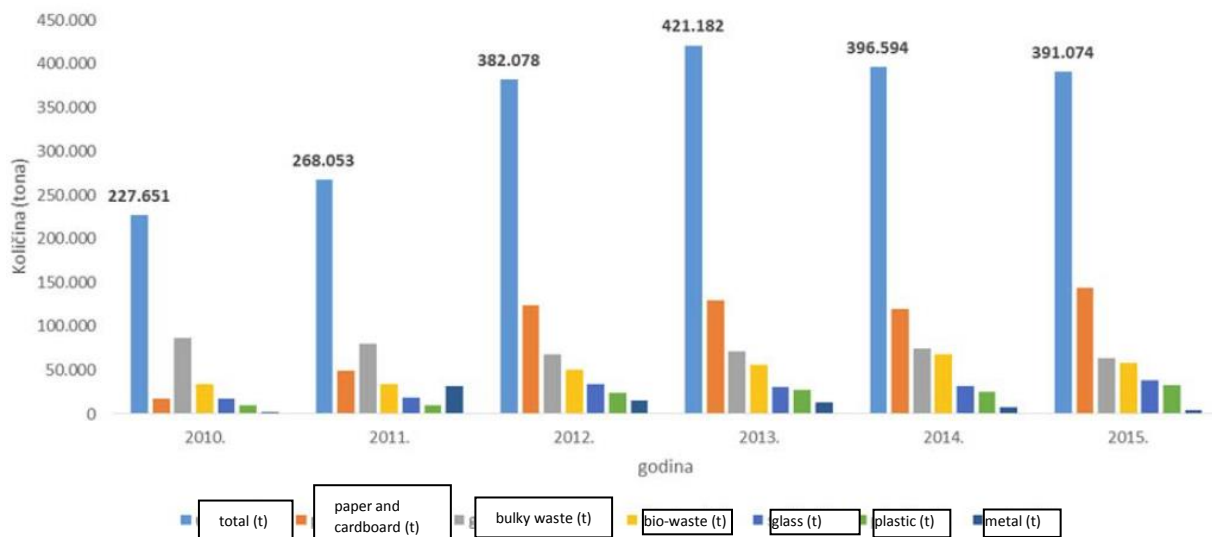


Image 6: The quantities of separately collected municipal waste (total, individual types) in the RC in the period from 2010 to 2015. (CAEN, 2016)

Separate collection of individual types of municipal waste (primarily paper, glass, plastic, metal) is conducted by collecting from households, from containers on public surfaces, smaller collection centres, recycling yards and by established national schemes for special categories of waste. Separate collection of useful types of waste from municipal waste organised by the local self-government units

(hereinafter: LSGU) was conducted in around 400 municipalities and cities in 2015. Despite the increase in the number of built recycling yards (from 17 in 2010 to 84 in 2016), and the introduction of 46 mobile units until 2016, the total quantities collected in recycling yards do not increase significantly, and amount to 15,901 tonnes in 2015.

In the period from 2010 to 2015, an increase is noted in the portion of municipal waste directed for recovery (Image 7). For 2010 this portion was merely 4% (68,947 tonnes), while for 2015 it was 18% (298,026 tonnes, which includes 8,768 tonnes of mixed municipal waste directed for mechanical-biological treatment).

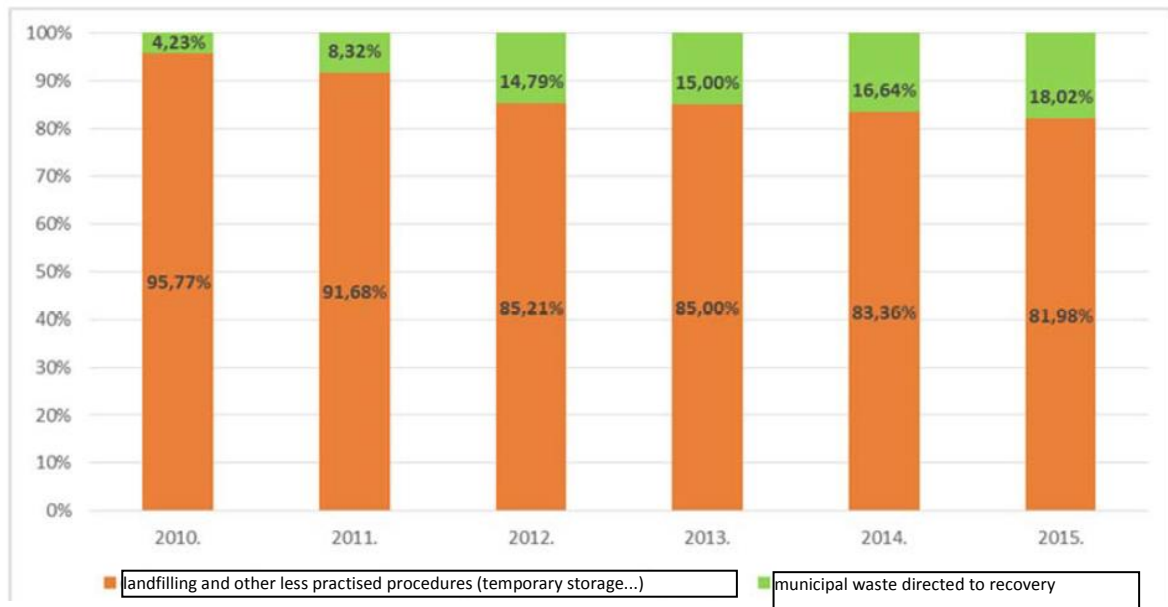


Image 7: Municipal waste management in the RC for the period from 2010 to 2015 (CAEN, 2016)

Besides the 18% of recovered (of which only 2% pertains to composting and anaerobic digestion) and 80% of landfilled waste in 2015, the remaining 2% are quantities of temporarily stored municipal waste and the estimated quantities for the non-participating part of the population, for which it was not possible to determine treatment procedures.

In 2015, only 27,432 tonnes were composted, and biogas facilities treated an additional 132 tonnes of municipal waste. Energy recovery claimed 288 tonnes of municipal waste, and only 56 tonnes was recovered without energy recovery. The quantity of landfilled municipal waste was 1,318,740 tonnes.

Image 8 shows the portion of recovery/disposal procedures for municipal waste in 2015.

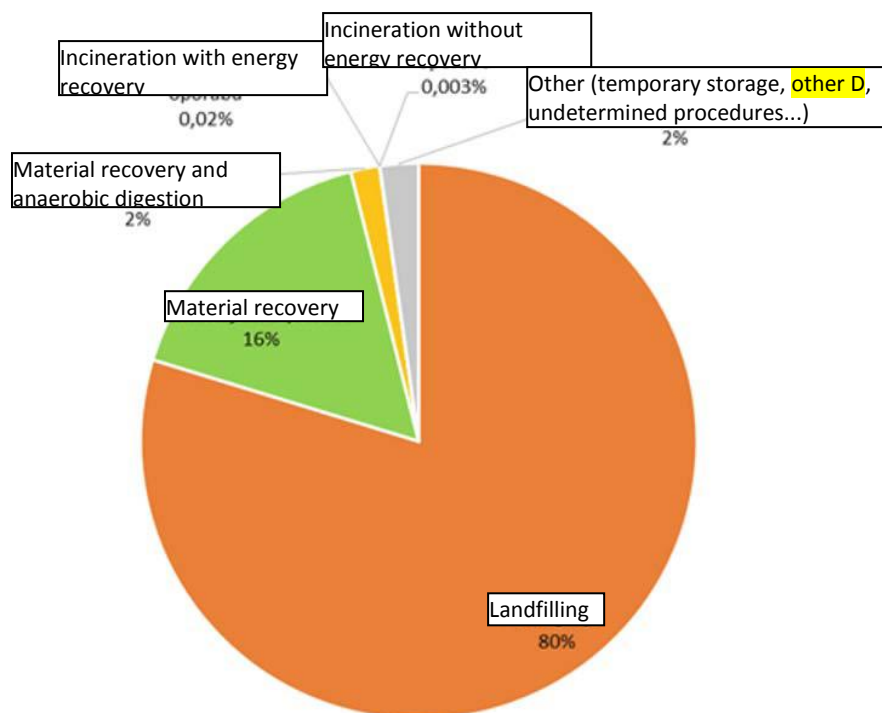


Image 8: Portion of recovery/disposal procedures for municipal waste in 2015. (CAEN, 2016)

The estimation of total quantities of recovered municipal waste in 2015 per county is shown in Table 2.

Table 2. Estimation of produced quantities of municipal waste and its management in 2015, by county (CAEN, 2016).

County	Total produced quantity of municipal waste (t)	Municipal waste directed to recovery (t)	Municipal waste recovery rate (%)
Zagreb County	83,601	18,467	22.1
Krapina-Zagorje	18,687	4,282	22.9
Sisak-Moslavina	51,303	6,628	12.9
Karlovac	46,163	5,304	11.5
Varaždin	34,192	8,389	24.5
Koprivnica-Križevci	25,725	6,311	24.5
Bjelovar-Bilogora	30,596	4,359	14.2
Primorje-Gorski Kotar	169,447	38,717	22.8
Lika-Senj	24,986	4,314	17.3
Virovitica-Podravina	25,060	5,369	21.4
Požega-Slavonija	15,961	2,497	15.6
Brod-Posavina	41,139	8,735	21.2
Zadar	108,784	13,190	12.1
Osijek-Baranja	79,882	13,605	17.0
Šibenik-Knin	55,152	8,452	15.3
Vukovar-Srijem	53,474	8,146	15.2
Split-Dalmatia	246,396	27,798	11.3
Istria	138,690	22,814	16.4
Dubrovnik-Neretva	71,900	12,525	17.4
Međimurje	27,065	10,349	38.2
City of Zagreb	305,714	67,774	22.2

Total	1,653,918	298,026	18.0
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*80% of total municipal waste was landfilled, the remaining, less-practiced procedures (temporary storage, procedures that were undeterminable) were applied to 2% of total municipal waste.

The recycling rate of four fractions of municipal waste - paper, plastic, metal and glass in 2015 was 25% (Calculation according to *method 2, Commission Decision 2011/753/EU establishing rules and calculation methods for verifying compliance with the targets set in Article 11 (2) of Directive 2008/98/EC of the European Parliament and of the Council or the Waste Framework Directive.*). The quantities of landfilled municipal waste reported by landfills decreased by 18% in the period from 2010 to 2015. The quantities of landfilled waste are shown in Image 9.

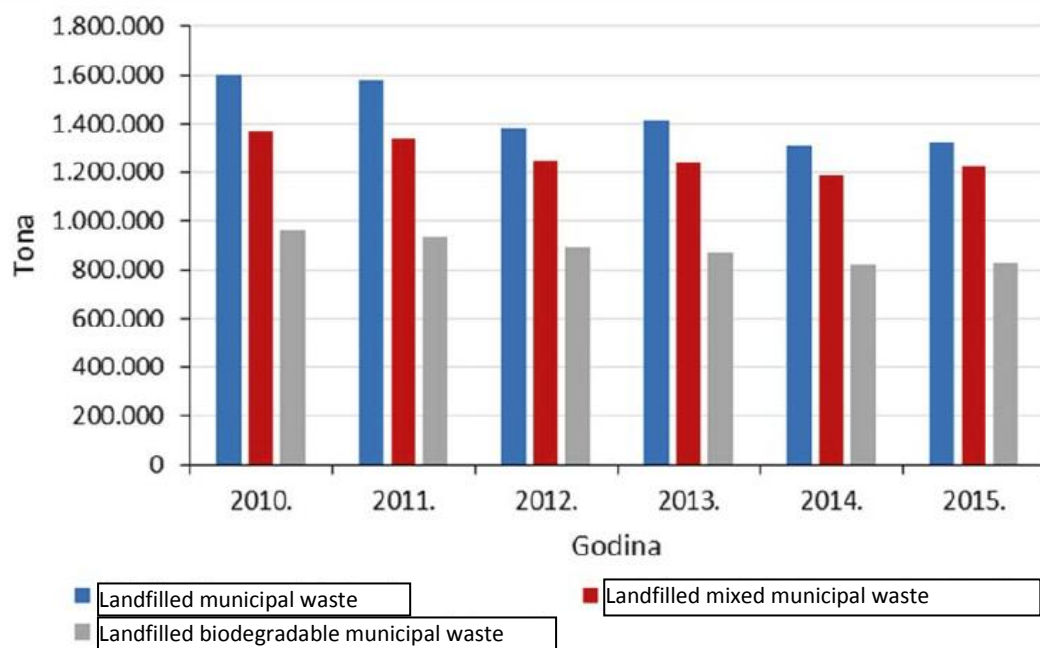


Image 9: The total quantities of landfilled municipal waste, landfilled mixed municipal waste and landfilled biodegradable municipal waste in the RC in the period from 2010 to 2015 (CAEN, 2016)

In 2015, a total of 1,318,740 tonnes of municipal waste was landfilled, of which 828,564 tonnes of biodegradable municipal waste (63%). In the same year, 1,224,081 tonnes of mixed municipal waste were landfilled. Despite only 47 landfills reporting weighing municipal waste before landfilling, these landfills are the ones receiving the largest quantities of waste. The portion of unweighed quantities in the total landfilled municipal waste in 2014 is 39%, and in 2015, somewhat better 33% (Table 3).

Table 3. Landfilling municipal waste in 2015, by county (CAEN, 2016).

County	Municipal waste landfilled (t)	Mixed municipal waste landfilled (t)	Biodegradable municipal waste landfilled (t)	portion of unweighed waste in landfilled municipal waste (%)
Zagreb County	38,480	35,801	24,907	28
Krapina-Zagorje	14,078	12,784	9,144	100
Sisak-Moslavina	56,738	55,353	38,814	30
Karlovac	35,487	33,829	23,259	36
Varaždin	4,160	3,743	2,860	100
Koprivnica-Križevci	35,099	33,988	22,354	21
Bjelovar-Bilogora	47,125	44,469	30,818	37
Primorje-Gorski Kotar	125,839	105,476	65,759	70
Lika-Senj	19,051	18,812	12,375	100
Virovitica-Podravina	17,989	17,710	11,478	27
Požega-Slavonija	12,431	11,991	8,252	18
Brod-Posavina	28,958	25,576	20,258	50
Zadar	86,803	75,713	56,584	19
Osijek-Baranja	71,834	68,754	50,904	87
Šibenik-Knin	45,208	42,177	29,337	17
Vukovar-Srijem	50,679	49,114	33,345	28
Split-Dalmatia	214,331	190,869	133,707	30
Istria	117,251	105,178	80,680	7
Dubrovnik-Neretva	49,637	48,035	32,493	100
Međimurje	16,304	13,449	11,266	0
City of Zagreb	231,259	231,259	129,969	0
Total	1,318,740	1,224,081	828,564	33

Biologically degradable waste is waste that can be degraded with biological aerobic or anaerobic procedures.

Biodegradable municipal waste includes biologically degradable types of waste originating from households and waste which is in its nature and composition similar to household waste, such as waste paper, biodegradable textile, green waste from the upkeep of public surfaces and etc., except production waste and waste from agriculture and forestry.

The production of biodegradable municipal waste per capita was increased from 158 kg in 1997 to 250 kg in 2015. Taking into consideration the fact that the biodegradable portion of mixed municipal waste is 65% (*Methodology for determining the composition and quantities of municipal or mixed municipal waste, CAEN*), the produced quantity of biodegradable municipal waste in 2015 was 1,070,783 tonnes.

The quantities of produced and landfilled biodegradable municipal waste in the period from 1997 to 2015 are shown in Image 10.

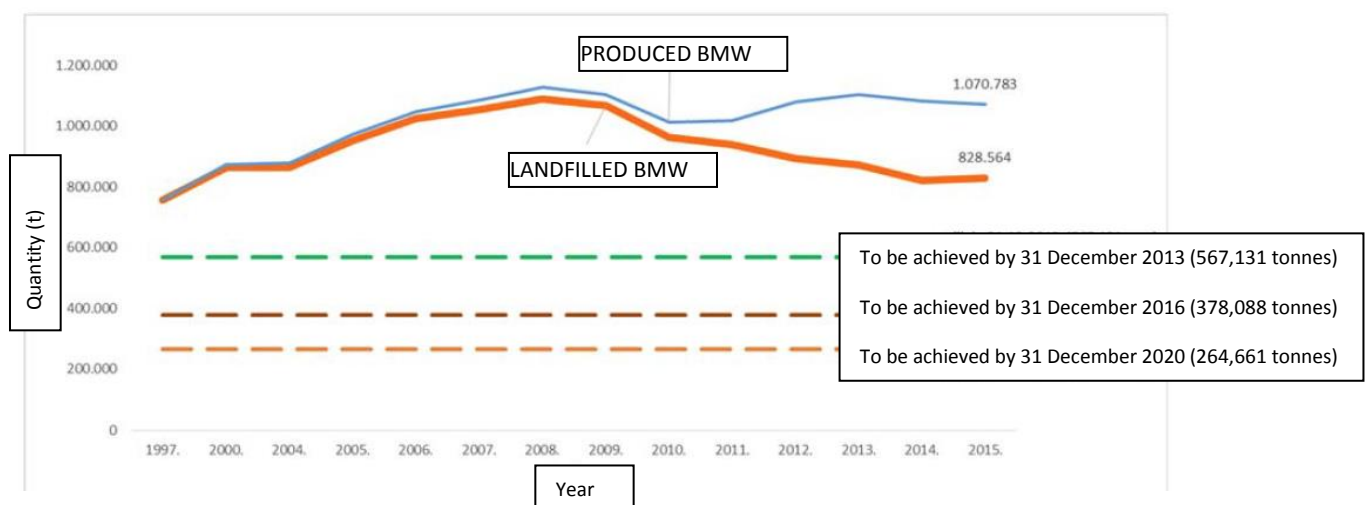


Image 10: Produced and landfilled biodegradable municipal waste in the period from 1997 to 2015, in relation to prescribed goals (CAEN, 2016).

1.1.3 Production waste

Production waste is considered to be waste produced in the production process in industry, crafts and other processes, except for the remains from production processes used in the production process of the same producer.

In 2014, the Environmental Pollution Register (hereinafter: EPR) reports the creation of 1,607,450 tonnes of production waste, of which 1,523,538 tonnes non-hazardous, which is around 3% more than the average reported quantities in the period from 2005 to 2014. A view of the quantities of reported production waste in the RC in the period from 2005 to 2014 is shown in Image 11.

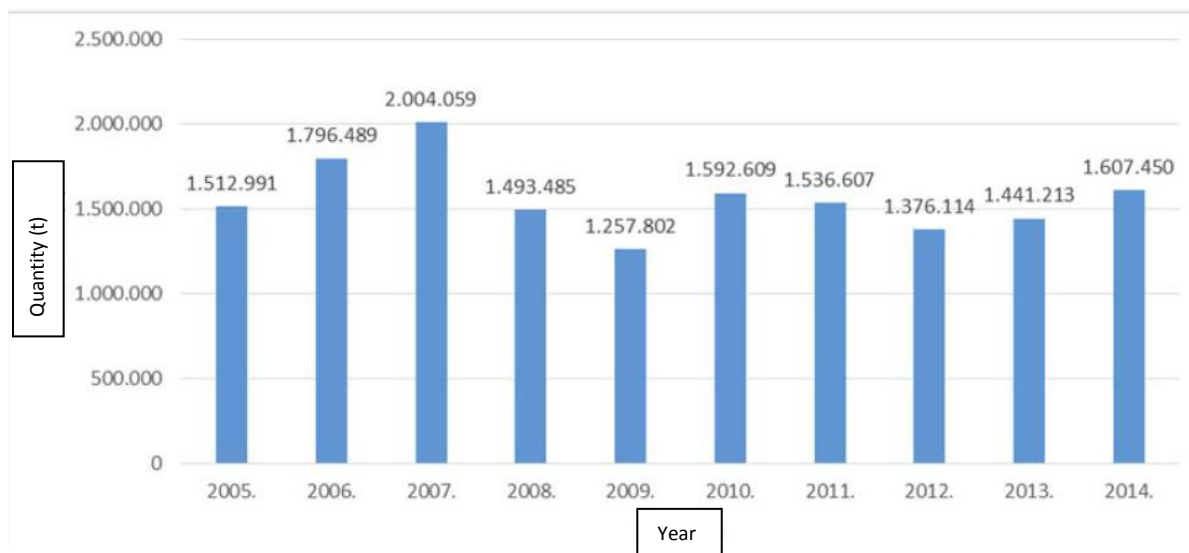


Image 11: Quantities of reported production waste in the RC in the period from 2005 to 2014 (CAEN, 2015)

The differences in the quantities of production waste are a consequence of economic movements in the last few years, but also of the change in data reporting methodology such as, for example, excluding reporting the remains from research and excavation of mineral resources remaining on site and animal by-products since 2008. According to the data from CAEN in 2014, the largest portion in total reported quantities of production waste was waste created in waste treatment and waste from devices for city waste water treatment and for preparation of potable water and water for industrial use (26%), construction and demolition waste, including excavated soil from polluted locations (26%) and waste from thermal processes (9%). For the most part, these are waste metals, residual sludge from waste water treatment facilities, mixed construction and demolition waste, airborne ash from coal incineration, ash sediment, slag and furnace dust, unprocessed slag etc. The City of Zagreb has the largest portion in produced production waste (25%), followed by counties Osijek-Baranja (11%) and Istria (11%). Production waste is landfilled at landfills for non-hazardous waste or exported.

1.1.4 Hazardous waste

Hazardous waste is waste possessing one or more hazardous properties defined by the ASWM.

In 2014, 130,316 tonnes of hazardous waste was reported, which is a 25% increase over 103,890 tonnes of hazardous waste in 2011 (Image 12).

In the last several years, the quality of the data has seen improvements, but quantities of hazardous waste are still not reported fully, and they are estimated to an annual 200,000 - 220,000 tonnes².

² Project Phare 2006: "Development of Hazardous Waste Management System, including the identification and management of "hot spot" sites"

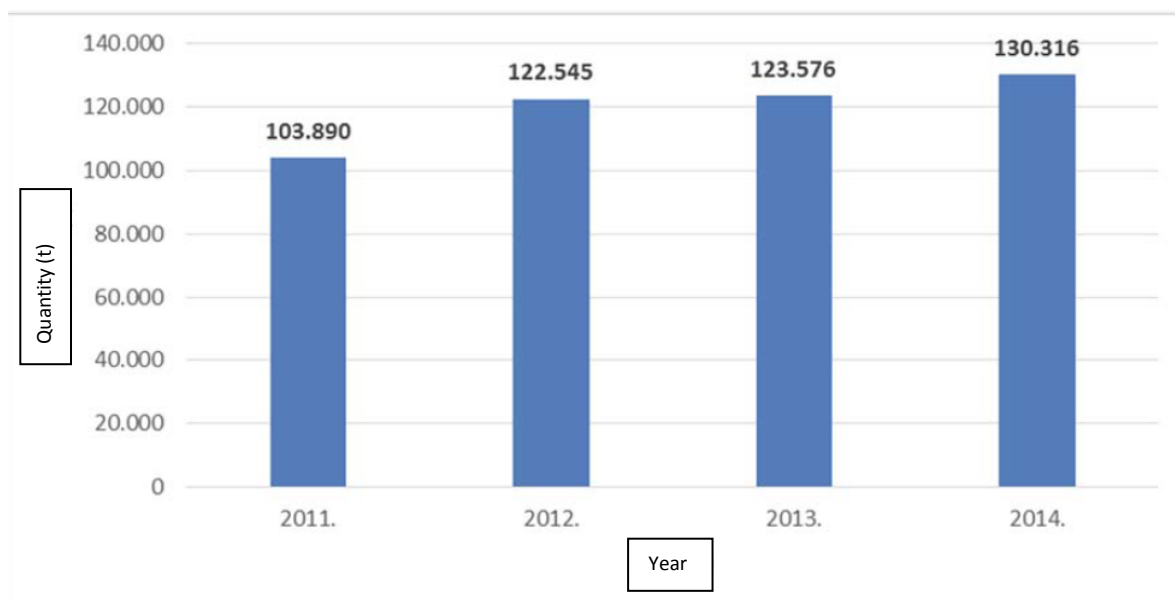


Image 12: Quantities of produced hazardous waste in the RC in the period from 2011 to 2014 (CAEN, 2015)

According to the data for 2014, hazardous waste from special categories of waste constitutes the largest portion of total quantities of hazardous waste. End-of-life vehicles and waste EE devices and equipment constitute 38% of total quantities of hazardous waste, and together with asbestos waste, even 52% of hazardous waste. Together with special categories of waste, a large portion of hazardous waste is chemical waste (17%).

When considering the origin of produced hazardous waste, together with households (25%), the largest producers of hazardous waste are the service sector (29%) and the processing industry sector (27%). The processing industry sector significantly contributes to hazardous waste production through coke production activities, as well as refined oil products and metal and metal products production. The quantities of hazardous waste coming from the construction sector and collection, treatment and waste disposal activities, as well as waste recovery are also significant.

Regarding hazardous waste management, around 18% of produced quantities of hazardous waste is exported for treatment annually. In the RC, around 34% of produced quantities of hazardous waste is materially recovered and around 9% is incinerated with energy use. Around 8% of produced hazardous waste is landfilled at specially prepared landfills, i.e. cells. These are construction materials which contain asbestos. The remains from 31% are pre-treatment procedures, i.e. preparations for the finishing operations. These are mostly treatment procedures after which waste disposal follows.

1.1.5 Special categories of waste

The ASWM defines the following special categories of waste: bio-waste, textile and footwear waste, packaging waste, waste tyres, waste oils, waste batteries and accumulators, end-of-life vehicles, asbestos waste, medical waste, waste electrical and electronic (hereinafter: EE) equipment and devices, waste ships, sea waste, construction and demolition waste, residual sludge from waste water treatment facilities, waste from the titanium dioxide industry, waste polychlorinated biphenyls and terphenyls (hereinafter: PCB).

For the six special categories of waste, “extended producer responsibility” has been introduced by way of fees for launching products on the market which create special categories of waste, for which separate collection and treatment systems are established. These are packaging waste, end-of-life vehicles, waste oils, waste batteries and accumulators, waste tyres and EE waste. A view of collected quantities of special categories of waste in the period from 2006 to 2015 is shown in Table 4.

Table 4. The quantities of special categories of waste collected from the beginning of implementing the ordinance on special categories of waste management (EPEEF and CAEN, 2016).

Special category of waste	Collected									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Packaging waste (t)	198.189	247861	272.135	231.239	178.112	125.258	118.493	116.794	110.217	140.441
End-of-life vehicles (t)	-	6.737	7.887	16.617	22.756	35.104	32.109	28.816	17.894	16.945
Waste batteries and accumulators (t)	-	6.484	10.737	7.180	8.290	8.480	7.165	7.296	6.965	5.596
Waste mobile batteries (t)	-	37	111	68	116	89	112	76	72	98
EE waste (t)	-	-	5.719	13.522	17.748	17.518	16.187	15.025	15.482	23.758
Waste oils-mechanical (t)	-	6115	7.068	6.784	6.640	6.391	5.835	5.678	5.753	5.390
Waste oils-edible (t)	-	1132	1.606	2.145	1.260	1.196	911	718	721	759
Waste tyres (t)	13.130	22.265	21.224	20.234	19.917	18.509	18.305	19.346	17.514	18.674
Construction waste containing asbestos (t)	-	-	0,004	1.660	3.283	3.637	8.985	11.673	9.284	9.476,67
Construction waste (t)*	275.323	266.457	194.406	131.863	362.567	579.240	717.382	872.782	761.312	882.256
Waste PCB (t)*	-	-	-	-	-	227	59	133	64	38
Medical waste (t)	-	-	-	-	3.663	3.507	3.317	3.118	3.842	4.232
Residual sludge from waste water treatment facilities ((tonnes of dry matter))	-	6.551	17.674	20.983	21.315	18.570	18.457	18.626	18.766	20.452

For data on construction and medical waste, waste PCBs and residual sludge from waste water treatment facilities, the data source is CAEN, while the data for the remaining categories come from the system managed by EPEEF.

**The data shown are about treated waste, which is shown also as produced construction and demolition waste until the arrival of new estimations (CAEN, project 2016).*

The data on waste PCBs relate to disposed equipment containing PCB (condensers and transformers) and any waste material or liquid containing or being polluted by PCB.

The data for 2011 relate to the quantities of waste PCBs disposed in the period from 2008 (from the entry into force of the Ordinance) - 2011.

Until 2008, the development of special categories of waste management was intense, and the quantities of collected and recovered waste increase systematically. From 2009, in almost all categories, a stagnation or decrease in collected quantities is noted, which is most likely caused by the decreased quantity of products on the market due to the economic crisis. In 2015, the collected quantities of most of the special categories of waste increased.

1.1.5.1 Bio-waste

Bio-waste is biologically degradable waste from gardens and parks, food and kitchen waste from households, restaurants, catering and retail objects and similar waste from food production.

