



6

Waste Management

1. Municipal Solid Waste

According to data included in the National Waste Management Plan, MSW collection and transportation is implemented by the cleaning services of 325 Municipalities, their Associations or Solid Waste Management Organizations. In addition, there are 502 licensed non-hazardous waste collection and transportation companies, to which Municipalities assign the collection/ transportation of MSW. The collection of MSW covers 100% of the territory.

According to the 2016 data of the Hellenic Recovery Recycling Corporation, 94% of the country's population is served for separate collection of Recyclable Materials by the Blue Bins Network and autonomous collection (297 Municipalities). The quantitative data for the years 2015 and 2016, regarding the management of MSW are presented in the following table:





Table 6.1.
Quantities of MSW generated and managed
(source: Ministry of Energy and Climate Change)

MSW Production	2015 Quantity (tn)		2016 Quantity (tn)	
	5,277,209.28		5,362,628.43	
MSW management	2015		2016	
	Quantity (tn)	%	Quantity (tn)	%
Disposal in landfills	4,160,935.45	78.85	4,215,701.21	78.6
Illegal disposal	265,000.00	5.02	200,000.00	3.7
Incineration	---	---	---	---
Recycling	698,414.91	13.23	738,144.00	13.8
Composting (Mechanical Waste Treatment Plant + domestic composting buckets + rural areas)	135,005.94	2.56	182,016.50	3.4
Energy recovery (R1) (waste cooking oils)	17,852.98	0.34	26,766.72	0.5

The comparison between the quantitative data for the years 2015 and 2016 and the quantitative elements of the National Waste Management Plan (2011) is presented in the following tables.

The below data show that, both in 2015 and 2016 there was an increase in the quantity generated per million € GDP, indicating that despite the decline in GDP, the consumption of basic commodities has not been reduced. Another important fact is that in 2016, compared to 2015, there was an increase in the quantities undergoing management, with a simultaneous decrease in those disposed in licensed and illegal landfills.

Table 6.2.
Quantitative data and indicators for Municipal Solid Waste Production

	2011	2015	2016
MSW Production (tn)	5,569,000	5,277,209.28	5,362,628.43
MSW Production (tn/inhabitant)	0.5149	0.4879	0.4958
MSW Production (tn/ million euro GDP)	26.90	29.93	30.78

Table 6.3.
Quantitative data for Municipal Solid Waste management

	2011	2015	2016
MSW quantities (tn) undergone Disposal Operations (D)	4,565,000	4,425,935.4	4,415,701.21
MSW quantities (tn) undergone Recovery Operations (R)	1,004,000	851,273.83	946,927.22

Table 6.4.
Performance – Target achievement for MSW

	Current Targets	Performance 2016	EU Performance 2016
MSW disposal in landfills		82.3% Licensed Landfills - illegal landfills	24%
MSW Recycling	50% to 2020	13.8%	29%
Bio-waste	---	3.4%	16%

1.1 Fines imposed

The decision of the EU Court of December 2, 2014 against Greece (Article 260 TFEU) for the uncontrolled disposal of waste has obliged the country to pay a flat-rate amount of 10,000,000 euro, as well as a six-month penalty payment on the basis of the initial amount of 14,520,000 euro, from which it would be deducted:

- an amount of 40,000 euro per uncontrolled waste disposal site which either ceased to operate or has been restored as of May 13, 2014, and
- an amount of 80,000 euro for those of the above sites that would have both cease to operate and have been restored by the same date.

According to the Commission's latest assessment for the 6th semester, there were still 80 infringements (from an initial total of 363), namely:

- 16 active and not-restored illegal landfills (34 infringements)
- 28 not-restored illegal landfills
- 20 restored illegal landfills for which it has not been proven that they have ceased to operate.

It should be noted that cases of inactive illegal landfills have not been accepted, although relevant evidence has been sent, as the EU calls for further guarantees for the lawful management of MSW, such as legally binding procedures.

2. Non-hazardous industrial waste

Non hazardous industrial waste and waste from other activities include all industrial and associated waste arising mainly from the manufacturing and power generation sectors, as well as other waste activities, in particular waste from health services, public services, etc. The comparison between the quantitative data for the year 2014 resulting from the Annual Waste Producer Reports and the quantitative data of the National Waste Management Plan (2011) for non-hazardous industrial waste is presented in Tables 6.5. and 6.6.

The non-hazardous waste recovery network includes waste treatment and recycling companies for the production of alternative raw materials and fuels, as well as companies using secondary materials (cement, iron and steel, metallurgy, ceramics industries etc.), which total in 150 facilities. The quantitative data show that in 2014 there was an increase of ~ 3% to the non-hazardous industrial waste disposal operations. With regard to recovery operations, out of a total of 807,947.06 tn of non-hazardous waste in 2014, 4,944.17 tn, corresponding to 0.61%, were sent to energy recovery, while the remaining 803,002.89 tn (percentage 99.39%) were sent for recycling.