The estimated quantities of produced bio-waste from municipal waste did not change since 2012 and, on average, constitute around 530,000 tonnes.

The portion of bio-waste in mixed municipal waste is 37%, determined based on the composition of mixed municipal waste shown in Table 1 of this Plan.

Taking into consideration the mentioned portion and quantities of landfilled mixed municipal waste, we come to the conclusion that landfills in the RC annually receive almost 500,000 tonnes of bio-waste, of which around 380,000 tonnes are estimated to be food waste. On average, around 11% of total produced bio-waste is separately collected, i.e. 60,000 tonnes, of which only a half is directed to recovery (composting, anaerobic digestion). Separate collection of bio-waste in 2015 was conducted in 96 LSGUs.

Image 13 shows the quantities of produced, separately collected and recovered bio-waste from municipal waste in the RC in the period from 2012 to 2015.

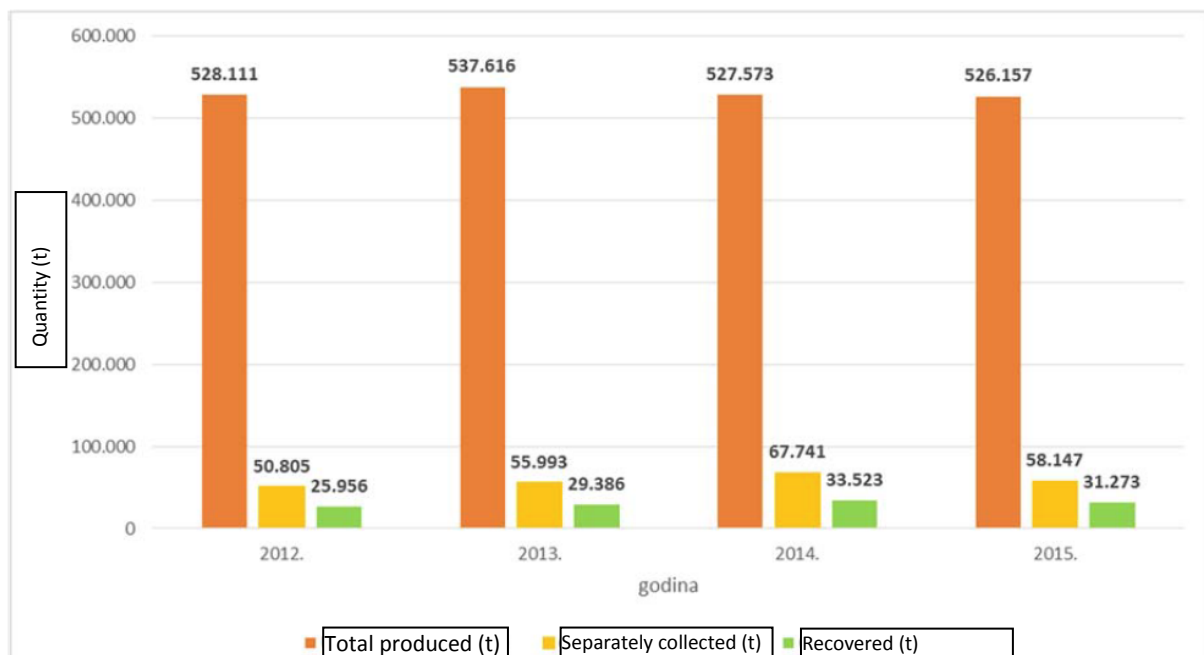


Image 13: Quantities of produced, separately collected and recovered bio-waste from municipal waste in the RC in the period from 2012 to 2015.

1.1.5.2 Textile and footwear waste

According to the data on estimated composition and quantities of municipal waste in the RC (Project: Creating a unique methodology for composition analyses of municipal waste, defining the average composition of municipal waste in the RC and estimating quantities of municipal waste, CAEN) based on the estimated composition of mixed municipal waste, the portion of textile waste in mixed municipal waste is 3.7%. Taking into consideration the data provided, the estimated quantity of textile waste which was in 2014 a part of mixed municipal waste is 46,033 tonnes, i.e. 10.9 kg per capita annually. Separately collected types of textile waste (production and municipal), including textile packaging, constituted 8,503 tonnes. Around 20% of separately collected textile waste is recovered in the RC, around 12% is landfilled, while the remainder is exported to other countries.

1.1.5.3 Packaging waste

Collected and recovered quantities of packaging waste are shown in Table 5.

Table 5. Quantities of packaging on the market and quantities of collected packaging waste in the period from 2006 to 2015 (EPEEF and CAEN, 2016).

	2006.	2007.	2008.	2009.	2010.	2011.	2012.	2013.	2014.	2015.
Total put on the market (t)	207.739	220.387	231.849	217.401	204.958	205.727	198.606	198.571	204.707	215.534
Total collected (t)	199.195	247.861	271.810	226.600	180.864	131.643	118.493	116.796	110.217	140.441
Total recovered (t)	198.189	247.978	272.135	231.239	178.112	125.258	118.493	116.796	100.969	129.554

From 2009 to 2014, the quantities of packaging on the market decrease, after which there is an increase again. During 2015, a total of 215,534 tonnes of packaging was put on the market in the RC, of which mostly paper, cardboard and multi-layer packaging with mostly paper components (76,663 tonnes), then glass packaging (53,335 tonnes), plastic packaging (51,959 tonnes), wood packaging (22,563 tonnes), metal packaging (10,866 tonnes) and other materials (148 tonnes).

The quantities of collected packaging waste from 2009 to 2014 have significantly decreased (around 50%, the largest decrease is noted in paper and cardboard quantities), partly due to the decreased quantities of packaging on the market, and partly due to the more efficient control of management system for this type of waste. In 2015, a new increase is noted in collected quantities (27% in comparison to 2014),

Over 55% of collected packaging waste in 2015 was packaging waste made out of paper, cardboard and multi-layer packaging with mostly paper components, after that 25% glass packaging, 18% plastic packaging, and the remainder of collected waste was packaging waste made out of metal and wood.

In 2015, a total of 60% of packaging waste was recovered. All the quantities within the Environmental Protection and Energy Efficiency Fund's system (hereinafter: EPEEF), according to the reports, were recovered via recycling, so the portion of recycled quantities in 2015 is also 60%, which is within the defined goal for packaging waste recycling.

In comparison to defined individual goals in recycling, the goals for glass (65%), plastic (46%) and paper (89%) were also achieved, while the recycling rate for metals was 14% from the defined 50%, and for wood only 3% from the defined 15%.

1.1.5.4 Waste tyres

The quantities of tyres put on the market decreased from 27,824 tonnes in 2007 to 19,774 tonnes in 2015, i.e. a 4% annual decrease rate. After the initial years of working with the system, the quantities of collected waste tyres after 2009 are without larger variations with an annual quantity of c. 18,700 tonnes of collected waste tyres. All the quantities of collected waste tyres are recovered, of which 76% is material recovery.

1.1.5.5 Waste oils

The collected quantities of waste mechanical oils did not change significantly since 2007, and the collected quantities are thermally recovered. According to the data in 2015, 32,786 tonnes of mechanical oil were put on the market in the RC. The estimated quantity of produced waste

mechanical oil is 16,393 tonnes. 5,390 tonnes were collected, i.e. around 33% of estimated produced quantities, and 6,830 tonnes were recovered, explained by the recovered quantities from storage.

According to the data by the EPEEF, in 2015, a total of 759 t of waste edible oils were collected within the EPEEF system, and 761 t were recovered.

However, the data by CAEN generated from the data reported in the EPR, including entities outside the EPEEF system show that in 2015, a total of 4,163 t of waste edible oils was collected, of which 1,400 t were recovered in the RC, and 2,500 t exported for recovery into other countries.

1.1.5.6 Waste batteries and accumulators

In 2015, 9,570 t of batteries and accumulators were put on the market in the RC. The reported quantity of collected waste batteries and accumulators was 5,596 t, while the recovered quantity was 6,198 (it is supposed that a part of the recovered quantities was collected in the previous year). In the last three years, on average 336 t of mobile batteries and accumulators were put on the market in the RC, while the quantity of collected mobile waste batteries and accumulators in 2015 was 98 t.

The goal defined by the ordinance regulating management of waste batteries and accumulators, and according to which it is necessary to achieve at least 25% collection rate for mobile waste batteries until September 2016, was met in 2012 with a collection rate of 29%. In 2013 and 2014, the goal was not met, and in 2015, with the achieved collection rate of 29%, the goal was met again. The waste batteries and accumulators recycling efficacy goals were met in the years in which they were monitored (2014, 2015).

1.1.5.7 End-of-life vehicles

In the first year of the implementation of the end-of-life vehicles management system, 7,915 tonnes of end-of-life vehicles were reported as collected, and 2,901 tonnes reported as treated. Until 2011, a continuous increase was noted and in that year, 35,104 tonnes were reported as collected and 35,111 tonnes of end-of-life vehicles were treated. However, the following four years document a continuous decrease in the quantities, averaging 13% annually, and so in 2015 saw the report of 16,690 tonnes of end-of-life vehicles collected and 16,945 tonnes treated. According to the reports of end-of-life vehicles treatment facilities, the goals for re-use and recycling (85% of average mass of end-of-life vehicle received for treatment) and re-use and recovery (95% of average mass of end-of-life vehicle received for treatment) were achieved.

1.1.5.8 Asbestos waste

In the period from 2008 to the end of 2015, certified collectors collected 48,002 tonnes of asbestos waste from construction. Since 2011, this type of waste was landfilled at specially built landfilling areas where, according to the data by CAEN, a total of 42,101 tonnes of was landfilled, and a part of the waste was exported.

1.1.5.9 Medical waste

In the period from 2010 to 2013, a 15% decrease was noted in the total reported quantities of medical waste, after which, in 2015, compared to 2013, a 36% increase is noted.

In 2015, a total of 4,232 tonnes of medical waste was produced, of which 77% hazardous waste whose collection and landfilling is subject to special demands due to infection prevention, and which is treated with sterilization/autoclaving. Non-hazardous medical waste made for 23% in the total quantities of medical waste, in which the largest portion (59%) was waste whose collection and landfilling was not subject to special demands due to infection prevention, e.g. clothing, plaster casts, bed sheets, one-time use clothing, linen, diapers etc. The largest quantities of medical waste were produced in medical protection activities (85%), of which mostly in hospitals (77%).

1.1.5.10 Waste electrical and electronic equipment

The system for collection and recovery of waste electrical and electronic equipment has shown a quick progression since its original implementation, and in 2010 the goal defined by the Ordinance on waste electrical and electronic equipment management (OG 42/14, 48/14, 107/14, 139/14) was met - 4 kg of collected waste EE devices and equipment per capita.

After the decrease of collected quantities in the following years, in 2015, the goal was met once again and waste EE devices and household equipment was collected at a rate of 4.73 kg/capita. From 2016, the goal of separate collection will be expressed as a portion of the quantities put on the market in the previous three years, with which RC will meet the goal significantly easier (in accordance with the methodology in 2015, a collection rate of 60% has already been met). Further increase of legislative goals necessitates the improvement of collection organisation. In 2015, the minimal prescribed goals were met for recovery and recycling applied per category of EE devices and equipment, ranging from 70 to 80% for recovery and 50 to 80% for recycling, depending on the EE equipment category according to Annex I of the Ordinance.

1.1.5.11 Waste ships and marine waste

There are currently no official data nor satisfying estimations regarding the quantities of waste ships and marine waste in the RC. It is necessary to develop a methodology of monitoring marine waste, which is foreseen by the Adriatic Monitoring Plan, prepared in concordance with the Decision adopting the Action Programme of the Strategy of Marine Environment and Coastal Area Management: Monitoring System for a Constant Status Estimation of the Adriatic Sea (OG 153/14).

1.1.5.12 Construction and demolition waste

The estimated average quantity of construction and demolition waste in the RC in the period from 2001 to 2005 was 1.3 million t/year and the estimated increase of waste quantities in the period from 2006 to 2015 was 2.3 million t/year (Project LIFE05 TCY/CRO/000114-CONWAS88 - LIFE project CONWAS).

The data on construction and demolition waste determined based on the reports of waste treatment facilities in the EPR are shown in Table 4. In 2014, 761,312 tonnes of construction and demolition waste were reported, of which nearly 40% of the mentioned quantity was disposed by landfilling, mostly soil and rock and mixed construction and demolition waste. For the other part of the reported quantities, recovery was documented, and a smaller part is temporarily stored. In 2016, the project "Improving the flow and quality of data on construction waste and waste from the exploration and exploitation of mineral resources in the Republic of Croatia" which will help to better determine the produced quantities of construction and demolition waste.

1.1.5.13 Residual sludge from waste water treatment facilities

The document *Treatment and disposal of waste and waste sludge generated by treatment of waste water from public sewerage systems of towns and municipalities in Croatian counties*, WYG International Ltd., *Croatian Waters, 2013* estimates that current devices for municipal waste water treatment annually produce 35,000-40,000 tonnes of dry residual sludge. Of that, around 50% of the sludge is produced by and located at the site of the Central Device for Waste Water Purification of the City of Zagreb. It is additionally estimated that, on a national level, around 2,000 tonnes of sludge are used for agricultural purposes and 1,000 are composted annually. The remaining sludge is mostly landfilled.

The quantities of residual sludge from waste water treatment facilities and devices for the purification of municipal waste waters reported in 2015 by waste producers in the waste management information system were 65,976 tonnes, which is equivalent to around 20,452 tonnes of dry sludge matter. In accordance with the Ordinance on managing residual sludge from waste water treatment facilities when the sludge is used in agriculture (OG 38/08), for 2015, 1,174 tonnes of dry sludge matter were

reported used on agricultural land. Over 70% of that quantity is used as compost after being mixed with waste from public surfaces (leaves, grass, twigs etc.) Of the 7 total users of sludge in agriculture, 2 used sludge after previous composting.

1.1.5.14 Waste from the titanium dioxide industry

The creation of waste from the titanium dioxide industry in the RC has not been reported.

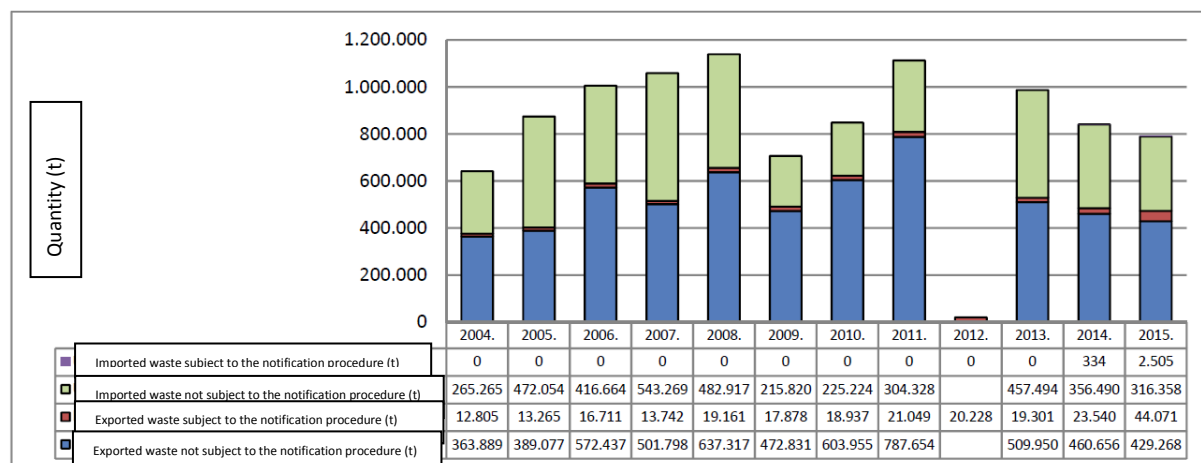
1.1.5.15 Waste polychlorinated biphenyls and terphenyls

In the period from 2008 to 2015, 132 proprietors were reported as owning, in total, 639 t of equipment containing PCB (condensers and transformers), of which 449 tonnes were disposed (70%), leaving 190 (30%) still to be disposed. In the mentioned period, a total of 72 t of waste objects, materials or liquids containing or being polluted by PCB were disposed. All the quantity of the collected waste is treated and disposed outside RC.

In the period from 2008 to 2015 in the RC, a constant increase of disposed equipment containing PCB has been noted. The disposal delay for the remaining quantities has been mostly caused by the situation in the economy and the lack of financial assets for replacement and disposal of equipment containing PCB.

1.1.6 Transboundary movement of waste

A view of the data on transboundary movement of waste in the period from 2004 to 2015 is shown in Image 14.



* The data on exported/imported non-hazardous waste in 2012 were not processed

Image 14: Transboundary movement of waste in the RC in the period from 2004-2015 (CAEN, 2016)

According to the data by CAEN in the period from 2004 to 2007, in the RC, an increase has been noted in the imported quantities of waste not subject to the notification procedure, after which there was a decrease, while from 2010, the quantities of imported waste not subject to the notification procedure grew again until 2013.

During 2014, a 22% decrease was noted in comparison to the previous year, while in 2015, an additional 11% decrease (316,358 tonnes were imported). The average quantity of imported waste not subject to the notification procedure in the period from 2004 to 2015 was 368,717 tonnes annually. The largest quantities of imported non-hazardous waste in 2015 was waste metals, waste from thermal processes (slag) and waste paper and cardboard directed for recycling.

The average quantity of waste not subject to the notification procedure exported from the RC in the period from 2004 to 2015 was 520,803 tonnes annually. After a period of increase until 2008, in 2009 a significant decrease is documented. In the following two years, a new increase of around 30% is documented. In 2014, around 10% less waste was exported than in 2013, while in 2015, a further 6.8% decrease is documented (429,268 tonnes).

Of the total quantities of exported waste in 2015, the largest part was waste metals (around 65%), and a significant portion was waste paper and cardboard (around 23%).

In the period from 2004 to 2011, transboundary movement of waste (exportation and passage) subject to the notification procedure sees an increase, after which follows a slight decline in 2013, and in 2014, a further increase is documented. The average quantity of exported waste subject to the notification procedure in the period from 2004 to -2015 was 20,057 tonnes. In 2015, 44,071 tonnes of waste subject to the notification procedure were exported, of which 18,425 t refers to hazardous waste, and 25,646 t non-hazardous waste subject to the notification procedure. The data point to a significant increase in comparison to 2014 (over 85%). The main reason for this increase is the growth of exportation of waste subject to the notification procedure, primarily waste from the yellow waste list (combustible waste).

The largest portion of exported waste was secondary waste, i.e. a mixture of materials from mechanical waste treatment, containing hazardous materials and liquid combustible waste containing hazardous material, as well as mixed waste composed of at least one type of hazardous waste. Except

these types of waste, waste lead accumulator plates were exported, as well as waste from thermal processes. The importation of waste subject to the notification procedure was realised for the first time during 2014 in the amount of 334 tonnes (batteries were imported for recovery), and in 2015, there has also been an importation of hazardous and non-hazardous waste (2,505 t of waste subject to the notification procedure were imported, of which 167.61 t were exclusively hazardous waste - batteries for recovery).

1.2 EXISTING FACILITIES, DEVICES AND SYSTEMS FOR WASTE MANAGEMENT

1.2.1 Facilities and devices for waste management

Facilities for waste management are facilities for waste collection, facilities for waste treatment and waste management centres. A facility of secondary purpose in which the activity of waste recovery is conducted is not considered to be a facility for waste management.

1.2.1.1 Recycling yards

According to the data by CAEN, in 2016, there were 84 recycling yards and 46 mobile recycling yards in the RC. A view of built recycling yards per county is given in Image 15.

The ASWM prescribes to LSGUs a minimal number of recycling yards or mobile units, depending on the number of citizens in the LSGU. The execution regulation determines the types of waste that recycling yards are obliged to receive (problematic waste, waste paper, metal, glass, plastic, textile, bulky waste, edible oils and fats, detergents, paints, medicine, EE waste, batteries and accumulators and construction and demolition waste from minor household repairs).

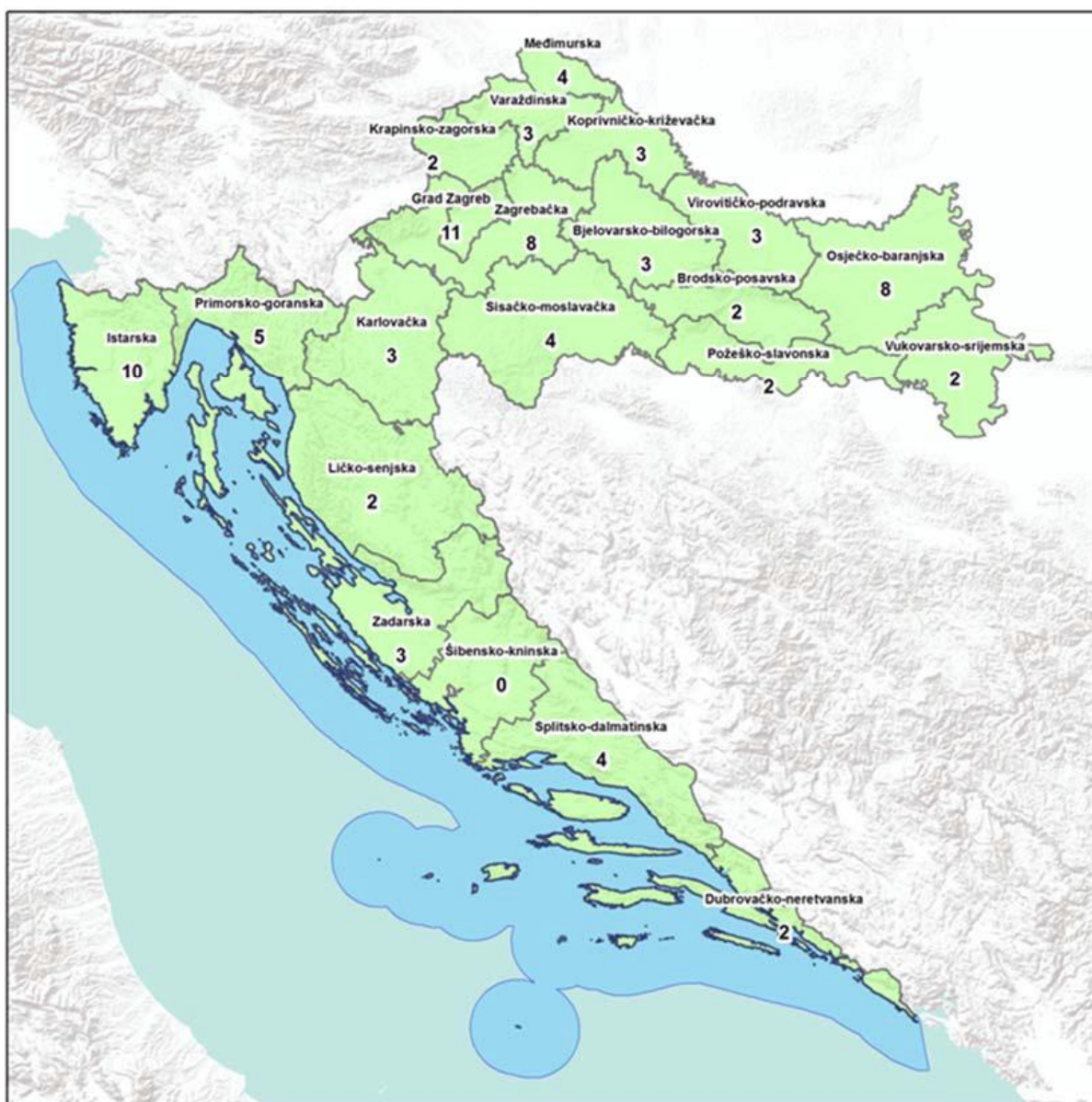


Image 15: The number of recycling yards in individual counties in 2016 (CAEN, October 2016)

The total number of established recycling yards, including mobile units, is dissatisfactory and in the near future necessitates an increase. For that purpose, it is important to continue building recycling yards, or to procure mobile recycling yards.

1.2.1.2 Facilities for biological waste treatment

Aerobic biological treatment of bio-waste by composting is conducted in 11 composting plants of a total capacity of around 103,397 t/year, of which, in 2016, 7 had a valid waste management permit.

In 2016, of the total 11 biogas facilities, 6 biogas facilities possessed the permit for anaerobic biological treatment of bio-waste, totalling a capacity of 234,800 t/year. An overview of locations of composting plants and biogas facilities in the RC in 2015 is given in Image 16, and an overview of the existing composting plant capacities in Table 6.

Table 6. An overview of composting plants in the RC and their available capacities in 2016 (CAEN, 2016).

Object location	Capacity (t/year)
Buzet	7*
Čakovec	10.000*
Imbriovec	6.990
Kloštar Ivanić	27.300
Koprivnica	1.900
Krk	6.000*
Perušić	1.200*
Prelog	3.000
Zagreb	Jakuševac 27.000
	Markuševac 10.000
	Jankomir* 10.000
Total	103.397

**the composting plant is not active or does not have a valid permit*

Despite the fact that the ASWM prescribes that LSGUs are obliged to secure separate waste collection in the documents issued based on the ASWM (waste management plans in LSGUs, decisions on ways of providing public services of municipal waste collection, decisions on delegating the public service of municipal waste collection), the effects of this measure in regards to bio-waste are very small on a national level.

Taking into consideration the national goal of biodegradable waste landfilling, the capacities for bio-waste treatment on all levels (households, local and national) are dissatisfactory. The system for separate collection of bio-waste is insufficiently developed in most LSGUs.

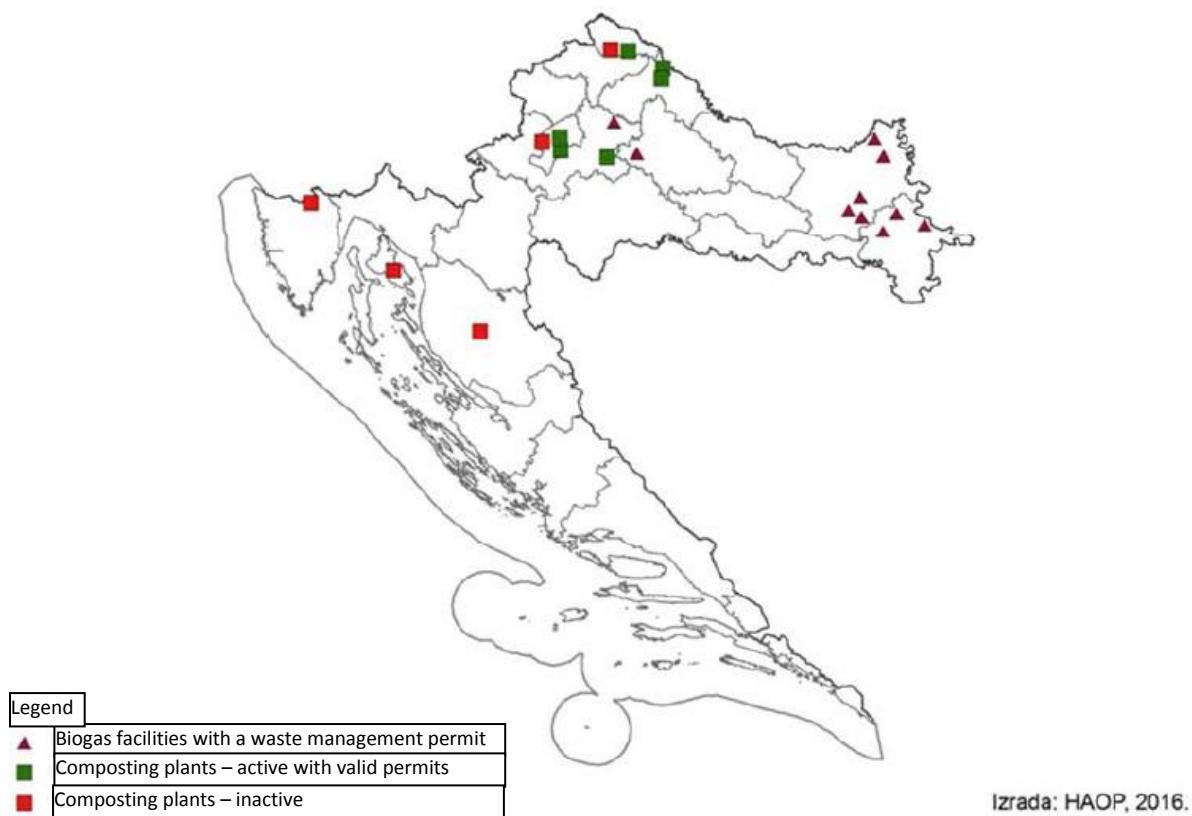


Image 16: An overview of composting plants and biogas facilities in the RC (2016).

1.2.1.3 Other facilities for material recovery of waste

According to the data by CAEN, the total capacity for material recovery of special categories of waste was 900,000 t/year in 2012. The available capacities for the treatment of some special categories of waste are sufficient (e.g. packaging waste), and some even significantly overshoot current needs (end-of-life vehicles 250,000 tonnes, EE waste 66,000 tonnes).

1.2.1.4 Facilities for energy recovery and waste incineration

In 2016, 23 facilities for energy recovery were registered - 17 companies received the certificate of inscription to the Register of energy recovery operators for personal waste, and 5 companies on 7 locations have valid permits for waste management according to procedure R1, and one hospital has the permit for the D10 procedure for disposal of exclusively personal waste.

An overview of locations of facilities for energy recovery and waste incineration in 2016 is given in Image 17.

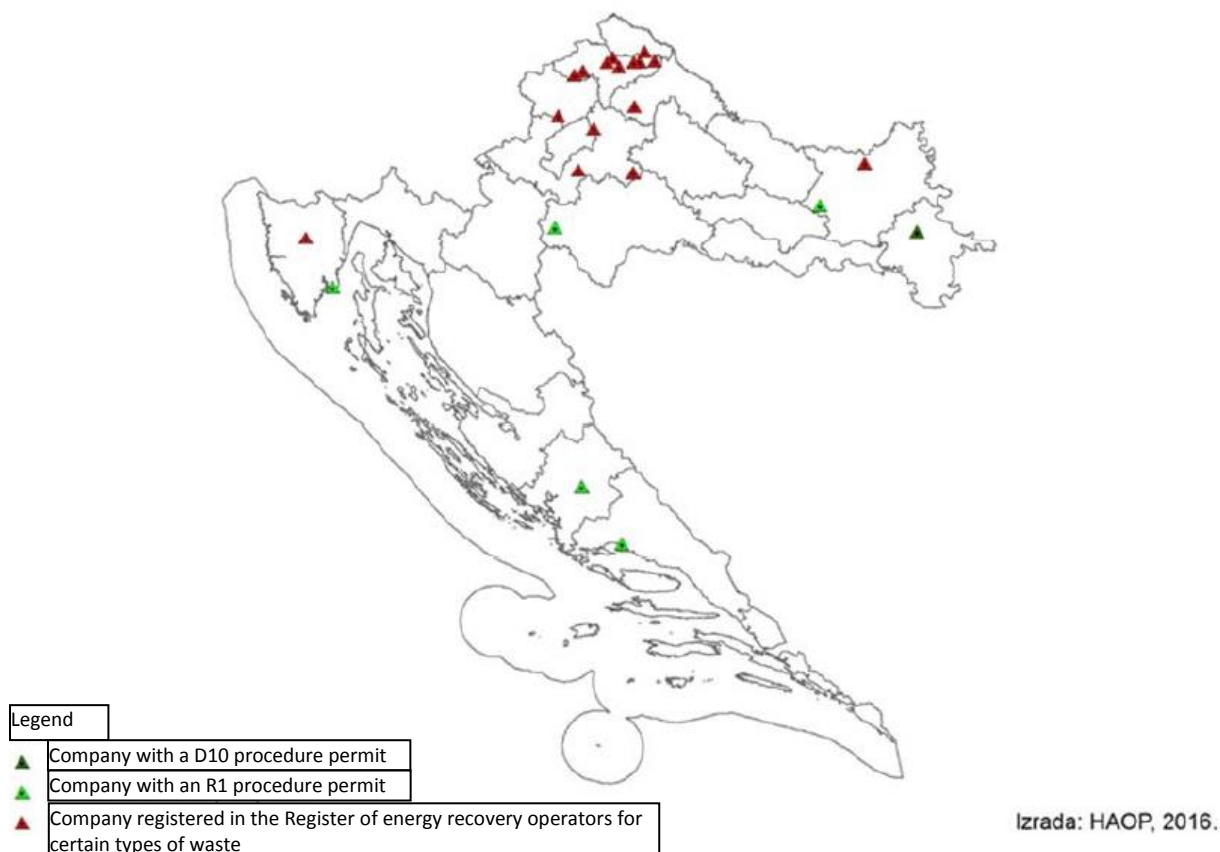


Image 17: An overview of locations of facilities for energy recovery and waste incineration in 2016 (CAEN, 2016)

Most of energy recovery is conducted in facilities that are not located on the territory of the RC. To conduct energy recovery of certain types and quantities of waste, the ASWM and Ordinance on waste management (OG 23/14, 51/14, 121/15 and 132/15) provide an exception to the requirement of obtaining a waste management permit.

1.2.1.5 Waste management centres

The Waste Management Plan of the Republic of Croatia in the period from 2007 – 2015 (OG 85/07, 126/10 and 31/11) foresaw the construction of 13 waste management centres (hereinafter: WMCs) for treatment of mixed municipal waste and other waste that was not previously recyclable (Image 18).

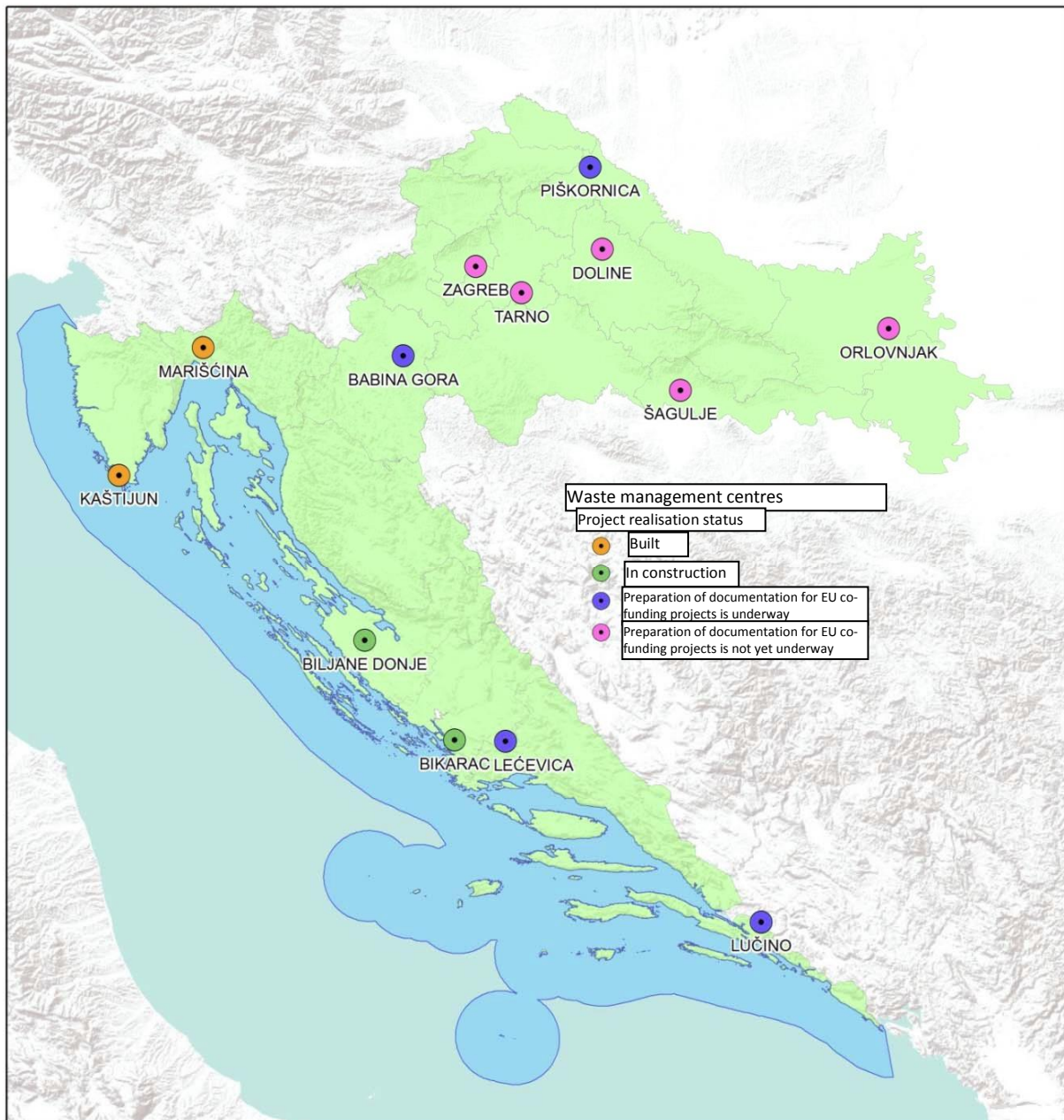


Image 18: Position and capacity of planned WMCs according to the Waste Management Plan of the RC for the period 2007 - 2015 according to the current status of realisation

Hitherto, the planned concept of the WMC system with mechanical-biological treatment technology (hereinafter: MBT) has been contributing to the achievement of goals regarding the decrease of biodegradable waste landfilling and total quantities of landfilled waste, but it is not sufficient in regards to achieving the municipal waste recycling goals.

Public funding secured the construction of two WMCs: WMC Kaštijun, with a 90,000 t/year capacity (County of Istria) and WMC Marišćina, with a 100,000 t/year capacity (County of Primorje-Gorski Kotar), while, currently, projects are being conducted for WMC Bikarac, with a capacity of 38 thousand t/year (County of Šibenik-Knin) and WMC Biljane Donje, with a capacity of 80 thousand t/year (County of Zadar), after the Decision on financing from the EU Cohesion Fund. In addition, private funding secured the MBT facility in the City of Varaždin (95,000 t/year). An overview of built facilities is given in Image 19.

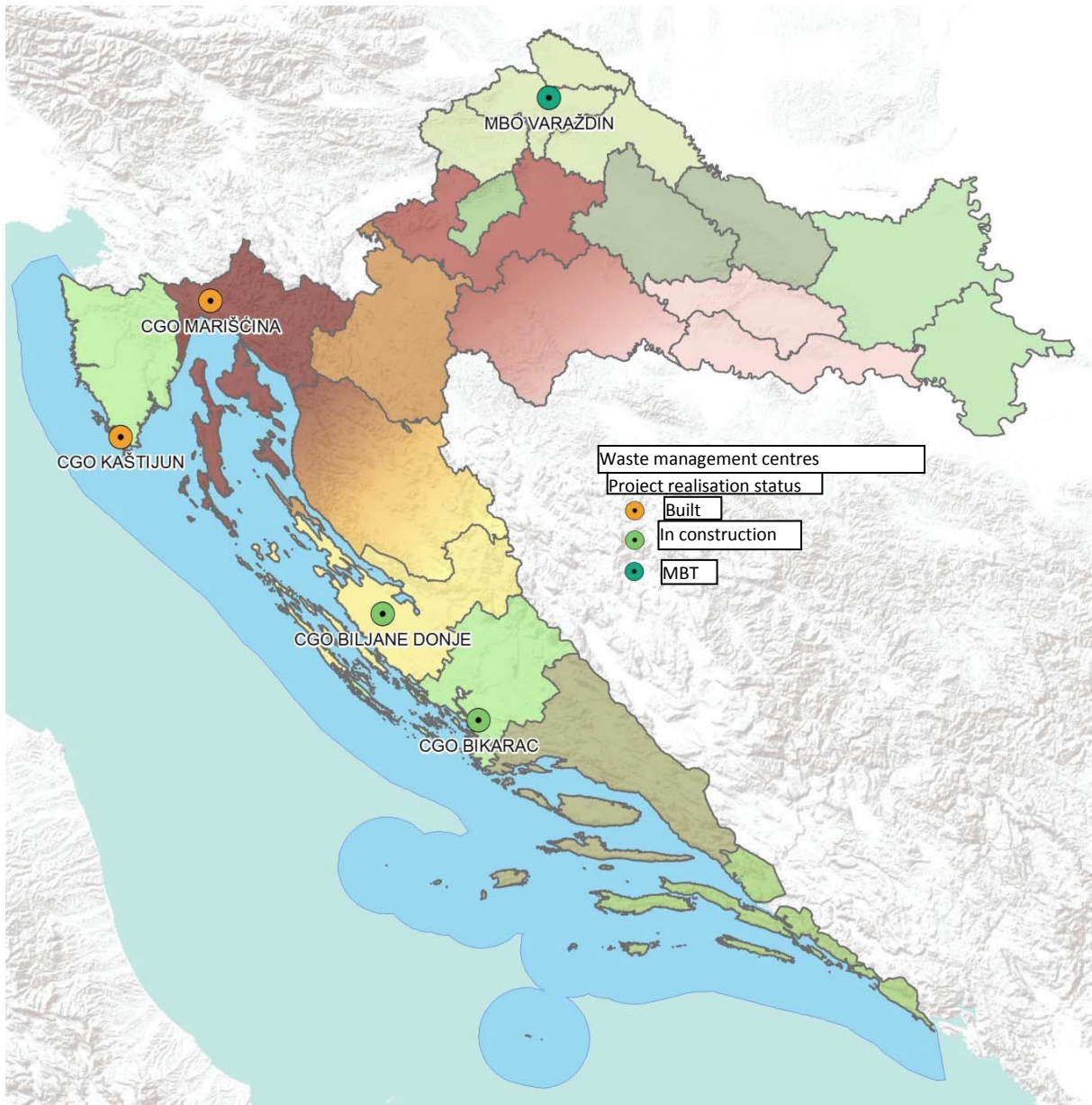


Image 19: The position of constructed WMCs, WMCs currently constructed and the MBT facility in Varaždin.

1.2.1.6 Landfills

According to the data by CAEN, during 2015, waste was landfilled at 148 landfills. 135 landfills received municipal waste, while 13 locations received exclusively production waste. During 2015, a total of 1,889,201 tonnes were landfilled (all types of waste), which is a 5.35% decline in comparison to 2010 when a total of 1,995,954 tonnes of waste were landfilled. Until the end of 2015, 174 landfills were closed, and waste from 83 former landfills was displaced. From 2008 to the end of 2015, the number of treated landfills increased from 63 to 171, and 134 locations are being treated or prepared for treatment.

The total remaining capacity of landfills in the end of 2015, according to the estimate of landfill operators delivered to CAEN, was 17,301,717 tonnes. These are capacities treated in the existing documentation and valid permits, with the possibility of increase depending on spatial possibilities, needs and chosen method of treatment of the mentioned categories of waste. An overview of statuses and capacities of landfills per county is given in Table 7. Some existing landfills secure their capacities with construction in phases. The mentioned capacities in Table 7 show capacities for constructed parts of the landfill.

Taking into consideration the significant number of unregulated landfills of non-hazardous waste and the goals of incremental decrease of landfilling waste quantities at unregulated landfills, with a stop planned for 31 December 2018, it is paramount to organise a gradual redirection of waste to regulated landfills or landfills that can become regulated on short notice. The current landfills, i.e. cells on landfills, that fulfil operational requirements after 31 December 2018 (i.e. that are regulated), will be able to continue working, while landfills not fulfilling operational requirements (i.e. unregulated) will have to close, in accordance with the regulations on conditions for waste disposal and landfill operations. The decision of stopping or continuing the work of the landfill considered regulated after 31 December 2018, as well as the decision on regulating landfills or parts of landfills (active cells) together with the remediation of closed cells, is the responsibility of the owner or operator of the landfill.

In the RC, there is no hazardous waste landfill.

An overview of landfill locations in the RC is given in Map 1 in the annex of this Plan.

Table 7. An overview of statuses and capacities of active landfills per county (CAEN, 2016)

County	Active landfills (status: end of 2015)	Active landfills with landfilled municipal waste (status: end of 2015)	Estimated remaining capacity of active landfills with landfilled municipal waste (status: end of 2015) (t)
Zagreb County	6	6	2.094.073
Krapina-Zagorje	7	6	119.386
Sisak-Moslavina	10	9	501.239
Karlovac	6	6	114.615
Varaždin	1	1	3.671
Koprivnica-Križevci	11	10	192.249
Bjelovar-Bilogora	5	5	237.625
Primorje-Gorski Kotar	11	10	268.110
Lika-Senj	10	10	97.498
Virovitica-Podravina	4	4	94.402
Požega-Slavonija	2	2	44.408
Brod-Posavina	3	3	86.384
Zadar	8	7	3.186.082

Osijek-Baranja	7	7	405.718
Šibenik-Knin	7	6	208.019
Vukovar-Srijem	6	6	274.319
Split-Dalmatia	15	15	682.847
Istria	11	8	247.504
Dubrovnik-Neretva	8	8	159.879
Međimurje	1	1	112.598
City of Zagreb	2	1	968.740
Total	141	131	10.099.367

The dynamics of landfill remediation defined by the *Waste Management Plan of the Republic of Croatia for the period 2007-2015* was not achieved because of the delay in the construction of waste management centres, long-term procedures regarding property and legal relations, changing the spatial planning documents and all other conditions for the beginning of construction work.

1.2.2 Current waste management systems

1.2.2.1 Bio-waste

In only 17% of LSGUs, separate collection of waste is conducted. It is mostly biodegradable waste from gardens and parks on public surfaces. The quantities of separately collected bio-waste from households are negligible. The most common waste management procedure for this type of waste is still landfilling.

1.2.2.2 Textile and footwear waste

The quantities of waste textile that is separately collected or separated from municipal waste are relatively small. Some of the causes are that it is only recently that a special regulation has been introduced, regulating the management of this type of waste (Ordinance on textile and footwear waste (OG 99/15)), so it is not possible to determine the effects of regulation with certainty. It is estimated that a high percentage of textile waste is still disposed via landfilling in the RC, especially if it is contained in mixed municipal waste. Separately collected textile waste is exported or recycled in a factory in Zabok, with a capacity of around 8,000 t per year. The waste management system for textile and footwear waste is insufficiently developed.

1.2.2.3 Packaging waste

With the establishment and development of the packaging waste management system, many companies have modernised their existing, or have built new facilities for waste recovery using EPEEF subsidies. Even though new facilities have been built, and a number of existing ones has been improved, i.e. the capacities for packaging waste recovery have been increased, especially plastic packaging, considering that the market for packaging materials is rapidly evolving, an improvement of the existing technology will be necessary, in terms of the technological applicability for the treatment of some types of packaging waste, e.g. for certain types of multilayer (composite) packaging. Capacities for treatment of packaging containing remains of hazardous matter or being polluted by hazardous matter are, on a national level, insufficient, so it is mostly exported from the RC.

Despite the positive direction in packaging waste management, there exists a need for the improvement of the mechanism of data supervision for the quantity of produced packaging waste, as well as the data on efficiency of recovery (recycling) and the improvement of systems for certain materials (e.g. for packaging except beverage packaging), and the need to establish a packaging waste management system for packaging that contains the remains of hazardous matter or that is polluted by hazardous matter.

The existing packaging waste management system does not sufficiently encompass all the types of packaging waste. The current system is based mostly on PET beverage packaging, while waste management for other types of packaging waste is not regulated in a satisfactory way.

1.2.2.4 Waste tyres

According to the available data, the capacities for recovery of waste tyres are sufficient, and the relation between the capacities for material and energy recovery is satisfactory because recycling is given the advantage compared to use for energy purposes.

However, it is necessary to additionally regulate the system for better use of existing capacities.

1.2.2.5 Waste oils

In the Republic of Croatia in 2015, 33% of total estimated produced quantities of waste mechanical oils was collected. The existing capacities for collection and recovery of waste mechanical oils in the RC are considered to be sufficient, however, the system for separate collection of waste mechanical oils does not achieve the expected effects. The existing system for waste mechanical oil management is insufficient in separate collection of waste mechanical oils and needs to be restructured in a way to increase its efficiency.

1.2.2.6 Waste batteries and accumulators

Considering the quantities of collected and recovered waste batteries and accumulators, the established system can be considered to be of quality and satisfactory.

1.2.2.7 End-of-life vehicles

According to the available data, the capacities for end-of-life vehicles recovery in the RC are sufficient, however, the end-of-life vehicles waste management system is insufficiently regulated insofar as repealing waste status and waste prevention (usable vehicle parts). The capacities for collection and treatment of end-of-life vehicles on a national level are satisfactory, however, further regulation of the system is necessary in order to better utilise the existing capacities.

1.2.2.8 Asbestos waste

To dispose of asbestos waste from construction, a system of collection and disposal on special landfilling areas has been established, within the frame of 17 municipal waste landfills in the RC, shown in Image 20. The mentioned system was free of charge for natural persons until the end of June 2016, i.e. it was financed by EPEEF, while legal entities settled the costs themselves. With the entry into force of the Ordinance on construction and demolition waste and asbestos waste (OG 69/16), the system of management of asbestos waste was more closely regulated and EPEEF obligations in financing the system decreased. The total capacity of built landfilling areas is around 79,100 m³, or 126,560 tonnes, and it was at around 40% of total constructed capacities in the end of December 2015.

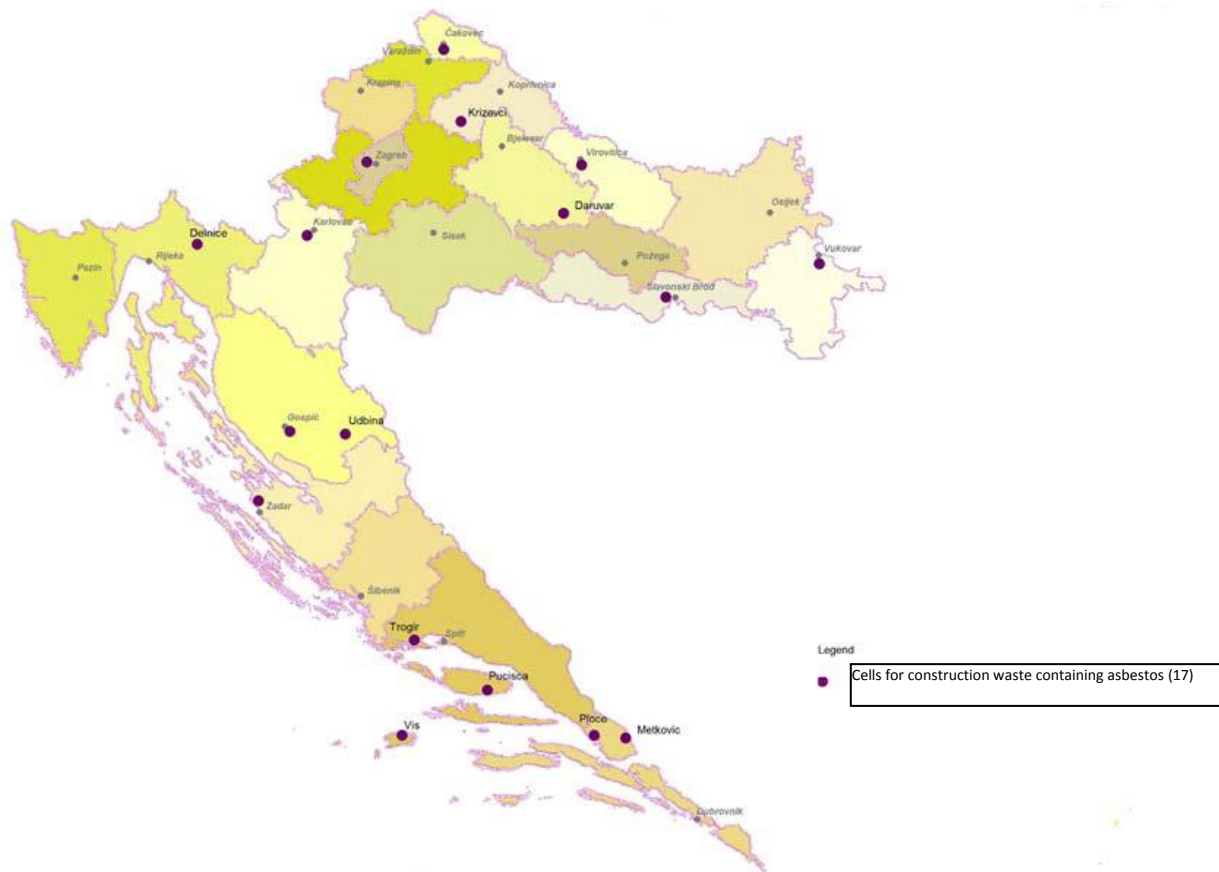


Image 20: A view of the locations of special landfilling cells for asbestos waste

The management system for asbestos waste has been established, however, further technical and other regulation is needed. It is also necessary to conduct a study to estimate the quantity of asbestos waste to be created in the following period.

1.2.2.9 Medical waste

The existing system of medical waste management needs to be improved and the management of some types of medical waste currently being exported needs to be handled in a more suitable way.

1.2.2.10 Waste electrical and electronic equipment

In 2010, the waste electrical and electronic equipment management system achieved its goal of 4 kg of collected EE waste per capita, and in 2012, the prescribed goals for recovery and recycling were also met. The capacities for EE waste treatment in the RC are bigger than the national needs. The EE waste management system is sufficiently developed, and it is necessary to consider the possibility of improving the system in terms of control and inclusion of all obliged persons in reimbursement.

1.2.2.11 Waste ships and marine waste

The ASWM defines waste ships and marine waste as special categories of waste, but the waste ships and marine waste management system is not established and there are no official data nor estimates as to the quantities of these types of waste.

In the RC, there are locations where there are wrecks (sunken ships) and sunken objects (e.g. sunken cargo on the seabed containing mechanical oil, fuel, old weapons, explosive devices or other hazardous matter). Wrecks and sunken objects do not fall into the category of waste ships nor marine waste but are regulated with special provisions.

1.2.2.12 Construction and demolition waste

The construction and demolition waste recycling facility with a capacity of 80,000 t/year is situated at the landfill Prudinec-Jakuševac in Zagreb.

In 2015, seven companies were documented as having permits for mechanical treatment of construction and demolition waste in mobile devices and only in the Koprivnica area was it mechanical treatment of construction and demolition waste in mobile devices within a recycling yard.

Construction and demolition waste is treated in mobile units, asphalt bases and at certain landfills where it is used as cover for landfilled waste.

In 2015, there were 160 different legal entities with 250 valid permits for the recovery of construction and demolition waste in the RC. It is documented that the largest portion of the permits pertain to metals including their alloys (31%), then concrete, bricks, (roof) tiles and ceramics (23%) and soil (including excavated soil from polluted locations), rocks and waste from dredging (15%). The system for construction and demolition waste management and the capacities for construction and demolition waste treatment (recycling yards for construction and demolition waste and mobile devices for construction and demolition waste treatment) are not sufficiently developed. Sorting construction and demolition waste at the site of their creation would significantly improve the possibility of its recovery.

1.2.2.13 Residual sludge from waste water treatment facilities

Currently, in the RC, an adequate management system for residual sludge from waste water treatment facilities is not established, primarily meaning the necessary infrastructure for treatment.

1.2.2.14 Waste polychlorinated biphenyls and terphenyls

Based on the Directive 96/59/EC and the Ordinance on the management of polychlorinated biphenyls and polychlorinated terphenyls (OG 105/08) which was in force until 2014, the possessor would be obliged to undertake all necessary measures to ensure the recovery and/or waste PCB disposal and recovery and/or disposal and decontamination of PCBs and equipment having more than 5 dm³ PCB volume by 31 December 2010. The mentioned goal was not realised within the given timeframe. In accordance with the provisions of the new Ordinance on the management of polychlorinated biphenyls and polychlorinated terphenyls (OG 113/14), it is necessary to separately collect and leave the equipment to a certified entity for decontamination and/or disposal in the shortest possible time, and latest at the deadline determined by the Act on the Confirmation of the Stockholm Convention on Persistent Organic Pollutants (OG-IA 11/06) i.e. by 2025.

1.2.3 Municipal waste public collection service

During 2015, 207 companies provided the public service of municipal waste collection. According to the data³ from 2016, to determine pricing for the service of collecting mixed municipal waste, 60% of cities and counties use container volume as the only or one of the criteria (37% as the only criterion), 33% includes the number of household members as a criterion in pricing (25% as the only criterion), 24% uses frequency of collection as one of or the only criterion, and less than 1% use living space (m²) as the only criterion in their calculations. The accessibility of the public service of municipal waste collection for citizens is satisfactory on a national level. It is necessary to further regulate the municipal waste collection service, especially in regards to separate bio-waste and packaging waste collection, including service pricing so as to achieve the set goals for municipal waste management.

1.2.4 An overview of the companies providing some of the waste management activities

In the period between 2007 and 2016, the total number of companies possessing a permit for waste management has seen an increase (the number of companies possessing a permit for non-hazardous waste management by around 42% and the number of companies possessing a permit for hazardous

³ The data were received via a questionnaire from 218 LSGUs (48 cities and 170 municipalities) (CAEN, 2016)

waste management by around 55%). In May 2016, 441 different companies had some sort of permit for waste management.

Table 8. Number of companies possessing a permit for waste management or are inscribed in Registers (CAEN, May 2016)

Type of company or permit	Number of companies
Permit for non-hazardous and municipal waste management	417
Permit for hazardous waste management	68
Certificate of inscription in the Waste Transport Register	1528
Certificate of inscription in the Waste Management Intermediary Register	409
Certificate of inscription in the Traders Register	295
Certificate of inscription in the Recycling Yards Register	84 ⁴
Certificate of inscription in the Register for entities storing their production waste	713
Certificate of inscription in the Energy Recovery Operators Register	14
Certificate of inscription in the Register for importers of waste not subject to the notification procedure	126
Certificate of inscription in the Register for exporters of waste not subject to the notification procedure	296
Certificate of inscription in the By-product Register	73
Certificate of inscription in the Waste Status Removal Register	11

When considering the number of valid permits, in 2016, for the management of non-hazardous production and municipal waste, it is 72% larger, and for hazardous waste management, 98% larger compared to 2007.

The total number of valid permits (note: one company may have several permits) for non-hazardous production and municipal waste management in May 2016 was 572, of which 462 permits were for the activity of waste collection, 398 storage, 396 recovery/treatment and 63 permits were for waste disposal. Of the 396 valid permits for recovery/treatment of non-hazardous production and municipal waste, 303 permits were for procedures of non-hazardous waste recovery, and 245 permits were for procedures of waste treatment. There were 19 valid permits for biological treatment. A total of 427 valid permits covered municipal waste management, including separate collection of certain types of municipal waste.

The number of companies documented as inscribed in the transporter, intermediary and exporter Registers from 2006 to 2016 is in a constant increase, however, a number of inscribed companies perform these activities only partially.

In the period from 2004 to 2016, there were no larger changes in the number of companies working with exportation of waste subject to the notification procedure. These are some fifteen companies that received a resolution/clearance to export hazardous waste from the Ministry for the environment and

⁴ In 2016, a total of 84 recycling yards were built and 46 mobile recycling yards were procured

energy (hereinafter: MEE). The number of companies performing the activity of waste management can be considered satisfactory. It is necessary to improve the supervision of waste movement (transboundary and within Croatian borders).

1.3 STATUS OF “HOT SPOT” REMEDIATION PROJECTS

The Waste Management Strategy of the Republic of Croatia (OG 130/05) defines “hot spots” as highly polluted locations in the environment, due to a long-term, unsuitable management of production (technological) waste (e.g. waste from leather and textile industry, waste from production and processing, drill-in fluids, oily soil and sludge left around deep wells, container sediments, waste from inorganic technological processes - acids, bases, heavy metal salts, waste from the artificial fertilizer production, waste from organic chemical processes, waste from paint remains and aerosol paints, pesticides, photographic industry waste, waste from inorganic thermal processes, waste oils of mineral origin and waste organic solvents, tyres, vehicles and asbestos production waste, as well as batteries and lead accumulators).

By the end of 2016, the following sites have been remedied: the Bakar Coke Plant (2010), asbestos cement waste around the bankrupted Salanit d.d. plant in Mravinačka kava (2007), the dig site on top of which the football field “Omladinac” in Vranjic is situated (2009), Mravinačka kava (2012), hazardous waste landfill, Lemić brdo near Karlovac (2016) and the landfill of slags from Plomin I Thermal Power Plant.

The remediation of the phosphorus gypsum landfill in Kutina is planned together with a complete landfill remediation and closing project financed by the owner.

Besides “hot spots”, the Waste Management Plan of the Republic of Croatia for the period from 2007 to 2014 defines locations polluted by hazardous waste. By the end of September 2016, the following locations have been remedied: the polluted grounds of the former electrodes and ferroalloys plant in Šibenik (2015), the closed-down factory “Borovo” in Vukovar - phase I (2009) and tar remediation on the beach Salbunara in the City of Komiža - Biševo island (2008).

Following the “polluter pays” principle, the remediation of Botovo washing and fumigation station and remediation of fuel oil in the closed-down screw factory Tvik in Knin are to be conducted by the legal entity - successor. For the remediation of Kaštela Bay, where larger quantities of slag are located, it is necessary to draw a Detailed Development Plan and form a financing model for the remediation.

An overview of the current statuses of “hot spots” remediation is given in Table 9.

Table 9. An overview of the statuses of “hot spot” remediation projects

No.	Polluted location	Project status	Possible sources of funding
1	Red mud basins and waste bases by the closed-down alumina plant in Obrovac	In December 2015, the MEE gave its Consent for the Remediation program by the EPEEF. In the following period, EPEEF plans to conduct public procurement to choose the contractor to draw the Main project for remediation completion, where all remediation procedures details will be determined, as well as making the location environmentally suitable.	National funding/ EPEEF
2	Remediation of the coastal area facing the bankrupted factory Salanit d.d. - Kosica	Project documentation is planned for the remediation of the part of the coast polluted by asbestos waste.	National funding/ EPEEF/EU
3	Remediation of the location with larger quantities of slag and ash: slag landfill in Kaštela Bay	EPEEF funding financed research and making the Amendment to the remediation programme, consented to by the MEE in June 2014. The City of Kaštela has to draw a Detailed development plan so as to, considering the future purpose of the location, be able to continue with the design.	Owner/ LSGU/ National funding/ EPEEF/EU
4	Remediation of the washing and fumigation station in Botovo	A Remediation programme has been drawn and it has to be completed. It is necessary to determine the legal successor to the polluter.	Polluter
5	Remediation of Sovjak pit near Rijeka	Project documentation has been compiled. In May 2014, research was conducted, after which the Environmental Impact Assessment study was drawn, and in January 2016, the decision on the environmental acceptability of the operation was obtained. After the drawn project concept, in September 2016, a location permit was obtained.	IPA/ EPEEF /EU
6	DIV d.o.o. from Samobor - fuel oil remediation from the former screw factory TVIK in Knin	Within the PHARE 2006 project, a Remediation plan proposal was drawn. The company DIV d.o.o. is obliged to draw a Pollution Remediation Plan for the company grounds.	Polluter

2 MAIN GOALS OF WASTE MANAGEMENT

The main goals of waste management in the RC are a consequence of the waste management status estimation and the obligations issued by EU legislation and regulations (Table 10).

Table 10. Obligations of the RC originating from EU legislation and regulations

Type of waste	Year	Minimal recovery	Minimal recycling	Collection rate	Status
Packaging waste	2008	60%	55-80% Depending on the material ⁵		Except in the part of metal and wood recycling, the goals have been met.
End-of-life vehicles	2015	95%	85%		Goal accomplished for 2015.
EE waste	2006	70-80% Depending on the category	50-80% Depending on the category	EE household waste min 4 kg per capita/year	Goal accomplished.
	2016			45% of total mass put on the market	-
	2019			65% of total mass put on the market or 85% collected	-
Batteries	2011		50% to 75%		Goal accomplished.
	2012			25%	Goal accomplished.
	2016			45%	-
Waste tyres	2006	Landfilling ban, recycling must include at least 70% of waste tyres			Goal accomplished, almost all quantities collected, 76% materially recovered
PCB	2010	PCB waste disposal and recovery and/or disposal and decontamination of PCBs and equipment with a PCB volume higher than 5 dm ³ ⁶			The goal is partially accomplished, 30% of equipment containing PCB remains to be disposed.
	2025	Disposal of equipment containing PCB ⁷			The goal is partially accomplished, 30% of equipment containing PCB remains to be disposed.
Decreasing the quantities	2016	50% i.e. 378,088 tonnes by 31 December 2016			In 2015, 828,564 t of

⁵ It is necessary to achieve the minimal recycling rates for packaging materials contained in packaging waste: 60% of mass for glass, 60% of mass for paper and cardboard, 50% of mass for metals, 22.5% of mass for plastic, counting exclusively the material recycled back to plastic, 15% of mass for wood.

⁶ Ordinance on the management of polychlorinated biphenyls and polychlorinated terphenyls (OG 105/08)

⁷ Act on the Confirmation of the Stockholm Convention on Persistent Organic Pollutants (OG-IA 11/06)

of landfilled biodegradable waste			biodegradable waste landfilled, considering insufficient treatment and low rate of separate collection, it is not likely that the goal will be met.
	2020	35 % i.e. 264,661 tonnes by 31 December 2020	-
Waste landfilling	2018	Landfilling ban for unregulated landfills	-
Municipal waste	2015	LSGUs to secure separate collection of problematic waste, waste paper, metal, glass, plastic and textile and bulky municipal waste.	Separate collection established in 400 LSGUs.
	2020	50% preparation for re-use and recycling of municipal waste.	For 2015, the rate is 18%.
Construction and demolition waste	2020	70% of recycling/material recovery of construction and demolition waste	The goal is not met, the analysis “Improving the flow and quality of the data on construction and demolition waste and research and exploitation of mineral resources in the RC” has been started.

Based on the evaluation of the current state of waste management and the obligations that the RC has to achieve in accordance with the EU and national legislation, this Plan defines the following goals that have to be met by 2022 (Table 11).

Table 11.

Waste management goals that need to be met by 2022 in comparison to 2015.

No.	Goal		
1	Improve the system of municipal waste management	Goal 1.1	Decrease the total quantities of produced municipal waste by 5%
		Goal 1.2	Separately collect 60% of mass of produced municipal waste (primarily paper, glass, plastic, metal, bio-waste etc.)
		Goal 1.3	Separately collect 40% of mass of produced bio-waste constituent in municipal waste
		Goal 1.4	Landfill less than 25% of mass of produced municipal waste
2	Improve the special categories of waste management system	Goal 2.1	Separately collect 75% of mass of produced construction and demolition waste
		Goal 2.2	Establish a system of management for residual sludge from waste water treatment facilities
		Goal 2.3	Improve the packaging waste management system
		Goal 2.4	Establish a marine waste management system
		Goal 2.5	Establish a system of management for waste ships, wrecks and sunken objects on the seabed
		Goal 2.6	Improve the system of management for special categories of waste
3	Improve the hazardous waste management system		

4	Remedy polluted locations
5	Continually conduct educative and informative activities
6	Improve the waste management information system
7	Improve waste management supervision
8	Improve administrative procedures in waste management

3 WASTE FLOW DEVELOPMENT ESTIMATION, NEEDS AND METHODS OF ESTABLISHMENT OF NEW SYSTEMS AND FACILITY NETWORKS AND DEVICES FOR WASTE MANAGEMENT

3.1 MUNICIPAL WASTE

An estimation of the quantities of produced municipal and biodegradable municipal waste for the period 2015 to 2030 (Image 21), was drawn in the Project⁸: “Creating a unique methodology for composition analyses of municipal waste, defining the average composition of municipal waste in the Republic of Croatia and estimating quantities of municipal waste.” CAEN (2015).

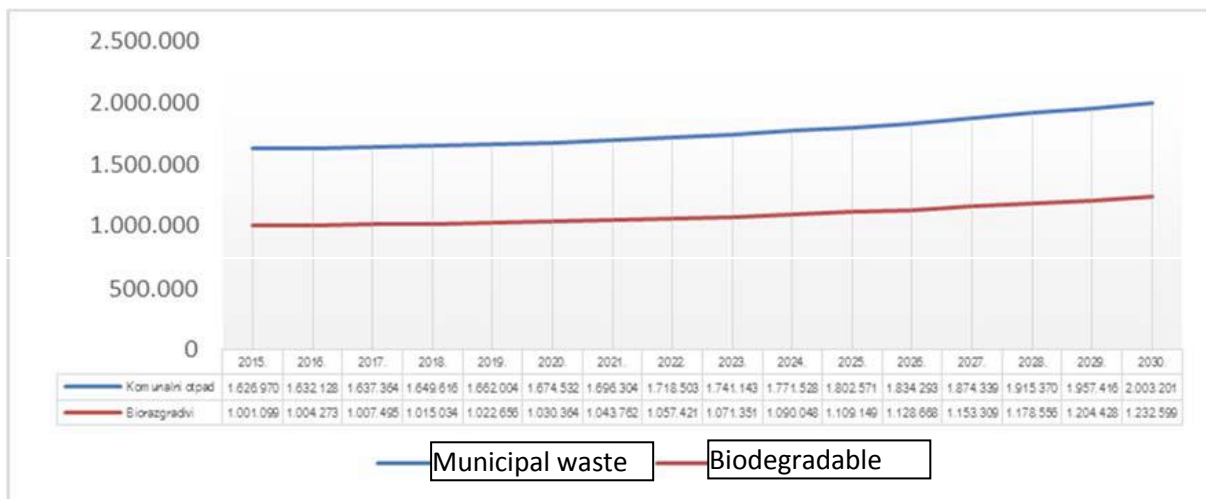


Image 21: An estimation of the total quantities of produced municipal and biodegradable municipal waste for the period 2015 to 2030 (CAEN, 2015)

According to the mentioned Project, a slight increase of the quantities of municipal waste is expected by 2030. With the current 1,650,000 t/year, in 2030, 2,000,000 tonnes of municipal waste is predicted.

But in order to stop the growth trend of produced municipal waste, increase the rate of separate collection and recycling, and decrease the portion of landfilled biodegradable waste, it is necessary to establish a municipal waste management system, promoting waste prevention, waste separation at its origin and which contains an infrastructure that makes possible to fulfil the goals and waste management in accordance with the order of priority in waste management (Image 22)⁹:

1. waste prevention,
2. preparation for re-use,
3. recycling,
4. other recovery procedures, e.g. energy recovery and
5. waste disposal.

⁸ <http://www.azo.hr/Metodologija> for determining municipal waste composition

⁹ For possible deviations from the order of priority of waste management, it is necessary to proceed in accordance with ASWM regulations.

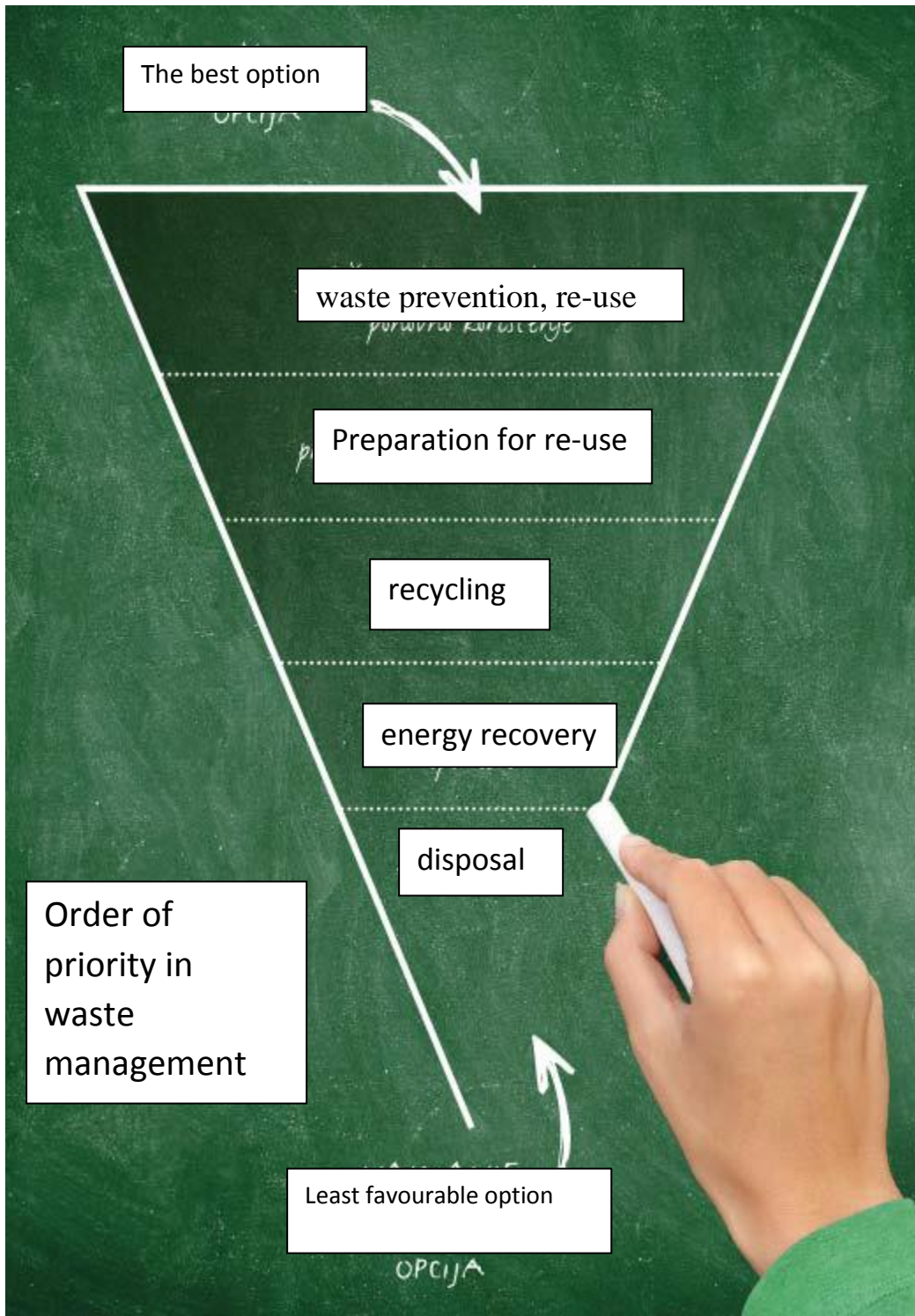


Image 22: Order of priority in waste management

Such a system encourages re-use, repair, restoration and recycling of existing materials and products. What was considered to be “waste” can be turned into a resource and with that in mind, a total municipal waste management of this kind is recommended (Image 23).

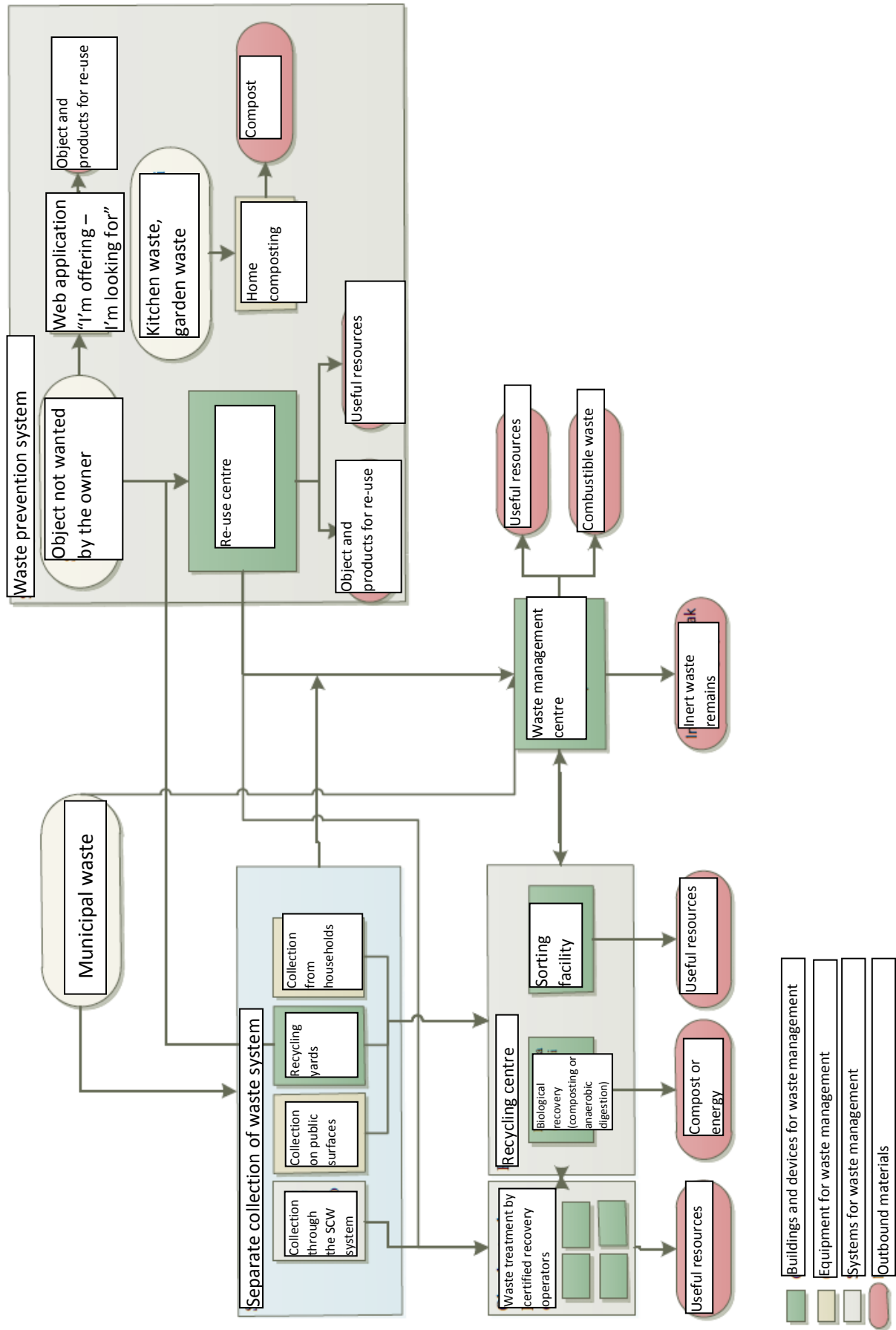


Image 23: Municipal waste management scheme

The first step in the complete system is to ensure the conduction of measures for waste prevention defined by the Waste Prevention Plan (Paragraph 9 of this Plan).

The most important measures in the waste prevention paragraph are establishing Re-use centres and securing necessary equipment for home composting.

Furthermore, the focus in the municipal waste management system will be placed on a system for separate collection of municipal waste, through securing the necessary infrastructure for the separation of municipal waste: at the origin waste creation, via recycling yards, on public surfaces and through implementing the regulations for special categories of waste (packaging waste, waste tyres, waste EE equipment, etc.)

Separately collected bio-waste will be taken for material recovery in facilities for biological (aerobic or anaerobic) treatment of separately collected bio-waste (composting plant or anaerobic digestion), in order to produce compost or digestates and biogas.

Separately collected paper, cardboard, metal, glass and plastic will be taken to sorting facilities for separately collected waste in order to increase the value or quality of separately collected waste and to prepare the waste for recycling. Separately collected waste will, after sorting, be taken to certified companies for recycling, or treatment.

Mixed municipal waste (waste remains) will be collected through the public service of mixed municipal waste collection provided by its performers, and the collected waste will be taken to WMCs directly or through transfer stations.

The establishment of the previously mentioned system will secure the achievement of goals of this Plan in 2022, and it will also change current waste flows (Image 24). Applying the waste prevention measures, the goal of decreasing total quantities of municipal waste will be met in 2022, to a maximum 1,571,222 t. Applying the measures of establishing a separate waste collection system, in 2022, at least 942,733 t of composite materials in municipal waste will be separated, such as: paper, cardboard, plastic, bio-waste, bulky waste. In the total quantity of separately collected waste, at least 201,116 t of waste will be separately collected bio-waste, representing 40% of total produced bio-waste, while at least 741,617 t will be separately collected useful resources such as paper, cardboard, glass, plastic and others. Applying all the measures, at the end of the planned period, there should be a maximum of 628,489 t of mixed municipal waste.

Total produced municipal waste ≤ 1.571.222 t		
Separately collected municipal waste ≥ 942.733t		Mixed municipal waste ≤ 628.489 t
Separately collected municipal waste (paper, glass, plastic and others) ≥ 741.617 t	Separately collected bio-waste ≥ 201.116 t	

Image 24: An overview of target values in 2022

3.1.1 Waste prevention

In order to achieve Goal 1.1, “Decrease the total quantities of produced municipal waste by 5% in relation to the total produced quantities of municipal waste in 2015”, it is necessary to ensure the functioning of the waste prevention system i.e. conducting the measures defined in the Waste Prevention Plan (Chapter 9 of this Plan) and establish re-use centres and secure the necessary equipment to conduct home composting measures in the RC.

3.1.1.1 Re-use centres and re-use networks

Re-use centres and re-use networks (for the promotion of re-use and preparation for re-use) are subjects whose activity is collection, restoration or repair and redistribution of products that would otherwise have become waste.

Re-use centres can under certain conditions, prepare for re-use products or parts of products that have become waste through recovery i.e. preparation for recovery (checking, cleaning or repairing) and revoke their waste status and return them to the market as products. In accordance with the activity description in the centres, according to the order of priority in waste management, the activities of the centre are waste prevention activities for products and re-use preparation activities for waste.

Establishing re-use centres, exchange and re-use is promoted for discarded products and objects not needed or wanted by their possessor, but that can still be used. Through re-use centres, it will be possible to re-use textile (clothes and footwear), furniture, electric and electronic devices and widely used objects like dishes, books, toys, sporting equipment, bicycles, child equipment and others.

In re-use centres it is necessary to establish a web application “I’m offering - I’m looking for” that will facilitate the exchange of things and objects not needed nor wanted by the possessor, as well as connecting the application within all the centres for re-use.

3.1.1.2 Home composting

In order to prevent landfilling bio-waste at landfills and contribute to the achievement of other waste management goals, it is necessary to promote composting among the general population. The goal is to achieve that households separate bio-waste from other household (municipal) waste by putting them in bio-waste containers, and by composting in personal composters or their garden, decrease the total quantities of produced waste. This measure will encompass rural areas, i.e. suburbia to urban centres with a larger number of households with yards. In the Republic of Croatia, the implementation of this measure could deduct 90,000 t of bio-waste annually.

3.1.2 System for separate collection of municipal waste

To achieve goal 1.2., “Separately collect 60% of mass of produced municipal waste (primarily paper, glass, plastic, metal, bio-waste etc.)”, it is necessary to secure an infrastructure that promotes and facilitates separate collection of individual types of municipal waste: waste paper, cardboard, glass, plastic, metal, bio-waste, bulky waste etc.

In 2015, a total of 24% of municipal waste was separately collected while the recycling rates for paper, metal, plastic and glass from municipal waste in 2015 were 25%, i.e. half of the aimed amount for 2020. In order to meet the prescribed goal of 50% recycling rates in 2020, it is necessary to, in as short deadlines as possible, secure a higher rate of municipal waste separation and the highest quality of separately collected recycling waste.

The planned increase in quantities of separately collected types of municipal waste (paper/cardboard, plastic, metal, bio-waste, bulky waste) is shown in image 25 and Image 26.

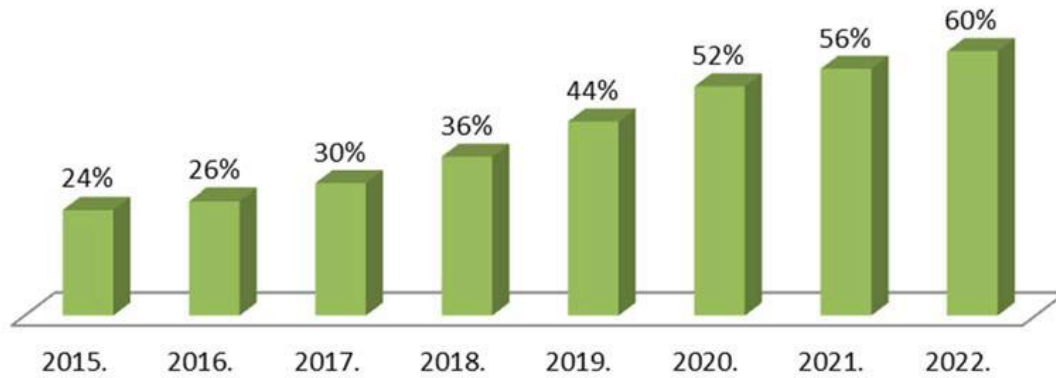


Image 25: Dynamics of meeting Goal 1.2, “Separately collect 60% of mass of produced municipal waste (primarily paper, glass, plastic, metal, bio-waste, bulky waste)”

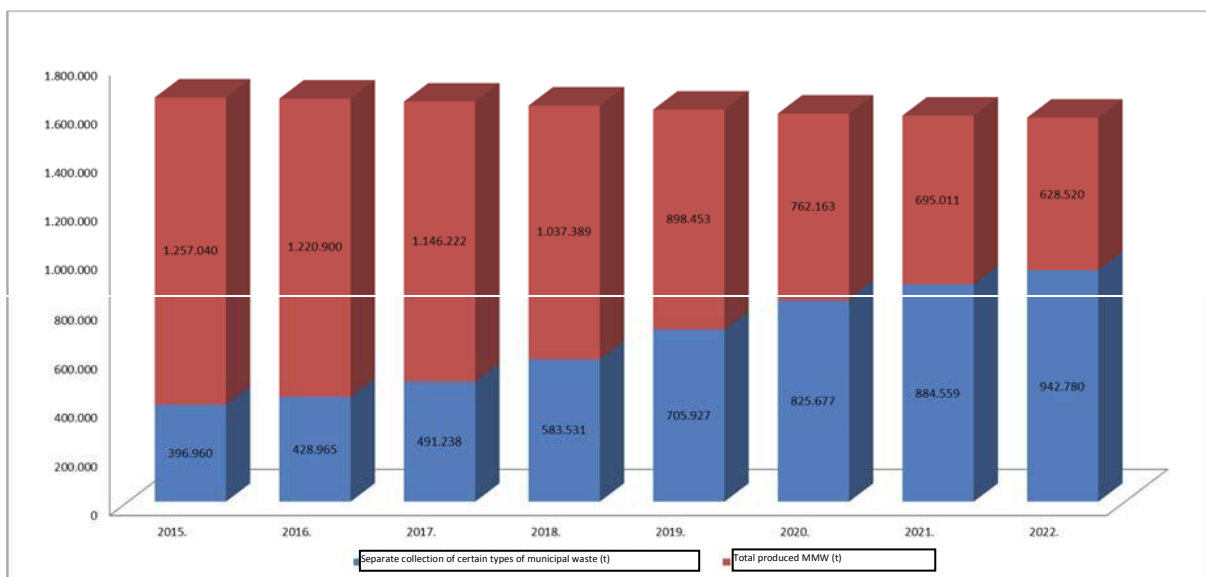


Image 26: A view of the dynamics of quantity increase of separately collected municipal waste by 2022

To fulfil the goal through the execution of the planned dynamic, it is necessary to procure municipal equipment, vehicles and vessels for separate collection of waste, construct recycling yards and sorting facilities for separately collected waste.

Recycling yard

A *recycling yard* is a supervised fenced area intended for separate collection and temporary storage of smaller quantities of special types of waste.

A recycling yard can be mobile, constructed as a mobile technical unit not a building or a part of a building, and whose purpose is separate collection and storage of smaller quantities of special kinds of waste (e.g. waste paper, metal, glass, plastic, textile, bulky waste, edible oils and fats, detergents, paints, medicine, EE waste, batteries and accumulators, construction waste from smaller household repairs etc.)

The ASWM prescribes that LSGUs are obliged to ensure the functioning of one or several recycling yards depending on the number of citizens in the LSGU. Even though the ASWM prescribes that LSGUs with more than 1,500 citizens are obliged to construct a recycling yard, in the application of the ASWM, it has been noted that this criterion may be increased to 3,000 citizens to decrease operational costs to LSGUs, without putting in jeopardy the achievement of the goal. To fulfil this

obligation, it is recommended to introduce the possibility of neighbouring LSGUs uniting in the use of one recycling yard.

Within recycling yards, a separate part for re-use can be secured (e.g. a “product re-use corner”).

Construction and demolition waste recycling yard

Construction and demolition waste recycling yard is a facility intended for sorting, mechanical treatment and temporary storage of construction and demolition waste.

Separately collected waste sorting facility

Separately collected waste sorting facility is a facility for waste management intended for sorting, mechanical treatment and storage of separately collected municipal waste.

Recycling centre

A recycling centre is a system of facilities and devices for the collection and treatment of municipal waste.

Waste treatment includes recovery and disposal procedures, as well as preparation procedures before recovery or disposal.

A recycling centre may include:

- a re-use centre
- a recycling yard
- a construction and demolition waste recycling yard
- a separately collected waste sorting facility
- a facility for the biological (aerobic or anaerobic) treatment of separately collected bio-waste

3.1.3 Waste management centre (WMC)

WMC is a system of several functionally and/or technologically connected facilities and devices for the treatment of municipal waste. So, in WMCs, different activities may take place, relating to collection and treatment of municipal waste, and it may contain:

- a re-use centre
- a recycling yard
- a construction and demolition waste recycling yard
- a separately collected waste sorting facility
- a facility for the biological (aerobic or anaerobic) treatment of separately collected bio-waste
- a facility/equipment for mechanical treatment of unusable bulky waste
- a facility for mechanical biological treatment of mixed municipal waste
- a cell for landfilling asbestos waste and
- a cell for landfilling previously treated non-hazardous waste.

WMCs may take in the following kinds of waste:

- bulky waste
- separately collected waste paper/cardboard, plastic, metal, glass
- separately collected bio-waste
- construction and demolition waste
- asbestos waste
- inert production waste
- mixed municipal waste.

The following types of waste are taken to WMCs directly via certified collectors and transporters or from transfer stations.

Except the already constructed WMCs (Kaštijun and Marišćina) and WMCs currently being built (Biljane donje and Bikarac), other WMCs defined by the Waste Management Plan of the Republic of Croatia for the period 2007 - 2015 will be prepared (Image 18), as well as the preparation of WMCs at new locations. When planning the capacities of these WMCs, it is necessary to conduct a feasibility study taking into considerations the waste management goals to be met by this Plan. The study must represent all measures that need to be undertaken at the wider locality of the WMC, to reach the goals and justify the planned capacity.

3.1.4 Landfills

A landfill is a facility intended for surface landfilling or underground landfilling.

Taking into consideration the obligation to stop landfilling at unregulated landfills after 2018, this Plan defines the measure 4.1. "Drawing a Plan of closing non-hazardous waste landfills including analyses for further capacities and possibilities of landfilling at regulated landfills".

3.2 SPECIAL CATEGORIES OF WASTE

3.2.1 Bio-waste

To fulfil the obligation of decreasing landfilling of biodegradable waste, the Goal 1.3, "Separately collect 40% of mass of produced bio-waste constituent in municipal waste", must be met, along with Goal 1.4, "Landfill less than 25% of mass of produced municipal waste".

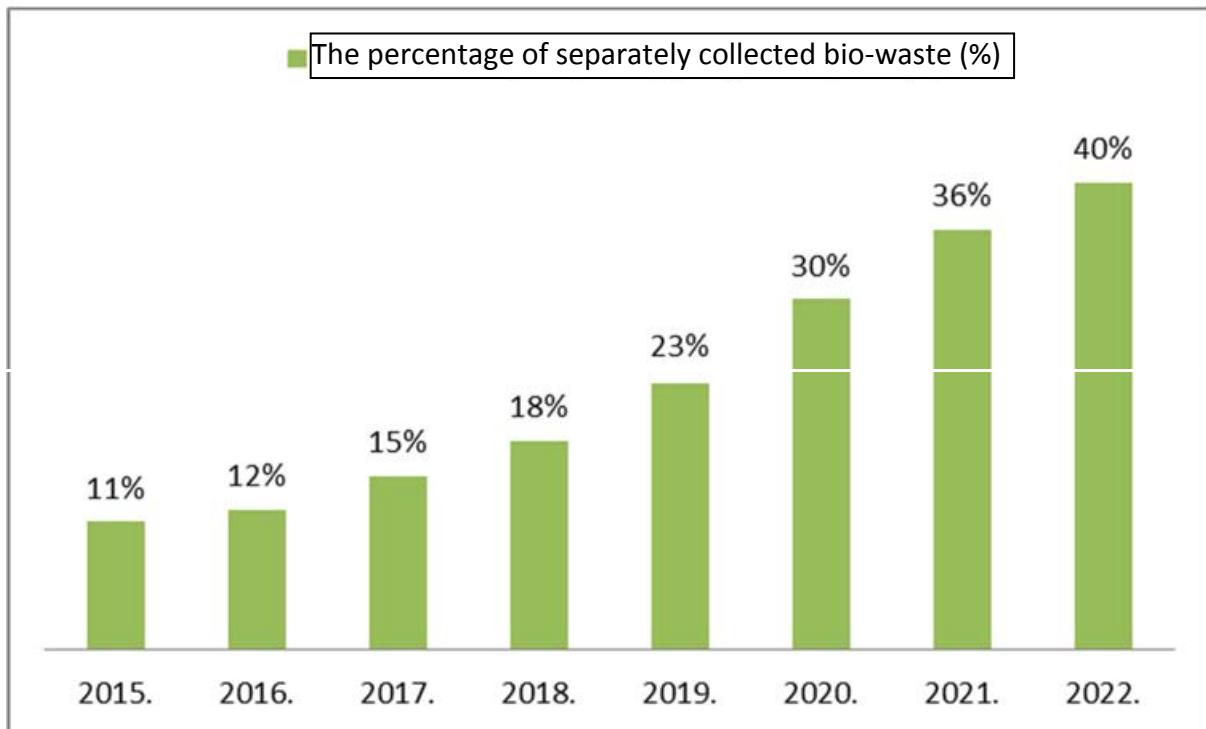


Image 27: A projection of growth of collected bio-waste

To accomplish this goal, it is necessary to secure equipment and vehicles for separate collection of bio-waste and the facilities for biological treatment of separately collected bio-waste.

Facilities for biological treatment of separately collected bio-waste

Facilities for biological treatment of separately collected bio-waste are used for aerobic (composting plant) or anaerobic (digester) treatment, with the goal of producing compost, digestates and biogas.

3.2.2 Textile and footwear waste

The analysis of the current state points to the need of upgrading the management system of this special category of waste, as well as a lack of reliable and complete data on quantities of produced textile and footwear waste and data on available capacities and technologies for the treatment of this type of waste.

3.2.3 Packaging waste

The results of the analysis of the available data on packaging and packaging waste for the period 2006 - 2013 show a decrease in the quantities of packaging waste which is mostly a consequence of the effect of the financial crisis on the economy and diminishing buying power. A smaller increase was documented in 2014 and 2015. Considering these data, it is necessary to take into consideration their incompleteness.

Also, certain types of packaging waste such as that containing the remains of hazardous matter or being polluted by hazardous matter, are not included in the current management system, i.e. including this type of waste into the management system is under way.

Based on the data on packaging quantities put on the market in the period from the establishment of the packaging waste management system, an estimation was drawn for the total quantities of produced packaging waste for the period of the implementation of this Plan. The estimation shows a further trend in decreasing quantities of produced packaging waste (Image 28) with a negative annual growth rate of 0.4%.

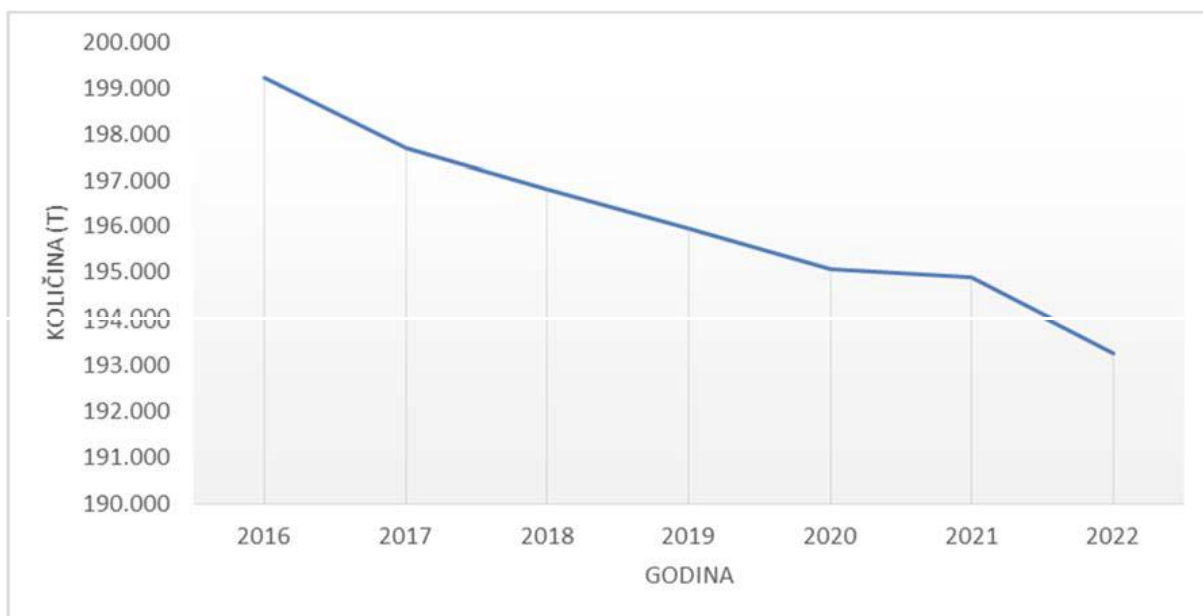


Image 28: An estimation of total quantities of produced packaging waste for the period 2016 - 2022

It is estimated that during the planned period, total quantities of packaging waste will be between 193,000 and 200,000 tonnes.

The mentioned negative trend for the total quantities of produced packaging waste for the planned period is different for different types of packaging material (Image 29).

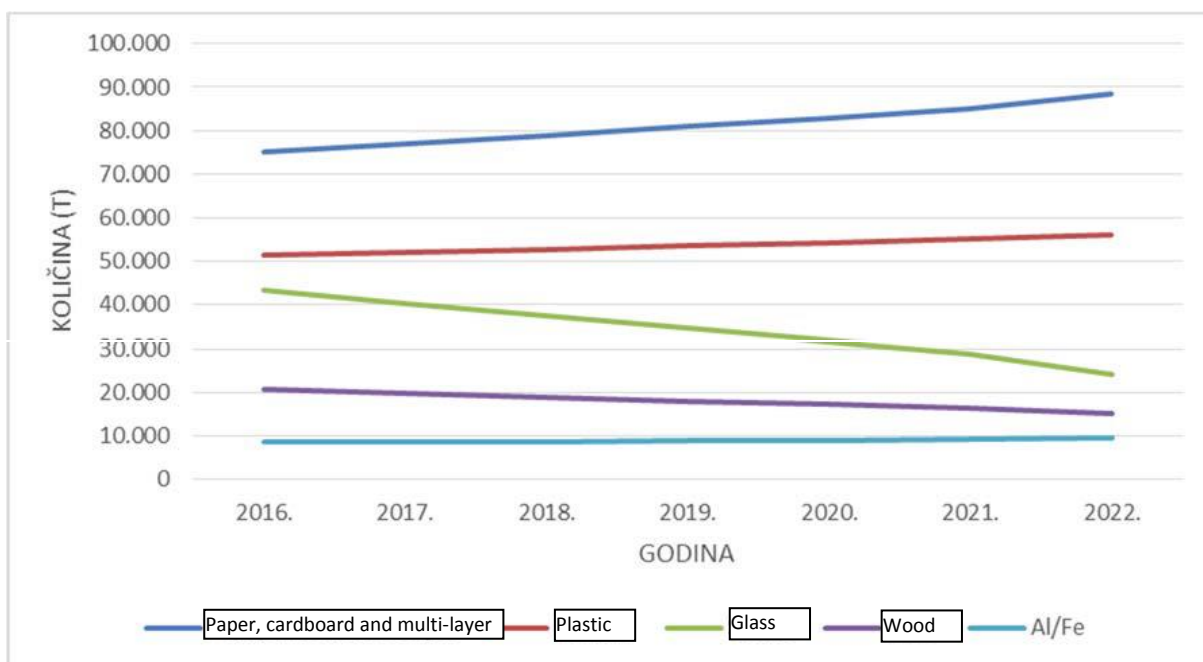


Image 29: An estimation of quantities of produced packaging waste by type of packaging material for the period 2016 - 2022

It is necessary to take into consideration that the predicted quantities do not include packaging waste containing the remains of hazardous matter or being polluted by hazardous matter, and for which there are no reliable data, as well as the fact that the estimation was drawn based on the data on the quantities of packaging waste documented in the EPEEF system, which does not encompass the total quantities of produced packaging waste in the RC. Taking into consideration additional sources of data according to which the quantity of empty packaging put on the market in the RC is almost two times

bigger than the registered quantities put on the market through the EPEEF system, it is to be expected that the quantities of packaging waste that will be created in the planned period, will be larger than estimated.

An analysis of the current state shows how sufficient capacities for the treatment of packaging waste exist, however, changes in organisation and control of the management system are needed, as well as changes in the current technologies for the treatment of packaging waste in accordance with the new technological trends in packaging production and the demands of a market approach in waste management in the framework of circular economy.

3.2.4 Medical waste

Taking into consideration the results of the analysis of the available data on medical waste, including a three-year period, it is estimated that there will be no significant changes in the dynamics of creation of this type of waste. However, to develop a more efficient medical waste management system, an improvement of the supervision of the waste flow for this type of waste is needed, as well as securing complete data. It is also necessary to improve the current organisation as to the collection and treatment of medical waste, especially in development of a higher-quality solution in the treatment of potentially infective waste.

3.2.5 Waste oils

Waste oils have a high recovery potential. In accordance to that, the waste management system for waste mechanical and edible oils needs to intensify the collection of this type of waste, and improve collection control and transfer to certified recovery operators. Additional capacities for the recovery of waste edible oil will be secured through the development of a system for biological waste treatment (composting facilities and biogas facilities).

3.2.6 Waste polychlorinated biphenyls and terphenyls

Equipment containing PCBs (transformers, condensers) are treated outside the RC, which is currently an adequate waste management method for this type of waste and will be continued in this planned period.

3.2.7 Construction and demolition waste

Construction and demolition waste has a high recycling potential and it is recognised at a European level as one of the high-priority waste flows. The evaluation of the current waste management state in the RC clearly shows that the officially available data on produced construction and demolition waste as well as the data on available capacities for construction and demolition waste treatment are not entirely reliable nor complete. According to the official data by CAEN for the period 2011 - 2013, the reported quantities of produced waste are less than 200 kg per capita and a growth trend is documented in the reported quantities in relation to the reported quantities of previous years when produced quantities were less than the mentioned 200 kg per capita. Considering the true growth of the construction sector in the RC by 2008 and the decrease after that year due to the recession, this growth in reported quantities can primarily be ascribed to the improved system of collection and data treatment, as well as possible methodological differences in classification.

The problems in determining the quantities of produced construction and demolition waste are not present only in the RC, but in other EU member states.

A study on construction and demolition waste management from 2011¹⁰ for the EC concluded that the methodology for determining the quantities and composition of construction and demolition waste is still not entirely uniform at an EU level, and currently available data on quantities are not entirely reliable.

¹⁰ Bio Intelligence Service "Management of construction and demolition waste"

For all countries that, by 2004, reported waste quantities per capita significantly smaller than the EU member states' averages (940 kg per capita) it was ascertained that they underestimated the quantities of produced construction and demolition waste. A more realistic estimation of the quantities of produced construction and demolition waste in these countries came through adopting the average of 940 kg per capita.

To estimate the quantities of construction and demolition waste, the prediction from the Industrial strategy of the Republic of Croatia 2014 - 2020 was used, noting that the physical volume of construction work for this period will constantly be at 88.9% of the volume from 2008. If this supposition is applied for the period of this Plan, the total quantities of produced construction and demolition waste in the period 2016 - 2022 will be 32.2 million tonnes.

These numbers demonstrate the necessity of recognizing produced construction and demolition waste as one of the priority categories of waste and that, in the following period, groundwork is prepared for the efficient management of this type of waste.

Taking into consideration that the largest quantities of construction and demolition waste still are not registered and are probably landfilled, in which its valuable properties are not utilized, significant improvements are necessary in the control of this waste flow.

An analysis which will secure appropriate data on the quantities, composition and available capacities for the treatment of produced construction and demolition waste is underway, based on which a solution proposal for the establishment of an efficient system will be drawn.

Considering that similar problems exist in other EU member states, the problem of determining the quantities and composition of construction and demolition waste must be considered in a wider context.

3.2.8 Residual sludge from waste water treatment facilities

According to the existing analyses¹¹ related to the treatment of residual sludge from waste water treatment facilities, the total sludge production by 2024 is estimated to be 107,000 tonnes per capita/year. A slight increase to 125,000 tonnes is estimated for 2051, however, it is not considered to be important due to great errors in estimations (Image 30).

¹¹ Treatment and disposal of waste and waste sludge generated by treatment of waste water from public sewerage systems of towns and municipalities in Croatian counties", WYG International LTd, Croatian Waters, 2013

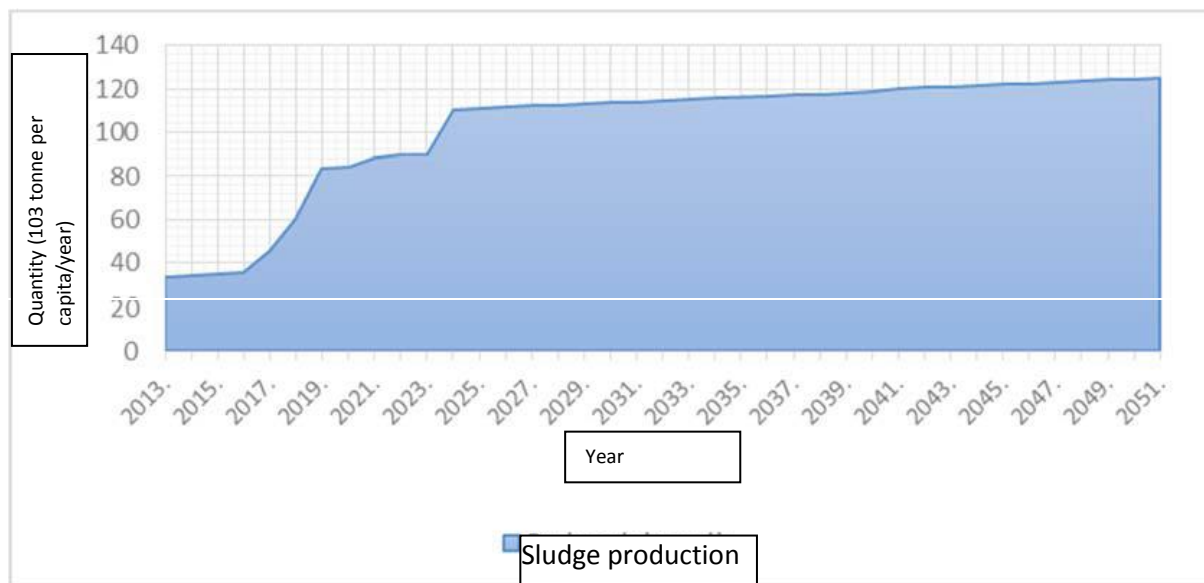


Image 30: An estimation of the quantities of produced residual sludge for the period from 2013 to 2051

Source: “Treatment and disposal of waste and waste sludge generated by treatment of waste water from public sewerage systems of towns and municipalities in Croatian counties”, WYG International Ltd., Croatian Waters, 2013

The highest sludge producing regions are north-west Croatia with the City of Zagreb as the main producer, eastern Slavonia, Istria-Kvarner and the county of Split-Dalmatia. The seasonal variations in tourist areas are a significant problem seeing that more than 70% of tourist stays happen within a period of two to three months. The mentioned variations are highest in the coastal area, specifically in the county of Istria with a winter production of 73% and summer production of 178% of annual average production. Currently in the RC, there is no adequate method of managing residual sludge. Residual sludge is mostly temporarily stored or landfilled, and smaller quantities are used in agricultural purposes or are composted.

During the establishment of the system for residual sludge management, it is necessary to follow the order of priority in waste management (Image 22), meaning primarily material recovery and application on areas suitable for sludge application. In order to determine the types of suitable areas, their locations and capacities, it is necessary to draw an Action plan for the use of residual sludge from waste water treatment facilities on suitable surfaces. In defining suitable surfaces, it is important to take into consideration the limitations of use on agricultural surfaces in agricultural production, i.e. it is necessary to regulate the criteria of the possible use for surfaces or cultures that are not in the food production system, with a use ban on ecological and integrated production in accordance with special regulations.

Residual sludge from waste water treatment facilities can be used in agriculture only if it was previously composted, digested, or stabilised, and if the content of heavy metals and other hazardous matter in accordance with the demands of the Ordinance on protection of agricultural soil from pollution (OG 9/14) and the Ordinance on the management of residual sludge from waste water treatment facilities when it is used in agriculture (OG 38/08),

3.3 PRODUCTION WASTE

Production waste is considered to be waste produced in the production process in industry, crafts and other processes, except for the remains from production processes used in the production process of the same producer.

The waste producer or waste owner is obliged to transfer their production waste to a certified entity for waste management or can treat their own waste if they are certified for it.

Production waste is received from the producers by certified companies for the collection or treatment of certain types of waste. Depending on the type of production waste, it is treated inside or outside the RC.

3.4 HAZARDOUS WASTE

Hazardous waste is waste possessing one or more hazardous properties defined by the ASWM.

Collection and treatment of hazardous waste is conducted via certified entities for the collection or treatment of certain types of hazardous waste. Depending on the type of hazardous waste, it is treated inside or outside the RC.

Problematic waste is hazardous waste from households, and citizens may leave it in recycling yards or at stores of the product creating the hazardous waste.

In order to improve this system, this Plan defines measure 3, including the conduction of a feasibility study, in which current capacities for hazardous waste treatment in the RC will be analysed, and needed capacities determined.

4 CRITERIA FOR DETERMINING PLANNED LOCATIONS AND THE NECESSARY CAPACITIES OF NEW FACILITIES AND PLANTS

4.1 CRITERIA FOR DETERMINING PLANNED LOCATIONS OF NEW FACILITIES AND PLANTS

Categories of facilities including facilities for waste management in terms of planning in spatial planning documents are:

1. nationally significant facilities:

- Waste management centre
- Incineration plant
- Hazardous waste landfill

2. regionally significant facilities:

- Recycling centres
- Sorting facilities
- facilities for the biological (aerobic or anaerobic) treatment of waste
- facilities for the treatment of hazardous and non-hazardous waste, except those with a national significance
- non-hazardous waste landfill including landfills with a cell for asbestos waste
- inert waste landfill

3. locally significant facilities:

- re-use centres
- Recycling yards
- other facilities for the collection and treatment of waste not of national and regional significance

The basic criteria for choosing and determining the locations for the waste management facilities have to take into consideration the elementary facts significant for planning the following facilities through a multi-criterion analysis: facility category, pedology, geomorphology, hydrological and hydrogeological properties of the location, water protection, forest protection, distance from inhabited

areas, relation to construction parts of the settlement, transport connection (roads, railroads), infrastructure development taking into consideration the possibilities of using products created as waste management results (RDF, thermal and electric energy, compost, etc.).

Determining locations of facilities for waste management is based on acknowledging the principles of environmental protection and waste management defined by the positive regulations from the mentioned area, scientific discoveries, best global practices and industry rules, as well as the financial - economic aspect.

Waste management in facilities of secondary purpose, in which waste recovery is conducted or can be conducted, but that are not considered facilities for waste management, are also to be used in the waste management system.

4.2 CRITERIA FOR DETERMINING THE NECESSARY CAPACITIES OF NEW FACILITIES AND PLANTS

Waste management projects (facilities, plants etc.) that are planned to be financed by the Operational programme competitiveness and cohesion (OPCC) 2014-2020 must have a drawn feasibility study.

A feasibility study is a document in which the current waste management system is analysed and a future system is determined (modelled) on a certain area taking into consideration technical feasibility, as well as financial, economic and ecological sustainability of the whole system, as well as its constituent parts.

The feasibility study also determines the ratio of co-finance with the funds from the OPCC.

The feasibility study must be drawn as a complete document, together with all the necessary background data and annexes, simultaneously taking into consideration the relevant documents, especially the EU Regulation 1303/2013, the Guide to cost-benefit analysis of investment projects (http://ec.europa.eu/regional_policy/en/newsroom/news/2014/12/guide-to-cost-benefit-analysis-of-investment-projects-for-cohesion-policy-2014-2020) and the Ordinance on the acceptability of costs (Official Gazette 149/14).

The remaining waste management projects (facilities, plants and others) that are not planned to be financed by the OPCC funds, also must have a drawn Feasibility study.

The exact number and location of individual facilities, plants as well as the choice of capacities, technical-technological solutions and other parameters important for individual projects depend on the results of studies, elaborates and other applicable documents drawn for the needs of these projects, while the order of priority in waste management must be followed, as well as other demands depending on financing conditions (regulations on state subsidies etc.).

It also important to continuously analyse and revise the capacities and number of facilities and plants needed in the waste management system in comparison to their significance and needs.

5 GENERAL TECHNICAL REQUIREMENTS FOR FACILITIES AND PLANTS

The general technical requirements for facilities and plants for waste management are defined in the regulations determining construction, in accordance with the prescribed base demands for construction¹² and special regulations on waste management, regulating basic technical and technological conditions for waste management related to facilities and plants (Ordinance on waste management and ordinances determining the management of special categories of waste, thermal waste treatment and waste disposal).

The facilities and plants for waste management whose functioning is in accordance with the conditions and environmental permit must be in accordance with the demands of best available techniques (BAT) - obligatory techniques and technologies applied in project design, construction, upkeep, use and closing down of such a facility, including limitations to environmental emissions.

While designing any facility for waste management it is also important to take into consideration the examples of best practices and the state of technical understanding during project design.

General technical requirements for facilities, plants and equipment (vehicles, containers etc.) must be directed and harmonised with the conditions for the achievement of waste management goals defined by this Plan.

¹² Facility in accordance with regulations on construction is a constructed system connected to the ground, built with purposefully connected construction products with or without installations, a system with an in-built plant, self-standing plant connected with the ground or system created by construction

6 ORGANISATIONAL ASPECTS OF WASTE MANAGEMENT AND DIVISION OF RESPONSIBILITY BETWEEN PRIVATE AND PUBLIC SUBJECTS WORKING IN WASTE MANAGEMENT

Waste management is a topic of interest for the RC. Waste management is secured by the Government of the RC and the Ministry of Environmental Protection and Energy by prescribing measures of waste management. The executive bodies on the national level are the Croatian Agency for the Environment and Nature and Environmental Protection and Energy Efficiency Fund. LSGUs and RSGUs are obliged to secure the conditions and implementation of prescribed waste management measures on their territories. Several LSGUs and RSGUs may contractually secure a common implementation of waste management measures.

The Ministry of Environmental Protection and Energy is responsible for deciding on waste management permit requests pertaining to hazardous waste and for thermal waste treatment, it settles requests for consent regarding EPEEF contracts for providing a special categories of waste treatment service, conducting register Registers for waste management activities and waste importation and exportation register Registers, as well as laboratory register Registers, by-products and revoking waste status, settles requests for exportation or importation of waste, gives work permissions to organisations, conducts supervision (inspection and administration).

The Environmental Protection and Energy Efficiency Fund is responsible for the pricing and settling of defined fees, conducting the Special categories of waste Register, financing and co-financing projects in waste management, managing the system of collection of certain special categories of waste and settling requests for autonomous accomplishment of individual goals for a certain special category of waste.

The Croatian Agency for the Environment and Nature is responsible for the development and direction of the waste management information system, for compiling the prescribed reports on waste management, development and direction of the Register of waste management activities and Electronic Register on the creation and flow of waste (e-ONTO).

Regional self-government units

Are responsible for planning the locations of cells for asbestos waste disposal and landfill locations and, together with local self-government units, via legal entities establishing and managing waste management centres (based on owner obligations), they secure the capacities for the treatment of mixed municipal waste and waste remaining after the treatment of mixed municipal waste, managing permits for waste management where MEE is not responsible, for checking the accordance of the waste management plans of waste producers, and checking the harmonisation (and issuing previous consent) of waste management plans of local self-government units with the Waste Management Plan of the Republic of Croatia.

Local self-government units

Are responsible for securing the public service of collecting municipal waste, establishing recycling yards and implementing measures of prevention for waste being left in the environment as well as removing abandoned waste from the environment, issuing consent to waste collection actions, planning locations of facilities of local significance, conducting educative-informative activities and executing the obligations prescribed by this Plan, and the rest in accordance with the ASWM.

Also, local self-government units are obliged to, in accordance with the ASWM, conduct this Plan, especially including projects determined by the List of projects of importance for the implementation of this Plan (Chapter 8).

Trading societies in public ownership by RSGUs and LSGUs

They conduct services of collecting or treating certain special categories of waste, providing the public service of collecting mixed municipal waste and biodegradable waste. They direct the work of WMCs, sorting facilities, recycling centres.

Trading societies in private ownership (legal entities and natural persons - contractors conducting one of waste management activities)

Trading societies in private ownership may be included in waste management by conducting the activities of waste transport, intermediation in waste management, waste trading, waste collection, waste recovery, waste disposal, other waste treatment and exportation and importation of waste, conducting waste collection actions, providing the public service of municipal waste collection and laboratory activities.

The municipal order service in local self-government units is responsible for the implementation of measures of prevention of unlawful waste abandonment in the environment (documenting locations of abandoned waste, conducting regular annual surveys of LSGU area and other defined measures) and for the removal of such abandoned waste, where it is obliged to demand a court order and assistance from an employee of the Ministry of the Interior when it is trying to determine the facts in relation to the abandoned waste.

7 MEASURES FOR PLAN EXECUTION

The achievement of the goals defined by this Plan (Chapter 2) in waste management is planned through the execution of the measures mentioned in this chapter, and especially by conducting the projects of importance for the execution of this Plan, given in Chapter 8 of this Plan.

The accomplishment of the goals in this Plan will be achieved through implementing measures, implementing the stipulations in the ASWM and related legal acts and necessary changes and amendments to the ASWM and executive regulations intending to improve the system of waste management.

7.1 MEASURES FOR IMPROVEMENT OF THE MUNICIPAL WASTE MANAGEMENT SYSTEM

In order to achieve **Goal 1.1, “Decrease total quantities of produced municipal waste by 5% in comparison to the total produced quantities of municipal waste in 2015”**, it is necessary to implement the measures mentioned in the Waste Prevention Plan which is an integral part of this Plan, as well as the measures mentioned in Table 12 and Table 26. (Measures for conducting educative - informative activities)

Table 12. Measures to achieve Goal 1.1, “Decrease total quantities of produced municipal waste by 5% in comparison to the total produced quantities of municipal waste in 2015”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
1.1.1	Measures defined by the Waste Prevention Plan	A description of waste prevention measures is given in Annex 12.5 of this Plan.	-	-	-
1.1.2	Establishing re-use centres ¹³	This measure includes: the construction of re-use centres i.e. construction work on current facilities to adapt them for their new use equipment procurement making and distributing promotional material organising workshops etc.	MEE/MEEC /CS/PI	EU/EPEEF /LSGU/CS /PI	2022
1.1.3	Home composting ¹⁴	This measure includes: procuring and distributing home composters making educative - informational materials organising promotional activities and workshops Considering that home composting depends on available surfaces for the use of produced compost, the priority for the implementation of this measure is rural areas, i.e. suburbia with a large number of living units with a yard.	LSGU/EPEEF	LSGU/EP EEF/EU	2020

¹³ This measure is mentioned in the Waste Prevention Plan (Chapter 9), but because of the effect on the total decrease of municipal waste quantities, the measure is shown separately in this part of the Plan.

¹⁴ This measure is mentioned in the Waste Prevention Plan (Chapter 9), but because of the effect on the total decrease of municipal and portion of biodegradable waste in mixed municipal waste, the measure is shown separately in this part of the Plan.

In order to achieve **Goal 1.2, “Separately collect 60% of mass of produced municipal waste (primarily paper, glass, plastic, metal, bio-waste etc.)”**, in the following planned period, it is necessary to continue the improvement activities for the existing system of separate collection of waste paper, glass, plastic, metal, bio-waste and bulky waste from municipal waste, primarily through infrastructure development and equipment procurement, education and informing all the system participants and a revision of the pricing system for the public service of collecting mixed and biodegradable municipal waste in such a way that the service of collection and treatment is priced by the quantity of received waste, as defined by the measures in Table 13.

Table 13. Measures to achieve Goal 1.2, “Separately collect 60% of mass of produced municipal waste (primarily paper, glass, plastic, metal, bio-waste¹⁵ etc.)”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
1.2.1	Procurement of equipment, vehicles and vessels for separate collection of paper, cardboard, metal, plastic, glass and textile	This measure includes the procurement of equipment, vehicles and vessels for separate collection of paper, cardboard, metal, plastic, glass and textile It is recommended to implement this measure together with the measure 1.2.2 wherever possible as a holistic project.	LSGU	LSGU/EP EEF/EU	2020
1.2.2	Constructing a sorting facility for separately collected paper, cardboard, metal, glass, plastic etc.	This measure includes the construction and procuring equipment for new, and, if needed, the increase of capacities and improvement of technology for the current sorting facilities for separately collected waste paper, cardboard, metal, glass, plastic etc.	LSGU	LSGU/EP EEF/EU/PI	2020
1.2.3	Constructing recycling yards	This measure includes: <ul style="list-style-type: none"> – Constructing and procuring equipment for recycling yards – conducting educative and informative activities for the local population – procuring mobile recycling yards 	LSGU	LSGU/EU	2019
1.2.4	Introducing quantity-based fees for collection and treatment of mixed and biodegradable municipal waste	This measure includes: <ul style="list-style-type: none"> – pricing the public service of collecting mixed and biodegradable municipal waste in such a way that the public service user is encouraged to separate waste, i.e. decrease the quantities of produced waste. 	MEE/LS GU	-	2017
1.2.5	Strengthening the market for waste intended for recycling	This measure includes: <ul style="list-style-type: none"> – creating technological demands (composition, additive portion, minimum quantities, etc.) which a certain type of waste must satisfy in 	MEE/CC E/CCTC/ PI	-	2018

¹⁵ Measures for separate collection of bio-waste are shown in Table 14.

		<ul style="list-style-type: none"> – order to be applicable for recycling – establishing network stations with data on technological demands – establishing the system of supply and demand of waste ("waste market") 			
1.2.6	Constructing recycling facilities	This measure includes, if needed, the construction and procuring equipment for new, and/or increasing capacities and improving the technology of existing recycling facilities.	PI	PI/EU ¹⁶	2022

In order to achieve **Goal 1.3, "Separately collect 40% of bio-waste from municipal waste"**, it is necessary to implement the measures in Table 14.

Table 14. Measures to achieve Goal 1.3, "Separately collect 40% of mass of bio-waste from municipal waste"

No.	Measure	Description	Responsible	Possible source of funding	Deadline
1.3.1	Development of quality and categorising criteria for compost and digestates	This measure includes the development of quality criteria, methods of categorising and quality control for compost and digestates,	MA/MEE	-	2018
1.3.2	Procurement of equipment and vehicles for separate collection of bio-waste	This measure includes the procurement of equipment and vehicles for separate collection of bio-waste It is recommended to implement this measure together with the measure 1.3.3 wherever possible as a holistic project.	LSGU	EU/LSGU/EPEEF	2020
1.3.3	Construction of facilities for biological treatment of separately collected bio-waste	This measure includes the construction and procuring equipment for new, and increasing capacities and improving the technology of the existing facilities for biological treatment of separately collected bio-waste by aerobic or anaerobic procedures.	LSGU	EU/LSGU	2020

In order to achieve **Goal 1.4, "Landfill less than 25% of municipal waste"**, it is necessary to implement measures in Table 15, supposing that goals 1.2 and 1.3 are met.

Table 15. Measures to achieve Goal 1.4, "Landfill less than 25% of municipal waste"

No.	Measure	Description	Responsible	Possible source of funding	Deadline
1.4.1	Introducing a fee for landfilling	This measure includes introducing a fee for landfilling encouraging the quantities of waste landfilled and increasing the quantities of separately collected waste	MEE/EPEEF	-	2017
1.4.2	Monitoring the amount of biodegradable	The measure includes regular analyses of the composition of mixed municipal waste in order to monitor the goals and determine the	LSGU ¹⁷	LSGU	continuously

¹⁶ According to the regulations in OPCC, financing a recycling plant would be applicable only if there is a lack of success in the market or if there is a significant lack of recycling capacities on a national level.

¹⁷ Or municipal company/person managing the landfill.

	waste in mixed municipal waste	amount of the biodegradable component in waste.			
1.4.3	Intervention measure to decrease landfilling municipal waste created in the City of Zagreb	<p>This measure includes:</p> <ul style="list-style-type: none"> – constructing a facility and/or procuring equipment necessary to sort separately collected waste – constructing a facility and/or procuring the equipment necessary for biological treatment of separately collected bio-waste – constructing a facility and/or procuring equipment necessary for the treatment of mixed municipal waste created in the City of Zagreb <p>The facilities need to be planned in such a way that they may later be used as parts of WMCs. The capacity of the facility needs to be determined in accordance with spatial conditions, quantities of waste and feasibility study.</p>	City of Zagreb	City of Zagreb/EPPEF/EU	2020
1.4.4	Intervention measure to decrease landfilling municipal waste created in the City of Split	<p>This measure includes:</p> <ul style="list-style-type: none"> – constructing a facility and/or procuring equipment necessary to sort separately collected waste – constructing a facility and/or procuring equipment necessary to sort separately collected bio-waste – constructing a facility and/or procuring equipment necessary for the treatment of mixed municipal waste created in the City of Split <p>The facilities need to be planned in such a way that they may later be used as parts of WMCs or so that they may be moved to a different landfill.</p> <p>The capacity of the facility needs to be determined in accordance with spatial conditions, quantities of waste and feasibility study. This measure includes phase I of the Karepovac landfill remediation in the City of Split.</p>	City of Split	City of Split/EPPEF/EU	2020
1.4.5	Constructing waste management centres	<p>This measure includes constructing facilities for the treatment of mixed municipal waste, non-hazardous waste remaining after material recovery and other non-hazardous waste.</p> <p>In planning the capacities of these facilities, it is necessary to draw a feasibility study which will take into consideration the goals prescribed by the Croatian and EU legislation as well as this Plan.</p> <p>The study must represent all measures that need to be undertaken at the locality of the project in order to reach the goals and justify the capacity.</p> <p>In planning these facilities, it is necessary to consider the possibility of having facilities for the treatment of construction and demolition</p>	RSGU	RSGU/EPPEF/EU/PI/PPP	2022

		waste, asbestos waste, bulky waste and bio-waste in the same facility, as well as a plant for sorting separately collected paper/cardboard, glass, metal and plastic.			
1.4.6	Planning energy recovery	This measure includes the analysis and evaluation of the need for energy recovery in the following planned period. This analysis needs to take into account the results of measure 3.1 of this Plan.	MEE	MEE/EU	2020

7.2 MEASURES FOR IMPROVEMENT OF THE SPECIAL CATEGORIES OF WASTE MANAGEMENT SYSTEM

In order to achieve **Goal 2.1, “Separately collect 75% of construction and demolition waste”**, it is necessary to implement measures in Table 16.

Table 16. Measures to achieve Goal 2.1, “Separately collect 75% of construction and demolition waste”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
2.1.1	Creating an action plan for separate collection and recycling construction and demolition waste	This measure includes drawing an action plan considering at least the following: <ul style="list-style-type: none"> – the quantities of produced construction and demolition waste – the availability of current capacities and available technologies for recycling of construction and demolition waste – an estimation of the need for new capacities and possible adaptations or modernising current facilities 	CAEN/MEE/EPEEF	CAEN/MEE/EPEEF/EU	2017
2.1.2	Constructing and procuring equipment for recycling yards for construction and demolition waste	This measure includes: <ul style="list-style-type: none"> – constructing and equipping new and increasing the capacities of existing (may include mobile units for recycling construction and demolition waste) – improving the technology of existing recycling yards for construction and demolition waste 	RSGU/LSGU/P	RSGU/LSGU/PI	2020

In order to achieve **Goal 2.2, “Establish a system of management for residual sludge from waste water treatment facilities”**, it is necessary to implement the measures in Table 17.

Table 17. Measures to achieve Goal 2.2, “Establish a system of management for residual sludge from waste water treatment facilities”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
2.2.1	An action plan for the use of residual sludge from waste water treatment facilities on suitable surfaces	This measure includes drawing an Action plan which includes: <ul style="list-style-type: none"> – defining the types of surfaces suitable for the application of sludge – defining locations and capacities of surfaces i.e. locations where the use of sludge is possible – defining the quality of treated sludge in accordance to the demands for specific application – an application to register agricultural and other locations where residual sludge or compost from DWWT is landfilled or can be landfilled, as well as a digital connection of this system with the geoinformational agricultural system 	MEE/MA/CW	CW/EU	2017
2.2.2	Establishing a sludge management system	The measure includes the construction of facilities and devices for sludge treatment with the goal of preparing sludge for application, in accordance with the demanded criteria which the mud must satisfy in order to be used on planned surfaces. The facilities include composting plants, digestors and devices for mixing with other materials in order to produce specific products (e.g. ash from biomass incineration)	MEE/MA / CW/LSGU/ Provider of water services	LSGU (Provider of water services)/EU /CW	2022

In order to achieve **Goal 2.3, “Improve the packaging waste management system”**, it is necessary to implement the measures in Table 18.

Table 18. Measures to achieve Goal 2.3, “Improve the packaging waste management system”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
2.3.1	Improvement and analysis of the existing packaging waste management system	This measure includes the identification of persons obliged to pay the fees and analysis of the existing packaging waste management system, whose goal is to evaluate the system, establish shortcomings and risks and give recommendations to improve the system. The analysis has to include monitored data	MEE/EPEEF	EPEEF	2017

		on packaging put on the market as well as data on the efficiency of recovery (recycling)			
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In order to achieve **Goal 2.4, “Establish a system of marine waste management”**, it is necessary to implement measures in Table 19.

Table 19. Measures to achieve Goal 2.4, “Establish a marine waste management system”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
2.4.1	Identifying the locations and sources of marine waste and identifying locations of accumulated marine waste on the seabed.	The measure includes conducting a study with data on locations that are a constant or occasional source of marine waste (from the coast, vessels and off-coast objects), estimating the quantity and type of waste on these locations, locations with accumulated marine waste on the seabed, remediation proposals, cost estimations and priority definitions.	MEE	MEE	2018
2.4.2	Establishing a system of prevention, collection and disposal of marine waste, as an integral part of the waste management system in the RC.	The measure includes preparing and executing projects of waste prevention, illegal landfill remediation on the sea coast and islands and collecting and disposing marine waste including waste fishing tools and marine waste from ships and off-coast objects. The measure includes conducting environmentally acceptable practices such as: waste collection during regular fishing activities, conducting cleaning actions, improving the system of receiving waste from harboured ships. The measure includes harmonising the Marine waste management Plan with the relevant Plans for the water, agriculture, economy, fishing and sea sectors and the establishment of material capacities for the collection and disposal of marine waste.	MEE MSTI, MA	MEE/R SGU/ LSGU/E U	2019
2.4.3	Intervention collection and disposal of marine waste	The measure includes creating a protocol for the case of sudden pollution by marine waste with an overview of jurisdictions and procedures	MEE/ LSGU/ RSGU/MS TI	MEE	2018
2.4.4	Establishing cooperation with neighbouring or other	The measure includes communication and cooperation with the authorities from neighbouring or other countries in case of marine waste pollution originating from a neighbouring or	MEE / MFA/MST I	MEE	contin uously

	countries regarding marine waste pollution	other country			
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In order to achieve **Goal 2.5, “Establish a system of management for waste ships, wrecks and sunken objects on the seabed”**, it is necessary to implement the measures in Table 20.

Table 20. Measures to achieve Goal 2.5, “Establish a system of management for waste ships, wrecks and sunken objects on the seabed”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
2.5.1	Establishing a waste ship management system	The measure includes issuing the appropriate regulations.	MEE/ MSTI	MEE/ MSTI	2018
2.5.2	Identifying the locations of wrecks and sunken objects on the seabed and creating a cadastre	The measure includes creating a map which contains the locations of wrecks and sunken objects on the seabed in ownership by the RC, as a precondition of their systematic remediation and disposal.	MSTI	MSTI	2018
2.5.3	Identifying the composition and quantities of hazardous matter and explosive material in wrecks and sunken objects on the seabed which pose the threat of polluting the marine environment or making the sea resource use an unsafe process (oils, fuels, fuel oils, left-behind weapons and explosive devices etc.)	The measure includes estimating the state, creating a background with the data on quantities and types of hazardous matter and left-behind weapons and explosive devices which are situated in wrecks and sunken objects on the seabed, their characteristics, positions etc., all as an integral part of mapping wrecks and sunken objects from the measure 2.7 1 for each individual location.	MSTI	MSTI	2018
2.5.4	Remediation of wrecks and sunken objects on the seabed in ownership of the RC	The measure includes building a remediation programme for wrecks and sunken objects, as well as their content, estimating risk for each location, proposing technical solutions, estimating costs and determining remediation priorities.	MSTI / MEE	MSTI	2019
2.5.5	Intervention remediation of wrecks and sunken objects on the seabed and their contents	The measure includes creating a protocol in case of a sudden leakage of hazardous matter from wrecks and sunken objects and other risks that may cause sea pollution or threaten health and security	MSTI / MEE	MSTI	2017

2.5.6	Improve normative standards and procedures for crisis interventions on wrecks and sunken objects on the seabed	The measure includes activities which must be undertaken in the shortest possible timeframe from the time of determining sudden leakage of hazardous matter from wrecks and sunken objects on the seabed or other types of risks according to the protocol from measure 2.5 4.	MSTI	MSTI	2017
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In order to achieve **Goal 2.6, “Improve the special categories of waste management system”**, it is necessary to implement measures in Table 21.

Table 21. Measures to achieve Goal 2.6, “Improve the system of management for special categories of waste”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
2.6.1	Improving the medical waste management system	This measure includes: <ul style="list-style-type: none"> – improving monitoring medical waste flow – improving the current medical waste treatment system 	MEE / MH CAEN	Health institutions /MH /PI	2020
2.6.2	Conducting an Asbestos waste estimation Study for each county	This measure includes conducting an Asbestos waste estimation Study for each county, which is estimated to be created in this planned period.	LSGU/CA EN	CAEN/EPE EF/EU	2019
2.6.3	Constructing cells for asbestos waste	This measure includes constructing cells for asbestos waste	LSGU RSGU	LSGU/RS GU EPEEF	2022
2.6.4	Improving the special categories of waste management system (end-of-life vehicles, waste batteries and accumulators, waste tyres, EE waste, oils)	This measure includes identifying the persons obliged to pay the fees and improving the waste management system and creating a Special categories of waste Management Register.	MEE/CAEN/EPEEF	-	2020

7.3 MEASURES FOR IMPROVEMENT OF THE HAZARDOUS WASTE MANAGEMENT SYSTEM

To achieve **Goal 3, “Improve the hazardous waste management system”**, it is necessary to implement the measures in Table 22.

Table 22. Measures to achieve Goal 3, “Improve the hazardous waste management system”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
3.1	Analysis of	This measure includes	MEE	EU/EPEEF/MEE	2019

	existing and necessary capacities for hazardous waste treatment	conducting a feasibility study which will analyse existing capacities for hazardous waste treatment and determine the necessary additional capacities and give recommendations for the improvement of the system.			
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7.4 MEASURES FOR REMEDIATION OF POLLUTED LOCATIONS

To achieve **Goal 4, “Remedy polluted locations”**, it is necessary to implement measures in Table 23.

Table 23. Measures to achieve Goal 4, “Remedy polluted locations”

No.	Measure	Description	Responsible	Possible source of funding	Dead line
4.1	Creating a Plan for closing non-hazardous waste landfills	Within this measure, a Plan for closing non-hazardous waste landfills for all counties will be created based on current available capacities and other relevant criteria, which will include further landfilling after 31/12/2018 to regulated landfills.	MEE//CAEN /RSGU LSGU	EPEEF/ME E/EU	2017
4.2	Remedy non-hazardous waste landfills	This measure includes remedying non-hazardous waste landfills	LSGU	EU/LSGU/ EPEEF	2022
4.3	Identifying new locations polluted by hazardous waste (“hot spots”)	This measure includes conducting a study for the identification of new locations polluted by hazardous waste (“hot spots”)	MEE	EPEEF/EU	2018
4.4	Remedying locations polluted by hazardous waste (“hot spots”)	This measure includes continuing remedying locations polluted by hazardous waste, so called “hot spots” defined in this Plan (Chapter 1.3) and newly identified locations of “hot spots” through the measure 4.3	MA/MEE	EU/EPEEF /PI	2022
4.5	Remedying abandoned waste locations	This measure includes removing abandoned waste from the environment, including speleological objects and preventing new waste abandonment at these locations,	LSGU	LSGU	2020

7.5 MEASURES FOR THE EXECUTION OF EDUCATIVE AND INFORMATIVE ACTIVITIES

To achieve Goal 5, “Continuously conduct educative and informative activities”, it is necessary to implement the measures in Table 24.

Table 24. Measures to achieve Goal 5, “Continuously conduct educative and informative activities”

No	Measure	Description	Responsible	Possible source of funding	Deadline
5.1	Creating a Programme of educative-informative activities on sustainable waste management	This measure includes creating a programme of educative-informative activities on sustainable waste management for the period from 2017 -2022 which will recommend guidelines, target groups and activities needed on a national and local level, emphasizing waste prevention, increasing separately collected waste and re-use.	MEE	EU/EPEEF	2017
5.2	Conducting activities from the Programme of educative-informative activities on sustainable waste management	This measure includes conducting all the activities defined in the Programme of educative-informative activities on sustainable waste management.	MEE/EPEEF/CAEN/RSGU/LSGU/civil society	EU/MEE/EPEEF/CAEN/RSGU/LSGU	2022
5.3	Conducting a national campaign on sustainable waste management	This measure includes creating informative-educative and promotional videos and other materials and programmes on sustainable waste management.	MEE/EPEEF	EU/MEE/EPEEF	2017

7.6 MEASURES FOR IMPROVEMENT OF THE WASTE MANAGEMENT INFORMATION SYSTEM

In order to achieve Goal 6, “Improve the waste management information system”, it is necessary to implement the measures in Table 25.

Table 25. Measures to achieve Goal 6, “Improve the waste management information system”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
6.1	Creating and/or improving applications that are part of the waste management information system	The measure includes designing a central digital application for: <ul style="list-style-type: none"> – managing the Waste creation and flow Register (hereinafter: e-ONTO) – designing and improving the waste management activities register in which waste management permit requests are demanded and received, as well as requests for inscription in the appropriate registers, managing registers and other documentation 	CAEN/MEE/EPEEF	EU/CAEN/EPEEF	2017/2018

		<p>related to waste management activities</p> <ul style="list-style-type: none"> – creating and improving the central digital application for transboundary movement of waste – designing an application for abandoned waste locations – designing a central digital application Register for management of special categories of waste, to report the quantities of matter and materials put on the market, data necessary for the coordination of supervision of quantities put on the market and other prescribed data in order to conduct the special categories of waste management system. 			
6.2	Creating an EPEEF information system for the preparation and implementation of projects	<p>This measure includes creating an information system for the preparation and implementation of projects by EPEEF</p> <p>The information system must be connected with the CAEN information system, as well as other institutions connected with EPEEF for control, exchange and data harmonisation related to special categories of waste and other EPEEF projects.</p>	EPEEF	EU/EPEEF	2018

7.7 MEASURES FOR IMPROVEMENT OF WASTE MANAGEMENT SUPERVISION

In order to achieve **Goal 7, “Improve waste management supervision”**, it is necessary to implement measures in Table 26.

Table 26. Measures to achieve Goal 7, “Improve waste management supervision”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
7.1	Educating all the participants in waste management supervision	This measure includes educating the employees of municipal order services in LSGUs and environmental protection inspectors	MEE/RSGU/LSGU	MEE	continuously
7.2	Analysis and redefining supervision jurisdiction in waste management	This measure includes analysis and redefining jurisdiction in supervising waste movement within the RC and supervision of transboundary movement of waste.	MEE/MI/MFIN	-	2018

7.8 MEASURES FOR IMPROVEMENT OF ADMINISTRATIVE PROCEDURES IN WASTE MANAGEMENT

In order to achieve Goal 8, “Improve administrative procedures in waste management”, it is necessary to implement the measures in Table 27.

Table 27. Measures to achieve Goal 8, “Improve administrative procedures in waste management”

No.	Measure	Description	Responsible	Possible source of funding	Deadline
8.1	Improving the system and procedures for issuing waste management permits	The measure includes the analysis of the existing system and procedures for issuing waste management permits, as well as proposing system improvement activities	MEE	-	2018

8 PROJECTS OF IMPORTANCE FOR THE EXECUTION OF THE WASTE MANAGEMENT PLAN

The list of projects of importance for the execution of this Plan and accomplishment of goals is given in Table 28.

Table 28. List of projects of importance for Plan execution

No.	Type of project
1	Conducting educative-informative activities
2	Improving the waste management information system
3	Procuring and distributing home composters
4	Procurement of equipment, vehicles and vessels for separate collection of bio-waste, paper/cardboard, glass, metal and plastic
5	Constructing a sorting facility for separately collected paper, cardboard, metal, glass, plastic and wood
6	Construction of facilities for biological treatment of separately collected bio-waste
7	Constructing recycling yards
8	Constructing waste management centres
9	Constructing cells for asbestos waste
10	Constructing recycling yards for construction and demolition waste
11	Remediation of non-hazardous waste landfills
12	Remediation of “hot spots”

9 WASTE PREVENTION PLAN

9.1 WASTE PREVENTION

The limitations of natural resources and negative effects on the environment caused by their exhaustion demand the improvement of existing and search for new models of sustainable use. So, one of the basic goals of the EU, by way of many financial instruments and strategies, is to encourage improvement of the economic system for more efficient resource and energy use.

The ten-year development strategy Europe 2020¹⁸ recommends sustainable growth as one of three main priorities in EU development, i.e. promoting an economy that uses resources more efficiently, that is more green and more competitive. The central aspect of this strategy is going from the current, linear economy to a circular one (Image 30), an economic model ensuring sustainable resource management and prolonging the lifespan of materials and products. The goal of this model is to decrease waste to the absolute minimum, and not only waste in production processes, but systematically, during the whole lifecycle of the product and its components.

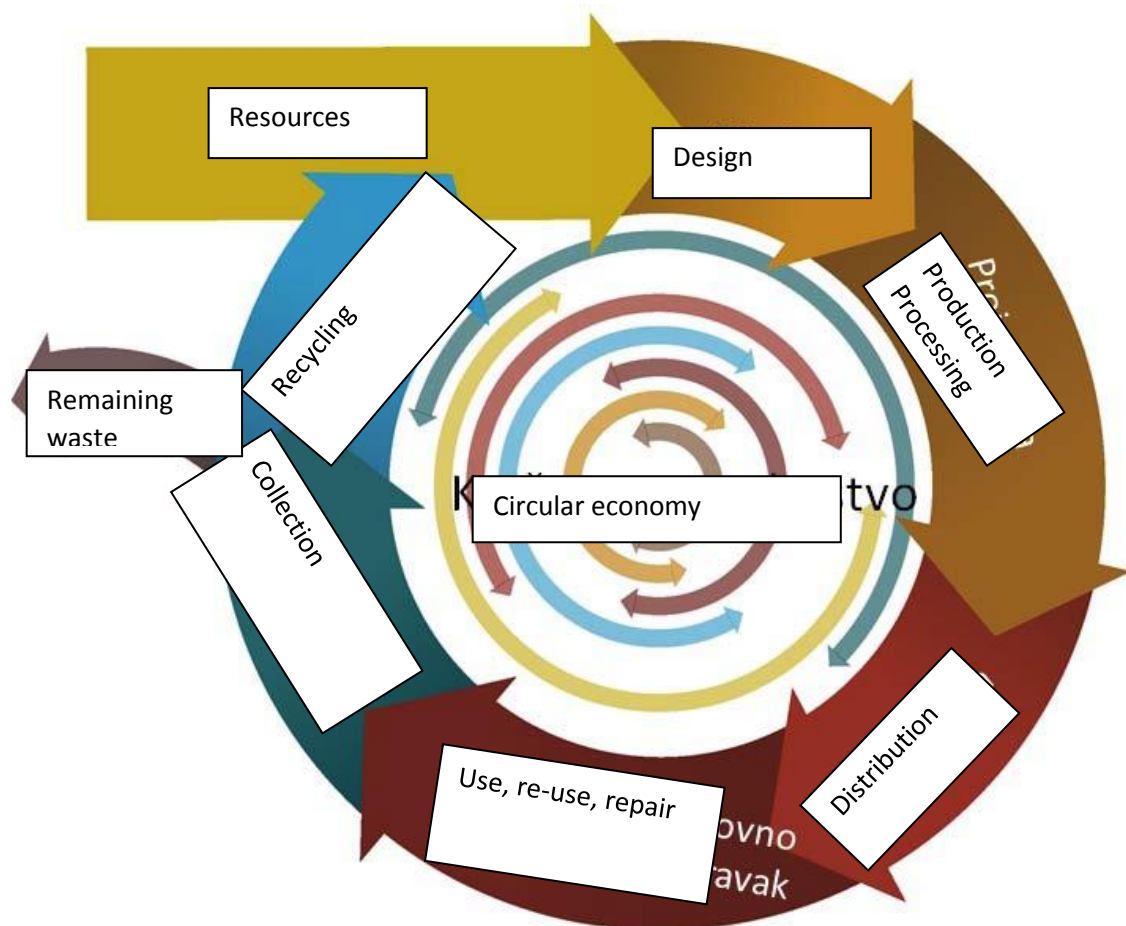


Image 31: Circular economy model Source: COM(2014)/398

To go to a circular economy, changes in the entire value chain are needed, from the efficient resource use, product design, new business and market models, new ways of transforming waste to resources, to new customer behaviour models. This means a complete change in the existing economic system and innovations, not only in technology, but in organisation, society, funding methods and policies.

¹⁸ EUROPE 2020 A strategy for smart, sustainable and inclusive growth (COM(2010)2020)

Some policies and instruments in the EU and on the national level already have secured the tools and subsidies in accordance with the model of circular economy. In fact, on 21 December 2005, the European Commission recommended the European strategy for the sustainable use of natural resources¹⁹, having as its goal to decrease the effects of resource use in a growing economy on the environment, where the focus on environmental effects of resource use is a deciding factor in achieving sustainable development in the EU. Resource initiative of the EU in 2008 points to the importance of more efficient resource use for the sustainable development of European economic systems. The plan for a more efficient resource use in Europe²⁰ calls for the transfer to sustainable development through an economy that efficiently uses resources with low carbon dioxide emissions, and recommends the action framework and underlines the need for an integrated approach in the area of environmental and economic policy.

In order to apply the waste management policy for the decrease of waste by developing a functional waste management system, having as a goal to use waste as a valuable resource, the Framework Directive on Waste²¹, in accordance to environmental benefits/costs, clearly defines the order of priority in waste management, ranking waste management options by their effects on the environment. At the top of that hierarchy is waste prevention and it represents the most efficient and most sustainable method of resource use. Seeing that the RC harmonised its legislation with the *acquis communautaire* of the EU, it also accepted the mentioned order of priority in waste management through the stipulations in the Act on Sustainable Waste Management.

In order to encourage waste prevention activities, all member states of the EU, including the RC, are obliged to create a Waste Prevention Plan, and in accordance with the Directive 2008/98/EC, its general content is defined in the Annex IV of the mentioned Directive, and it is presented in the ASWM.

According to the ASWM, waste prevention means conducted measures before some matter, material or product becomes waste, in order to decrease the quantities of waste, including re-use of products and prolonging their lifespan, diminishing negative effects of the created waste on the environment and human health and diminishing the content of hazardous matter in materials and products. Waste prevention decreases the quantities and toxicity of waste even before any other procedure of recovery or disposal becomes an option.

¹⁹ COM(2005)/670

²⁰ COM(2011)/571

²¹ Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives (OJ L 312, 22/11/2008)

9.2 CURRENT STATE OF WASTE PREVENTION

The Republic of Croatia did not until this point have an obligation to prepare a Waste Prevention Plan, so even though some measures of waste prevention are being conducted already, there is a lack of appropriate organisation in the waste prevention system, as well as concrete indicators for measure efficiency.

So, for example, even though there is a legally defined framework for the introduction of ecological labels for products and services which affect their use, this measure has still not been recognised as significant by the producers and wider public (consumers). The activities related to corporate and public procurement are still on the level of instructing and educating the professionals and the wider public on the importance and advantages of such socially responsibly business category. The education and raising awareness on the need right waste management is included in educative programmes, but separate collection of waste was emphasized instead of waste prevention.

When it comes to measures affecting design, production and product distribution, a positive movement has been noted in regards with the ISO 14001 waste management system, which has been recognised as important for conducting business efficiently by a growing number of companies, but this measure is still not sufficiently applied to be able to result in waste prevention.

The economic measures related to the “polluter pays” principle, as producer responsibility measures during product design and production, the obligation of notifying the seller and consumer on the properties of the product and manipulation method after its shelf life are already defined in the ordinances on special categories of waste.

An additional improvement in waste prevention has been made by decreeing regulations on conditions and environmental permit issuing, with a goal to prevent and control pollution from industrial and agricultural activities. This permit directs the so called “large polluters” to use the best available techniques (BAT), such as, among others, using technologies producing small quantities of waste and promoting recovery and recycling of matter produced and used in the process, and, where it is applicable, waste,

A national action plan for green public procurement for the period from 2015 to 2017 was adopted, with a view to 2020, whose focus was introducing basic green measures in public procurement for priority product and service groups, and each product group has metrics containing key pressures on the environment, including resource and energy use, biodiversity effect, toxicity, polluting matter emissions, greenhouse gases and CO₂ as well as waste creation.

9.3 GOALS AND PRIORITIES

The legislative-regulatory framework for waste management in the RC seeks to establish a higher-quality waste management system based on waste prevention and an efficient system of separate collection of waste which is adequately recovered.

Waste prevention contributes to the accomplishment of the following general goals in waste management:

- separating economic growth from the increase of waste quantities
- guarding natural resources
- decreasing the total mass of landfilled waste
- decreasing the emissions of polluting matters in the environment
- decreasing the hazard for human health and the environment.

Accomplishing these goals will be possible following the mentioned specific goals of the Waste Prevention Plan for the period 2017-2022, and its success of execution may directly be monitored through the indicators in Annex 12.4.

Municipal waste prevention

Municipal waste is composed of different types of usable materials of different origin, however, certain components of municipal waste contain hazardous materials harmful to the environment and human health. The municipal waste management system is highly complex, includes a great number of participants, demands significant investments and the establishment of an adequate infrastructure, as well as a high level of awareness on the importance of establishing a functional municipal waste management system and the importance of its prevention.

Despite significant efforts on a national, regional and local level to decrease the quantity of municipal waste created and landfilled, according to the official data by CAEN, the percentage of separately collected and recovered waste is still relatively low and the largest part of the produced municipal waste is landfilled without previous treatment.

Considering the already mentioned order of priority in waste management, the prescribed goals for the RC to accomplish, which are also goals of the Waste Management Plan of the RC, the potential harmful effect on the environment and human health due to irresponsible municipal waste management, and rational resource use and upkeep, this Waste Prevention Plan defines measures by which municipal waste prevention will be accomplished.

Bio-waste prevention

According to the analysis of the existing state in the Waste Management Plan of the RC for the period 2017 - 2022, it is estimated that, in the RC, of the total quantities of waste in households, around 37% is bio-waste, of which 380,000 tonnes is food waste.

Bio-waste takes a significant place in European institutions' programmes so it is necessary to secure separate bio-waste collection with the intent of composting and digesting bio-waste, treating it in such a way as to achieve a high level of environmental protection, using materials produced from bio-waste safe for the environment etc.

Also, the European Commission document "*The Roadmap to a Resource Efficient Europe*" (COM(2011)571), a goal was defined according to which by 2020, food waste landfilling must decrease by 50% in the EU.

Producing food waste, except the negative environmental effects in terms of inadequate use of natural resources for food production, the effect on soil, biodiversity, harmful environmental emissions, also includes social-economic and moral components.

Taking into consideration these data and information including the harmful environmental emissions caused by irresponsible bio-waste management, the Plan, among other things, treats measures for bio-waste prevention, *emphasizing food waste prevention*.

The current legal framework for municipal waste management, prescribing quantitative goals related to biodegradable municipal waste, economic measures like fees, including the regulation on by-product management and waste status removal, which prescribes special criteria for waste status removal for compost and anaerobic digestate, are an excellent basis to create a system in which the defined order of priority in bio-waste management will effectively be applied.

Electric and electronic waste prevention

In the last several decades, technological advancement in electronic data management and communication encouraged economic growth and improved human life in immeasurable ways. However, the growing dependence on electronic products, both in households as on the workplace, has created a new ecological challenge, and that is the creation of electric and electronic waste.

Considering the systematic changes in computer technology and the appearance of new electronic household tools, this waste flow is one of the fastest-growing waste categories. More and more devices and equipment become EE waste after their lifespan, causing two problems: environmental degradation and irreversible loss of valuable resources.

Namely, EE waste can cause hazardous materials, such as e.g. lead, chrome, cadmium, mercury, phosphorus, various bromides, beryllium, barium, silicon, arsenic etc. Mercury from electronic equipment is the leading source of mercury in municipal waste. Additionally, plastic in electronic equipment is often treated with fire inhibitors based on bromine, and with irresponsible management of this type of waste, they can cause significant negative environmental effects.

On the other hand, EE waste contains numerous valuable materials (glass, plastic, noble metals) that can be re-used. Re-use and recycling resources from out-of-use electronic equipment helps in keeping natural resources and preventing air and water pollution and preventing the creation of greenhouse gases caused by the production of new products.

For all of the above, it is of utmost importance to prevent the creation of EE waste and re-use or recycle old EE equipment and devices, so a body of measures and executive mechanisms to decrease the quantities of created EE waste is recommended, as well as decreasing its harmful environmental effect.

Paper and cardboard waste prevention

Paper is one of the most important and widely used consumer materials with an almost inexhaustible possibility of use.

To produce paper, it is necessary to spend a great quantity of natural resources, water and energy, and continuous forest clearing which is tightly related to paper production contributes to soil erosion and the decrease in its quality.

Around 30% of municipal waste is paper and cardboard. If it is landfilled, organic waste such as paper is decomposed as biogas, containing methane - a greenhouse gas connected with global warming. Waste paper and cardboard in the landfill are slowly decomposed and significantly prolong the activity time of the landfill.

Considering the high percentage of this type of waste in municipal waste, the successful execution of measures and waste prevention activities for paper and cardboard are important also for the accomplishment of strict European goals.

Construction and demolition waste prevention

According to the Act on Sustainable Waste Management, construction and demolition waste is waste created during building construction, reconstruction, removal and upkeep of existing buildings, as well as waste from excavated material which cannot without previous recovery be used for construction of the building for whose construction it was created.

Considering its origin, it includes construction site waste, demolition waste, waste from the construction and upkeep of roads, as well as soil, rocks and vegetation.

Irresponsible management of construction and demolition waste not only pollutes the environment, but this waste category takes a large volume at landfills.

According to the results of the analysis of state and projections of quantities of produced construction and demolition waste in the RC and quantities predicted for the planned period of this document, this type of waste, considering the created quantities, has a high recycling potential, and legislative goals, so it represents a priority in waste management and waste prevention activities.

As in the case of bio-waste, the existing legislative framework, through fees for landfilling construction and demolition waste, encouraging opening recycling yards for construction and demolition waste and specifying special criteria for waste status removal for construction products, has created a good basis for creating a system in which the defined order of priority in waste management will be effectively applied.

For better efficiency of the entire waste management system, the Plan recommends measures for construction and demolition waste prevention primarily based on the recommendations of other European countries, noting the specificity of certain areas in the RC.

9.4 WASTE PREVENTION MEASURES 78

The following are waste prevention measures in order to accomplish the defined specific goals of the Waste Prevention Plan for the period 2015-2021. According to the proposal from Annex IV of the Directive 2008/98/EC, the measures are grouped in three basic measures group, and for each measure, the specific goal(s) and proposals of possible measure execution (activities) are individually shown. Additionally, for each measure, a link was given to the measure from Annex IV of Directive 2008/98/EC and the Act on Sustainable Waste Management and indicators for monitoring the efficiency of execution of each individual mechanism/measure.

9.4.1 Measures that can influence the framework conditions related to waste creation

Measure 1: Encouraging re-use of demolition material

It is important to establish subsidies for re-use of demolition material. In that, it is important to define the conditions which the demolition material must satisfy. Additionally, it is possible to establish a central register of buildings in order to get data on the current state of buildings and used materials, for which it will be mostly energy audits and certificates as the source of data. In this way, the possibilities of using demolition/disassembly materials will be planned with more quality and in time.

Link to measure from Annex IV of the Directive 2008/98/EC:	The use of planning measures, or other economic instruments promoting the efficient use of resources. (1)
Specific goal(s):	Construction and demolition waste prevention

Measure 2: Organising informative-educative campaigns on food waste prevention

It is necessary to create an informational campaign with a catchy key message which would be promoted via radio, TV and other electronic media. The campaign can encompass the creation of poster, brochures, flyers and video-informative educative content intended for professionals and the wider public. These materials contain data on e.g. smart shopping, meal planning methods, using food remains etc.

It is necessary to create promotional materials on food waste prevention intended for educational institutions (kindergartens, elementary and high schools) and organise educational-informational campaigns there.

The promotional materials intended for the citizenship can, in cooperation with the companies managing municipal waste, can be printed and delivered to citizens' home addresses together with bills.

In their waste management plans, local self-government units and the City of Zagreb must emphasize, besides the general municipal waste prevention measures, preventing bio-waste, i.e. food waste.

To support LSGUs in making their Waste Management Plans, guidelines for their preparation will be prepared. Plan guidelines will help in planning the waste management system and in promoting the

development of coherent appropriate practices in planning in the RC, in accordance with the demands of the relevant legislation.

Additionally, after making the guidelines, for a highest-quality measure and activity inclusion when it comes to food waste prevention in waste management plans and their execution, an educational campaign will be prepared for the workers in LSGUs, i.e. workshops with the adequate educational materials. The workshops will be designed as a type of introduction to the planning process, as well as a forum where current problems will be debated, and to subjects such as establishing the goals of the Plan and their prioritisation, defining measures of waste management and waste prevention measures with a special emphasis on food waste prevention, executing the plan, the revision process etc.

This measure includes activities intended for all subjects in the food business, seeing that food waste prevention has to be conducted in the entire chain of food production, “from field to table”.

In this way, the effect of the national campaign will be strengthened, and a better effect in implementing waste prevention measures will be achieved.

Link to measure from Annex IV of the Directive 2008/98/EC:	The use of planning measures, or other economic instruments promoting the efficient use of resources. (1) The use of awareness campaigns and information provision directed at the general public or a specific set of consumers. (12)
Specific goal(s):	Bio-waste prevention

Measure 3: Work on the improvement of the system of collection and analysis of food waste data

The first step in the waste prevention process demands identifying the types and quantities of created waste. Considering that the largest quantities of food waste still find their way to mixed municipal waste, the data on produced quantities are hard to determine by analysing grocery sales and municipal waste collection. There is no official complete and reliable data on the total quantities of food waste created in the RC.

To get this information, CAEN conducted a project called Data collection on food waste statistics from 27 July 2013 to 27 August 2014 in which the manual “Food waste prevention in tourist and catering services” was created.

The results received in the project represent a good starting point to determine the normative system of monitoring the effects of food waste prevention measures. To establish such a system, in the following programme period, it is necessary to repeat this (or a similar) project, in order to get relevant data to serve in determining the progress in decreasing the total quantities of food waste.

Link to measure from Annex IV of the Directive 2008/98/EC:	The development of effective and meaningful indicators of the environmental pressures associated with the generation of waste aimed at contributing to the prevention of waste generation at the level of local self-government units and regional self-government units and at the level of the Republic of Croatia (3)
Specific goal(s):	Bio-waste prevention

9.4.2 Measures that can influence design and production and distribution phase

Measure 4: Promoting sustainable building

To implement this measure, it is necessary to create a so called “Guide to green and sustainable building”. These types of guides represent an efficient way to emphasize methods of waste decrease because they go beyond raising awareness, and provide practical tools and techniques for construction and demolition waste prevention to business subjects, such as e.g.:

re-use and renovation, durability design, adaptability and disassembly possibilities, exchange of materials, using less toxic materials, separating toxic materials.

The subject of construction and demolition waste prevention, especially the exchange of waste materials will be treated in the improvement of the Croatian Waste Market or in designing a new Internet portal.

It is also important to include the topic of “green building” in professional exams for spatial planning and construction positions and including the waste prevention topic in the Decision on environmental acceptability, which would, together with the already mentioned measures of environmental protection, limiting or moderating the negative effects on the environment, prescribe measures for waste prevention during and after construction, during the use of the building for which an environmental impact assessment was conducted.

Together with the recommended measures for municipal waste prevention, especially the measures encouraging “green” and sustainable public procurement, this measure, directed specifically at construction and demolition waste, will contribute to the improvement of the entire construction and demolition waste management system.

Link to measure from Annex IV of the Directive 2008/98/EC:	The provision of information on waste prevention techniques with a view to facilitating the implementation of best available techniques by industry. (5)
Specific goal(s):	Construction and demolition waste prevention

Measure 5: Establishing a food donation system

The Agriculture Act (OG 30/15) has for the first time in the RC provided a basis for the establishment of a food and feed donation system with the goal of preventing the destruction of large amounts of food, environmental protection and helping the socially vulnerable and persons experiencing natural disasters and catastrophes.

At the same time, conditions that food must satisfy to be donated were prescribed, meaning its health safety and suitability, as well as the responsibilities of subjects in the food business that take part in the food donation chain.

The Minister of Agriculture has adopted the Ordinance on conditions, criteria and methods of donating food and animal feed (OG 119/2015).

By cooperating with the Ministry of Agriculture, it is necessary to organise an intense media campaign to clearly and succinctly introduce the news originating from the legal framework for food donation, and emphasize the social-economic advantages of establishing a system of donation. The campaign must also be aided by adequate printed informative materials (flyers, brochures, posters etc.)

Additionally, food donation initiatives must be started, as well as initiatives for collection and donation of groceries to citizens with less buying power, through the collection of agricultural, agro-industrial and processed food produce by the donator, which are further distributed to socially vulnerable categories of the population, via humanitarian and social institutions helping in a similar way to those in need.

Link to measure from Annex IV of the Directive 2008/98/EC:	The use of awareness campaigns or the provision of financial and decision making support. (8)
Specific goal(s):	Bio-waste prevention

9.4.3 Measures that can influence the consumption and use phase

Measure 6: Organising a communication campaign for citizens

The most effective measure in the execution the waste prevention concept is raising public awareness on long-term unsustainability of irresponsible behaviour patterns, i.e. conducting a communication campaign.

Considering the above, a campaign will be organised with the purpose of informing households on the quantities of created and landfilled waste, and the necessity of stopping to produce it.

For the successful execution of such a campaign, it is necessary to previously create a detailed communication plan with clearly defined goals, messages and targeted groups. It must be precisely defined to whom a certain campaign is speaking and with what goal, the sent message controlled, the most useful channels for its dissemination chosen and its effects evaluated.

The campaign can be held through the following direct channels and tools for goal communication:

- improving the MEE website on waste prevention and educating on the possibilities and uses of waste prevention
- opening and tending to social media profiles (e.g. Facebook, Twitter etc.)
- media advertisements (TV, radio)
- creating educative curricula specially adapted to children of all ages (schools, kindergartens)
- contracting experts for LSGUs/municipal companies that will do terrain work, determine needs to act, cooperate with local boards etc.
- payment slips (for the service of waste collection) - put some information on waste decrease on the back
- public opinion and surveys - directed research into public opinion and survey conduction related to the topic of waste prevention is useful communication material, but also to evaluate and measure the success of realised activities and their possible correction.

The campaign can be supported through the Internet portal mentioned in the previous chapter, which would be a part of the existing Croatian Waste Market or a completely new system. In this way, a complete information system for waste prevention and exchange of good practices would be established, in which the interested public could be informed and educated on the possibilities and uses of waste prevention, including the availability of products for re-use.

Measure 7: Encouraging waste plastic bags prevention

It is necessary to introduce an obligatory fee for light plastic bags and an obligation to sellers that they inform the consumers on the negative effect of large consumption of plastic bags on the environment at the location where plastic bags are sold, including locations where consumers take plastic bags by themselves (bags in rolls for fruits and vegetables etc.)

Link to measure from Annex IV of the Directive 2008/98/EC:	Economic instruments such as incentives for clean purchases or the institution of an obligatory payment by consumers for a given article or element of packaging that would otherwise be provided free of charge. (11) The use of awareness campaigns and information provision directed at the general public or a specific set of consumers. (12)
Specific goal(s):	Municipal waste prevention

Measure 8: Encouraging home composting

In order to prevent landfilling bio-waste at landfills and contribute to the achievement of other waste management goals, it is necessary to encourage citizens to compost in their own homes. The goal of this measure is to achieve that households separate bio-waste from other household (municipal) waste by leaving it in special bio-waste containers, and that through composting in their own composters, they get completely free organic fertilizer with which they will save on buying artificial fertilizer or flower soil.

In order for the local self-government units to be included in the active encouragement of the local population to compost in their households, it is necessary to organise educative workshops for local self-government units, whose programme can be based on education on methods of organising and conducting quality campaigns on the topic of bio-waste prevention including education on the topic of the importance of composting and the application of composters.

Additionally, it is possible to encourage home composting by co-funding the procurement of home composters.

Link to measure from Annex IV of the Directive 2008/98/EC:	The use of awareness campaigns and information provision directed at the general public or a specific set of consumers. (12)
Specific goal(s):	Bio-waste prevention

Measure 9: Encouraging “green” and sustainable public procurement

By including environmental criteria and establishing public procurement policies, and by determining new specifications for goods and services favouring durability, the possibility of use more than once, less packaging or smaller level of toxicity, the public sector can concentrate its buying power to decrease of waste, and, by extension, landfilling.

Together with replacing conventional goods, services and works with alternative ones, having a less negative environmental impact, in public and corporate procurement procedures, it is necessary to additionally define competition criteria so as to positively value and award “green” alternatives.

It is necessary to additionally build capacities within government bodies for green public procurement, to procure energy efficient and ecologically suitable products, works and services, as well as strengthen capacities of educators so as to make possible the integration of green public procurement in regular training programmes.

This will be achieved by making guidelines to establish environmental criteria in competition documentation, and other practical advice on “green” or sustainable procurement, based on appropriate indicators.

Additionally, it is possible to establish a database on “green” products satisfying environmental criteria and their links to their suppliers, so that buyers have an easier job in defining environmental criteria and, consequently, the procurement of goods, services and works that cause a long-term decrease in waste creation.

Link to measure from Annex IV of the Directive 2008/98/EC:	Integration of environmental protection and waste prevention criteria in procedures of public and corporate procurement (15)
Specific goal(s):	Municipal waste prevention, EE waste prevention and paper and cardboard waste prevention, construction waste prevention

Measure 10: Encouraging exchange and re-use of used products

Re-use of products means any procedure by which the product, which was designed and constructed to, during its life-cycle, fulfil a minimum number of work cycles, be used again for the same purpose for which it was built or for another function, aided by other market products or without them.

Re-use procedures may include:

- restoration: restoring the product to a satisfying working state
- repair: correcting some error in the product
- resale: reselling the used product (or its parts)
- re-production: returning the product to its initial specifications
- improvement: improving the product to achieve better performances compared to initial ones.

Within recycling yard, a so called “Re-use corner” may be organised, where citizens can bring things they do not need anymore, and other citizens (of weaker financial status) can take these things for further use.

MEE and EPEEF will publish a document Re-use Guidelines on their web sites. To achieve a significant change in perception, awareness and habits of the general public, it is necessary to design a campaign with a catchy key message such as e.g.: “Used is not used up”, which would be repeated via radio, TV and other electronic media.

Additionally, the campaign would include making posters, brochures, flyers and video-informational educational content, containing useful information on the value of so-called used-up materials and the possibilities of its repair and/or re-use. These materials will contain data on where and how the citizens can donate their used products, i.e. exchange them for some others that they need.

For this goal, it is necessary to establish an Internet portal for re-use, collecting and distributing products (clothes, books, electronic and electric equipment, computers, furniture, food etc.) which can be used in the widest sense of that word and which are useful and necessary to someone, donated by people that do not need them anymore. The portal can be organised within the existing Croatian Waste Market, started by the CCE, organised with the goal of connecting business partners offering or seeking all types of useful waste/secondary resources that can be used as input resource for further production.

In Re-use Centres, a web portal “I’m offering - I’m looking for” must be established and it must be connected within all the Centres so as to create a network of supply and demand.

To determine if it is more cost-effective to upgrade and improve the existing informational and design solution of the Croatian Waste Market portal or if a new system should be created, a previously conducted short research (analysis) will be conducted.

Additionally, cities and municipalities will organise special actions of collecting used products, where citizens would be invited to bring such products to a certain location. Separate objects may then be distributed to individuals of lower buying power, and unusable materials may be processed for other needs.

After all of the above, activities of organising common spaces (re-use and repair centres) would take place, serving to collect, sort and/or repair used products, and connecting with humanitarian institutions that could re-use these products.

Active cooperation with repairmen will be established (repair services), social institutions that could donate some of these products to their protégés and others, and the long-term unemployed as well as the homeless will be included in the re-use activities, with the possibility of long-term employment.

Additionally, it is necessary to adapt the legal framework so as to ensure unhindered function of re-use of some types of waste, prolonging the lifespan of certain products and their market positioning.

Link to measure from Annex IV of the Directive 2008/98/EC:	The promotion of the re-use and/or repair of appropriate discarded products or of their components, notably through the use of educational, economic, logistic or other measures (16)
Specific goal(s):	Municipal and EE waste prevention

A tabular view of all waste prevention measures in the Plan is in Annex 12.5. of the Plan.

10 FINANCIAL ASSETS FOR THE EXECUTION OF PLAN MEASURES

Table 29. Financial assets for the execution of plan measures

Measure no.	Measure	Estimation ²² of necessary financial assets (HRK)
M1.1.1	Measures defined by the Waste Prevention Plan	10.000.000
M 1.1.2	Establishing re-use centres	75.000.000
M 1.1.3	Home composting	80.000.000
M 1.2.1	Procurement of equipment, vehicles and vessels for separate collection of paper, cardboard, metal, plastic, glass and textile	300.000.000
M 1.2.2	Constructing a sorting facility for separately collected paper, cardboard, metal, glass, plastic etc.	350.000.000
M 1.2.3	Constructing recycling yards	450.000.000
M 1.2.5	Strengthening the market for waste intended for recycling	1.000.000
M 1.2.6	Constructing recycling facilities	75.000.000
M 1.3.2	Procurement of equipment and vehicles for separate collection of bio-waste	75.000.000
M 1.3.3	Construction of facilities for biological treatment of separately collected bio-waste	150.000.000
M 1.4.3	Intervention measure to decrease landfilling municipal waste created in the City of Zagreb	100.000.000
M 1.4.4	Intervention measure to decrease landfilling municipal waste created in the City of Split	100.000.000
M 1.4.5	Constructing waste management centres	1.600.000.000
M 1.4.6	Planning energy recovery	1.000.000
M 2.1.1	Creating an action plan for separate collection and recycling construction and demolition waste	1.000.000
M 2.1.2	Constructing and procuring equipment for recycling yards for construction and demolition waste	80.000.000
M 2.2.1	An action plan for the use of	5.000.000

²² These amounts are prone to change in accordance with feasibility studies of individual projects or other documents needed to realise an individual measure

	residual sludge from waste water treatment facilities on suitable surfaces	
M 2.2.2	Establishing a sludge management system	100.000.000
M 2.3.1	Improvement and analysis of the existing packaging waste management system	2.000.000
M 2.4	Establishing a marine waste management system	2.500.000
M 2.5	Establishing a management system for waste ships, wrecks and sunken objects on the seabed	40.000.000
M 2.6.1	Improving the medical waste management system	2.000.000
M 2.6.2	Conducting an Asbestos waste estimation Study for each county	2.000.000
M 2.6.3	Constructing cells for asbestos waste	5.000.000
M 3.1	Analysis of existing and necessary capacities for hazardous waste treatment	1.000.000
M 4.1	Creating a Plan for closing non-hazardous waste landfills	2.000.000
M 4.2	Remedy non-hazardous waste landfills	975.000.000
M 4.3	Identifying new locations polluted by hazardous waste ("hot spots")	2.000.000
M 4.4	Remediating locations polluted by hazardous waste ("hot spots")	450.000.000
M 4.5	Remediating abandoned waste locations	10.000.000
M 5.1	Creating a Programme of educative-informative activities on sustainable waste management	800.000
M 5.2	Conducting activities from the Programme of educative-informative activities on sustainable waste management	10.000.000
M 5.3	Conducting a national campaign on sustainable waste management	5.000.000
M 6.1	Creating and/or improving applications that are part of the waste management information system	10.000.000
M 6.2	Creating an EPEEF information system for the preparation and	5.000.000

	implementation of projects	
Total (HRK)		5.077.300.000

Project execution funds will be secured from:

Public sources:	State budget
	LSGU and RSGU budgets and public service provider funds and water service provider funds (owned by local self-government units)
	EU funds (Operative programme competitiveness and cohesion 2014-2020)
	EPEEF/CW
Bank credits	The World Bank, European Bank for Reconstruction and Development, European Investment Bank etc.
Private sources:	Private investments in all types of waste treatment
	Private investments in WMCs (public-private partnership, concessions etc.)
	Private investments in primary separation and waste collection - facilities for recycling and collection (public-private partnership, concessions etc.)

Indicative funding ratios per source and year:

	2017.	2018.	2019.	2020.	2021.	2022.	Total
State budget	245.000	3.775.000	15.325.000	1.970.000	1.075.000	1.025.000	23.415.000
EU funds	107.655.000	232.000.000	1.192.026.250	926.302.885	543.425.000	418.850.000	3.420.259.135
LSGU	26.800.000	54.000.000	257.350.000	182.984.500	24.880.000	29.300.000	575.314.500
RSGU	8.200.000	21.600.000	91.875.000	108.300.000	135.390.000	91.800.000	457.165.000
EPEEF	135.256.900	132.400.000	83.937.500	60.560.715	48.080.000	30.525.000	490.760.115
CAEN	750.000	825.000	311.250	0	0	0	1.886.250
CW	0	500.000	4.500.000	3.750.000	3.750.000	3.000.000	15.500.000
Private investments	0	15.000.000	27.000.000	30.000.000	12.000.000	9.000.000	93.000.000
							5.077.300.000

11 ESTIMATING USEFULNESS AND APPROPRIATENESS OF ECONOMIC INSTRUMENTS IN WASTE MANAGEMENT WITH UNBURDENED FUNCTION OF THE INNER MARKET

Economic instruments must add to the sustainability of the waste management system and to the transition to circular economy. Economic instruments are used to achieve goals and prevent harmful effects. Economic instruments in the RC are fees for waste landfilling, fees for managing special categories of waste, refundable deposits and fees for the public service of collecting municipal waste. These fees are used to achieve goals in waste decrease, increasing waste recycling and decreasing waste landfilling.

11.1 LANDFILLING FEE

The landfilling fee is used to decrease the quantities of landfilled waste and simultaneously encourage waste recovery i.e. serves to accomplish the waste landfilling goals and separate collection of waste. The regulations on waste management in the RC prescribe the following kinds of fees for landfilling, paid to the EPEEF:

- municipal waste landfilling fee, prescribed by the Act on Sustainable Waste Management, relating to waste landfilled at an unregulated landfill and landfilled biodegradable municipal waste in larger-than-allowed quantities, not in application
- fee for construction and demolition waste landfilling, prescribed by the Act on Sustainable Waste Management, relating to certain types of construction and demolition waste which is landfilled, not in application
- fee for environmental pressure by waste, prescribed by the Act on the Environmental Protection and Energy Efficiency Fund (OG 107/03 and 144/12), regarding landfilled non-hazardous/technological waste
- hazardous waste fee, prescribed by the Act on the Environmental Protection and Energy Efficiency Fund, regarding production of hazardous waste which is not treated or exported.

Considering that 80% of waste is still landfilled, and all mentioned fees are still not applied, it is necessary to revise the fee system.

11.2 FEE FOR REDUCING THE QUANTITY OF MIXED MUNICIPAL WASTE

The subsidiary fee to reduce the quantity of mixed municipal waste is prescribed by the Act on Sustainable Waste Management. By this fee, a local self-government unit (LSGU) is encouraged to conduct measures of decreasing the quantities of mixed municipal waste created in the area of the LSGU. The LSGU pays the fee to EPEEF based on the mass of collected mixed municipal waste going over the prescribed limiting quantity. This fee is used to co-finance separate collection of waste. It is not yet in application.

11.3 FEE FOR MANAGEMENT OF SPECIAL CATEGORIES OF WASTE

The fee for management of special categories of waste is prescribed by the Act on Sustainable Waste Management. The fee is an instrument of implementing extended producer responsibility i.e. the producer who makes the product which creates a special category of waste pays this fee for the management of this special category of waste. The fee is used to finance the costs of the system of waste collection and treatment, and it is paid to EPEEF which controls the system of collection and treatment of special categories of waste and is responsible for the achievement of goals in collection and treatment of that waste. The fee for management of special categories of waste is applied to waste electric and electronic equipment (EE waste), waste oils, packaging waste, end-of-life vehicles, waste tyres, waste batteries and accumulators. The existing fee system is continuously monitored with regards to costs and meeting goals, and is, if needed, harmonised with the real costs of collecting and treating certain special categories of waste.

Besides the system of collecting and treating special categories of waste controlled by EPEEF, the Act foresees a system controlled by the organisation and individual accomplishment of goals by the producer of the product causing the creation of a certain special category of waste.

Considering the several-years' experience, it is necessary to improve the current system of fees in the part of identifying persons obliged to pay the fee, monitoring the data on special categories of waste and, by creating a Register for these special categories of waste, analyse the possibility of accomplishing goals within other systems defined by the Act.

Besides paying the fee for management of special categories of waste, as an instrument conducting extended producer responsibility for certain types of waste, the obligation that the producer takes in the waste from the type of product causing it has also been introduced.

The Act on Sustainable Waste Management also defines a fee for the operation of the special categories of waste management system, which shall serve to fund measures for monitoring producer obligations and the operation of the system including its informational infrastructure.

An instrument of expanded responsibility of the producer of products causing the creation of certain types of waste is used to accomplish the goal of separate collection, recycling and waste recovery, but is also accomplishing the goal of decreasing landfilling waste.

11.4 REFUNDABLE DEPOSIT

A refundable deposit is defined by the Act on Sustainable Waste Management and it is a stimulative measure encouraging the possessor of waste to give a certain type of waste to the seller of the type of product which creates the corresponding waste or to a person managing a recycling yard and, for that, to receive a certain amount of refundable deposit.

The refundable deposit is applied only for some types of packaging and here significant success has been achieved, especially in regards to PET beverage bottles.

The purpose of the refundable deposit is to secure the transfer of certain waste to the system of separate collection of that waste i.e. the refundable deposit is an instrument used to accomplish the goal of separate collection, recycling and waste recovery, but is also accomplishing the goal of decreasing landfilling.

11.5 FEE FOR PUBLIC COLLECTION OF MUNICIPAL WASTE

The fee for public collection of municipal waste is defined by the Act on Sustainable Waste Management with the purpose of covering the costs of the system of collecting and treating municipal waste. The service provider is obliged the price the public service proportionally to the quantity of received waste, where the quantity criterion is mass of received waste or container volume and frequency of emptying. Besides the mentioned, the service provider is obliged to include into the price the costs of procurement and upkeep of the equipment for waste collection as well as waste transport and treatment. The principle of pricing the service according to the quantity of received waste is important because it directly influences the behaviour of individual users. In the pricing system based on the quantity of received municipal waste, two parts of the fee must be taken into consideration - fixed and variable. The fixed part of the fee is used for the procurement and upkeep of equipment, vehicles, treatment facilities, sorting, recycling etc., while the variable part is for mixed municipal waste which the service user did not separate, i.e. which is deposited in a container. To determine the variable part of the fee, different approaches can be utilised (e.g. different fees for different container/bag volumes or determining the mass of received waste). Experience shows that such a way of determining the municipal waste fee is encouraging and efficient in accomplishing the goal of decreasing waste creation, increasing separate collection of waste and decreasing landfilling.

The current system of fees for the collection of municipal waste has numerous drawbacks and does not contribute to the decrease of the production of mixed municipal waste nor to the decrease of the quantities of biodegradable waste in mixed municipal waste. Even though a certain level of solidarity or common responsibility is probably necessary in the system (e.g. users in apartment buildings), it is essential to influence the behaviour of each individual user in order to achieve goals. The price of the public service of collecting municipal waste must be acceptable considering the average income of its users, while at the same time, ensuring that the provider of the public service can settle their costs.

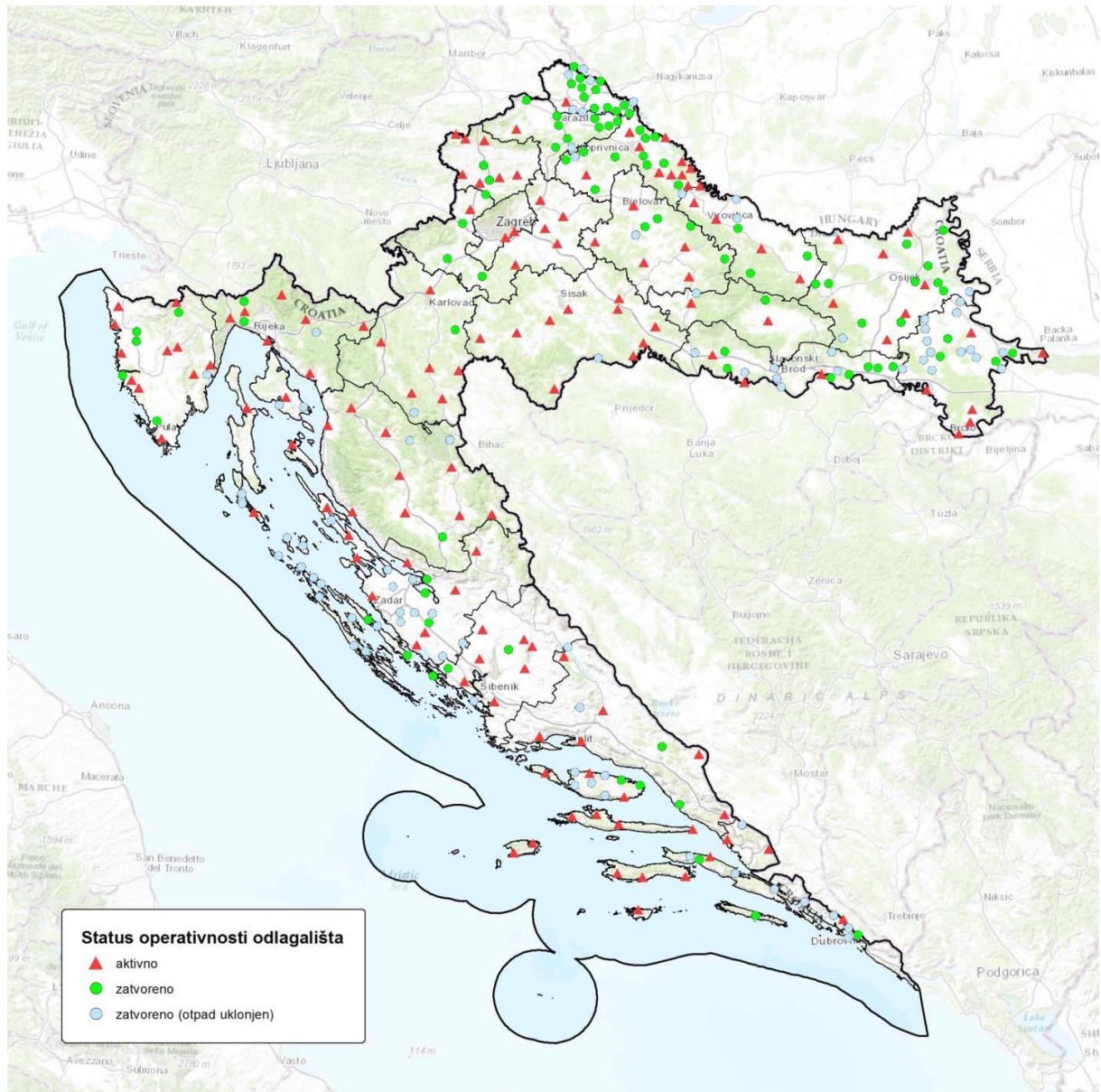
The municipal waste management system must be changed and connected with the systems of separate collection of special categories of waste, especially packaging, which creates a significant portion in

the volume of mixed municipal waste, so as to make separate collection of waste in the interest of the public service provider, which should be funded from the fee for management of special categories of waste.

Introducing fees for the public service of collecting municipal waste based on the quantity of received mixed or biodegradable municipal waste is used to accomplish the goal of waste prevention, decreasing landfilling, increasing separate collection and recycling or recovery of waste.

12 ANNEX

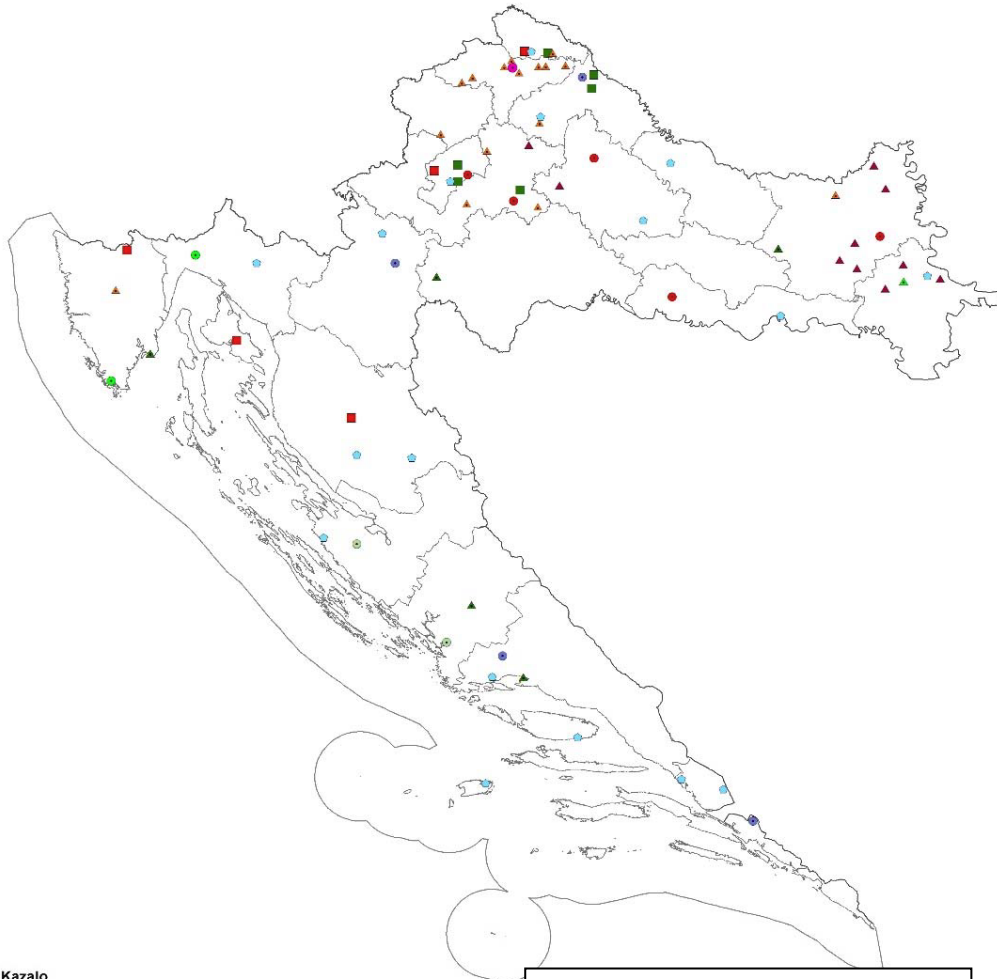
12.1 LANDFILL MAP ACCORDING TO OPERATIONAL STATUS



- active
- closed
- closed (waste removed)

12.2 WASTE MANAGEMENT FACILITIES MAP

WASTE MANAGEMENT FACILITIES



Kazalo

Centri za gospodarenje otpadom

Status realizacije projekata:

- Izgrađeno
- ◉ U provedbi
- ⊕ U tijeku je priprema dokumentacije za prijavu projekata za EU sufinanciranje
- Nije započela priprema dokumentacije za prijavu projekata za EU sufinanciranje

Mehaničko-biološka obrada otpada

- MBO Varaždin

Kazeta za zbrinjavanje azbestnog otpada

- ⊕ Kazeta za zbrinjavanje azbestnog otpada

Postrojenja za energetske uporabu i spaljivanje otpada u 2016. godini

- ▲ Tvrtka s dozvolom za postupak D10
- ▲ Tvrtke s dozvolom za postupak R1
- ▲ Tvrtke upisane u Očevnik energetskih oporabitelja određenog otpada

Bioplinna postrojenja s dozvolom za gospodarenje otpadom

- ▲ Bioplinna postrojenja s dozvolom za gospodarenje otpadom

Kompostišta

- Aktivna s valjanom dozvolom
- Nisu aktivna

Legend

Waste management centres

Project realisation status:

- constructed
- in construction
- documentation preparation for EU co-funding projects is underway
- documentation preparation for EU co-funding projects is not yet underway

Mechanical-biological waste treatment

- MBT Varaždin

Asbestos waste disposal cell

- asbestos waste disposal cell

Energy recovery and waste incineration facilities in 2016

- company with D10 procedure permit
- company with R1 procedure permit
- companies registered in the Register of energy recovery operators for certain types of waste

Biogas facilities with a waste management permit

- biogas facilities with a waste management permit

Composting plants

- active with valid permit

- not active

TIMEFRAME FOR CROATIAN WASTE MANAGEMENT PLAN EXECUTION

Measure no.	Measure	Deadline	2017	2018	2019	2020	2021	2022
M1.1.1	Measures defined by the Waste Prevention Plan	2022						
M 1.1.2	Establishing re-use centres	2022						
M 1.1.3	Home composting	2020						
M 1.2.1	Procurement of equipment, vehicles and vessels for separate collection of paper, cardboard, metal, plastic, glass and textile	2020						
M 1.2.2	Constructing a sorting facility for separately collected paper, cardboard, metal, glass, plastic etc.	2020						
M 1.2.3	Constructing recycling yards	2018						
M 1.2.4	Introducing quantity-based fees for collection and treatment of mixed and biodegradable municipal waste	2017						
M 1.2.5	Strengthening the market for waste intended for recycling	2018						
M 1.2.6	Constructing recycling facilities	2022						
M 1.3.1	Development of quality and categorising criteria for compost and digestates	2018						
M 1.3.2	Procurement of equipment and vehicles for separate collection of bio-waste	2020						
M 1.3.3	Construction of facilities for biological treatment of separately collected bio-waste	2020						
M 1.4.1	Introducing a fee for landfilling	2017						
M 1.4.2	Monitoring the amount of biodegradable waste in mixed municipal waste	continuously						
M 1.4.3	Intervention measure to decrease landfilling municipal waste created in the City of Zagreb	2020						
M 1.4.4	Intervention measure to decrease landfilling municipal waste created in	2020						

	the City of Split							
M 1.4.5	Constructing waste management centres	2022						
M 1.4.6	Planning energy recovery	2020						
M 2.1.1	Creating an action plan for separate collection and recycling construction and demolition waste	2017						
M 2.1.2	Constructing and procuring equipment for recycling yards for construction and demolition waste	2020						
M 2.2.1	An action plan for the use of residual sludge from waste water treatment facilities on suitable surfaces	2017						
M 2.2.2	Establishing a sludge management system	2022						
M 2.3.1	Improvement and analysis of the existing packaging waste management system	2017						
M 2.4.1	Identifying the locations and sources of marine waste and identifying locations of accumulated marine waste on the seabed.	2018						
M 2.4.2	Establishing a system of prevention, collection and disposal of marine waste, as an integral part of the waste management system in the RC.	2019						
M 2.4.3	Intervention collection and disposal of marine waste	2018						
M 2.4.4	Establishing cooperation with neighbouring or other countries regarding marine waste pollution	continuously						
M 2.5.1	Establishing a waste ship management system	2018						
M 2.5.2	Identifying the locations of wrecks and sunken objects on the seabed and creating a cadastre	2018						
M 2.5.3	Identifying the composition and quantities of hazardous matter and explosive material in wrecks and sunken objects on the seabed which pose the threat of polluting the	2018						

	marine environment or making the sea resource use an unsafe process (oils, fuels, fuel oils, left-behind weapons and explosive devices etc.)							
M 2.5.4	Remediation of wrecks and sunken objects on the seabed in ownership of the RC	2019						
M 2.5.5	Intervention remediation of wrecks and sunken objects on the seabed and their contents	2017						
M 2.5.6	Improve normative standards and procedures for crisis interventions on wrecks and sunken objects on the seabed	2017						
M 2.6.1	Improving the medical waste management system	2020						
M 2.6.2	Conducting an Asbestos waste estimation Study for each county	2019						
M 2.6.3	Constructing cells for asbestos waste	2022						
M 2.6.4	Improving the special categories of waste management system (end-of-life vehicles, waste batteries and accumulators, waste tyres, EE waste, oils)	2020						
M 3.1	Analysis of existing and necessary capacities for hazardous waste treatment	2019						
M 4.1	Creating a Plan for closing non-hazardous waste landfills	2017						
M 4.2	Remedy non-hazardous waste landfills	2022						
M 4.3	Identifying new locations polluted by hazardous waste ("hot spots")	2018						
M 4.4	Remedying locations polluted by hazardous waste ("hot spots")	2022						
M 4.5	Remedying abandoned waste locations	2020						
M 5.1	Creating a Programme of educative-informative activities on sustainable waste management	2017						
M 5.2	Conducting activities from the Programme of	2022						

	educative-informative activities on sustainable waste management							
M 5.3	Conducting a national campaign on sustainable waste management	2017						
M 6.1	Creating and/or improving applications that are part of the waste management information system	2018						
M 6.2	Creating an EPEEF information system for the preparation and implementation of projects	2018						
M 7.1	Educating all the participants in waste management supervision	continuously						
M 7.2	Analysis and redefining supervision jurisdiction in waste management	2018						
M 8.1	Improving the system and procedures for issuing waste management permits	2018						

WASTE PREVENTION MEASURES OVERVIEW

No.	Measure	Specific goal(s):	Implementation mechanisms (activities):	Indicators:
Indicators/pointers to monitor the accomplishment of general waste management goals				Intensity of waste production - separating economic growth from waste production EU funds spent on waste management projects in the field of waste prevention
MEASURES THAT CAN INFLUENCE THE FRAMEWORK CONDITIONS IN WASTE CREATION				
1	Encouraging re-use of demolition material	Construction and demolition waste prevention	Establishing subsidy fees for the re-use of demolition material.	Decreased quantities of total produced construction and demolition waste Increased the number of users of the subsidy fee for the re-use of demolition material Defined conditions which the demolition material must satisfy Established a central building register
			Defining conditions which the demolition material must satisfy	
			Establishing a central building register	
2	Organising informative-educative campaigns on food waste prevention	Bio-waste prevention	Conducting informational campaigns including making and promoting flyers and textbooks	Number of conducted national campaigns Number of conducted campaigns in LSGUs Created LSGU guidelines on the topic of preparing local WMPs Number of local WMPs that have food waste prevention measures Number of cities and municipalities conducting educational-informational activities with the purpose of prevention Number of workshops organised in LSGUs Number of produced flyers, brochures,
			Educating LSGUs via workshops and preparing educational material on methods of defining measures and activities for bio-waste prevention	
			Creating LSGU guidelines on the topic of preparing local WMPs	
3	Work on the improvement of the system of collection and	Bio-waste prevention	Conducting statistical analyses in order to ensure complete and reliable data necessary	Conducted statistical analyses with food waste data collection activities

	analysis of food waste data		to monitor progress in bio-waste prevention	Decreased food waste quantities on landfills in % and t
MEASURES THAT CAN INFLUENCE DESIGN AND PRODUCTION AND DISTRIBUTION PHASE:				
4	Promoting sustainable building	Preventing construction waste	Creating a Guide to green and sustainable building	Decreased the quantities of total produced construction and demolition waste Created a Guide to green and sustainable building Improved the existing or designed a new Internet portal "Green building" topics introduced in professional exams
			Improving the existing or designing a new Internet portal	
			Introducing the topic of "green building" in professional exams	
5	Establishing a food donation system	Bio-waste prevention	Adopting an Ordinance on regulating the food donation system	Decreased total quantities of bio-waste in %, t Decreased food waste quantities on landfills in %, t Conducted a campaign on food donation Increased the number of food donation initiatives
			Starting food donation themed campaigns	
			Starting food donation initiatives in the RC	
MEASURES THAT MAY INFLUENCE THE CONSUMPTION AND USE PHASE:				
6	Organising a communication campaign for citizens	Municipal waste prevention	Creating a communication plan	Decreased the quantities of total produced municipal waste in % and tonnes Decreased the quantities of total food waste in % and tonnes Created a communication plan Number of visitors to the MEE website's part on waste prevention Opened profiles on social networks and the number of likes, i.e. memberships Number of advertisements Number of visits to schools and/or kindergartens Made a textbook for citizens Improved the existing or designed a new Internet portal
			Adding content and directions for waste prevention to the MEE website	
			opening and social media profiles	
			Media advertising	
			Organising an educational campaign in schools and kindergartens	
			Awarding prizes for best eco-design and ecologically responsibly business	
			Promoting eco-events (green events) and "weeks of sustainable shopping"	
			Creating a textbook for citizens	
			Improving the existing or designing a new	

			Internet portal	
7	Encouraging waste plastic bags prevention	Municipal waste prevention	<p>Introducing obligatory payment for light plastic bags</p> <p>Introducing an obligatory fee for light plastic bags and an obligation to sellers that they inform the consumers on the negative effect of large consumption of plastic bags on the environment at the location where plastic bags are sold, including locations where consumers take plastic bags by themselves (bags in rolls for fruits and vegetables etc.)</p>	Decreased the consumption of light plastic bags (the number of bags put on the market)
8	Promoting home composting	Bio-waste prevention	<p>Organising workshops for LSGUs on campaign preparation</p> <p>Establishing a programme of co-funding home composters</p>	<p>Decreased total bio-waste quantities</p> <p>Increased the number of households that compost their own waste</p> <p>Increased the number of campaigns in LSGUs on the topic of home composting</p> <p>Number of co-funded home composters</p>
9	Encouraging “green” and sustainable public procurement	Municipal waste prevention, EE waste prevention and paper and cardboard waste prevention, construction waste prevention	<p>Creating a textbook for green and sustainable public procurement</p> <p>Defining the usual criteria for procurement objects that can simply be included in the competition documentation</p> <p>Establishing a database of “green” products</p> <p>Educating the conductors of public and corporate procurements aimed towards environmental specifications and those specifically related to waste</p>	<p>Decreased the quantities of total produced municipal waste</p> <p>Decreased the quantities of total produced EE waste</p> <p>Decreased the quantities of total produced waste paper and cardboard</p> <p>Created a textbook for green and sustainable public procurement</p> <p>Established a database of “green” products</p> <p>Increased the number of conducted green and sustainable public and corporate procurements</p> <p>Increased the number of educations on the topic of green and sustainable</p>

			prevention	public procurement Defined the usual criteria for procurement objects that can simply be included in the competition documentation
10	Encouraging exchange and re-use of discarded products	Municipal and EE waste prevention	Creating Guidelines to establish a re-use system in the RC	Decreased the total quantities of municipal waste
			Conducting a pilot project for the establishment of a re-use system	Decreased the total quantities of EE waste Increased the number of companies in recovery or using useful parts of waste
			Conducting a communication campaign via media with the goal of raising citizens' awareness	Number of newly opened workplaces in waste re-use
			Publishing a Guide for repair/loaning/use of used electric and electronic devices and equipment	Conducted a communication campaign on the topic of re-use of used products Increased the number of informative materials on the topic of re-use of used products
			Organising events (in cooperation with the civil sector) of collection, exchange and trading with used products	Number of organised events for the collection, exchange and trading with used products
			Improving the existing or designing a new Internet portal	Improved the existing or designed a new Internet portal
			Adapting the legal framework	
			Establishing common spaces (re-use centres and repair centres)	
			Establishing cooperation with repairmen and social institutions	
			Including socially vulnerable groups in recovery activities	