Table 6.5.
Quantitative data and indicators for non-hazardous industrial waste production

	2011	2014
Non-hazardous industrial waste production (tn)	17,186,000	17,663,438
Non-hazardous industrial waste production (tn/ inhabitant)	1.589	1.633
Non-hazardous industrial waste production (tn/ million euro GDP)	83.01	98.87

Table 6.6.
Quantitative data for non-hazardous industrial waste management

	2011	2014
Quantities of non-hazardous industrial waste (tn) undergone Disposal Operations (D)	13,835,000	13,674,801.39
Quantities of non-hazardous industrial waste (tn) undergone Recovery Operations (R)	1,313,000	807,947.06

3. Hazardous Waste

The following table presents the 2014 quantitative data for the production and management of hazardous waste, which have been collected from the National Hazardous Waste Management Plan.

The comparison between the quantitative data for the year 2014 resulting from the Annual Waste Producer Reports and the quantitative data of the National Hazardous Waste Management Plan (2011) for hazardous industrial waste is presented in Tables 6.8. & 6.9.

Table 6.7.
Current hazardous waste production (years 2011 - 2014)
(Source: National Hazardous Waste Management Plan)

Waste category	2011	2012	2013	2014
	(tn)			
I - INDUSTRIAL HW & HW from Other Activities	272,427	231,296	222,902	218,789
1/ Industrial HW (excluding waste falling within the waste categories listed below)	136,236	112,885	107,066	104,342
2/ HW from public utilities, public service, etc.	16,400	13,590	12,888	12,560
3/ HW from health services plants	16,299	16,500	16,650	16,800
4/ Waste oils	55,560	40,050	37,113	35,244
5/ Vehicle and industrial accumulator waste	46,900	47,150	47,950	48,600
6/ HW from depollution of end-of-life vehicles	1,032	1,121	1,235	1,243
II - HAZARDOUS URBAN WASTE	6,500	6,512	6,527	6,539
1/ Electrical and Electronic Equipment Hazardous Waste	1,137	1,183	1,132	1,139
2/ Portable batteries and accumulators waste	1,110	1,000	960	960
3/ Other	4,253	4,329	4,435	4,440
III - HW from EXCAVATION, CONSTRUCTION AND DEMOLITION (*)	598	820	890	721
1/ Waste containing asbestos	598	820	890	721

The quantitative data presented above shows that in 2014 there was an increase of 6.45% to the hazardous waste disposal operations. This fact is in agreement with both the reduction of GDP and the usually increased costs of recovery operations for waste producers. With regard to recovery operations, out of a total of 77,057.26 tn of hazardous waste in 2014, 21.84 tn, corresponding to 0.03%, were sent to energy recovery, while the remaining 77,035.42 tn (percentage 99.7%) were sent for recycling. The existing collection and transportation network for hazardous waste (of about 30 companies) covers the country's needs for both domestic and cross-border transportation. The existing disposal network includes two private Hazardous Waste Disposal Sites, the Industrial Waste Disposal Landfill of PPC S.A. at Kardina, Ptolemais, and of Aluminum of Greece S.A. at Viotia. The existing hazardous waste management network includes a significant number of companies engaged in recycling - recovery of waste, deriving mainly from alternative management waste streams.

3.1 Fines imposed

With the Decision of the EU Court of September 7, 2016, a penalty payment was imposed on Greece for failing to comply with a previous Decision (Decision of September 10, 2009, Commission vs. Greece, C-286/08) because Greece:

- had not yet adopted a specific plan for the management of hazardous waste
- had not created an integrated and appropriate network of hazardous waste disposal facilities
- had not implemented the management of «historical waste» in accordance with the provisions of Union law.

Amounts paid:

Flat-rate amount

10,000,000 euro (paid in December 2016)

1st semester (7 September 2016 - 7 March 2017)

4,558,914.36 euro (paid in late August 2017)

2nd semester (7 March 2017 - 7 September 2017)

4,357,270.26 euro (to be paid by early January 2018)

Total amount paid so far: 18.916 million €

Table 6.8.

Quantitative data and indicators for hazardous waste production

	2011	2014
Hazardous industrial waste production (tn)	279,525	219,286
Hazardous industrial waste production (tn/ inhabitant)	0.0258	0.0203
Hazardous industrial waste production (tn/ million euro GDP)	1.350	1.227

Table 6.9.

Quantitative data for hazardous waste management

	2011	2014
Quantities of hazardous industrial waste (tn) undergone Disposal Operations (D)	37,500	38,661.59
Quantities of hazardous industrial waste (tn) undergone Recovery Operations (R)	101,600	77,057.26

4. Packaging And Packaging Waste

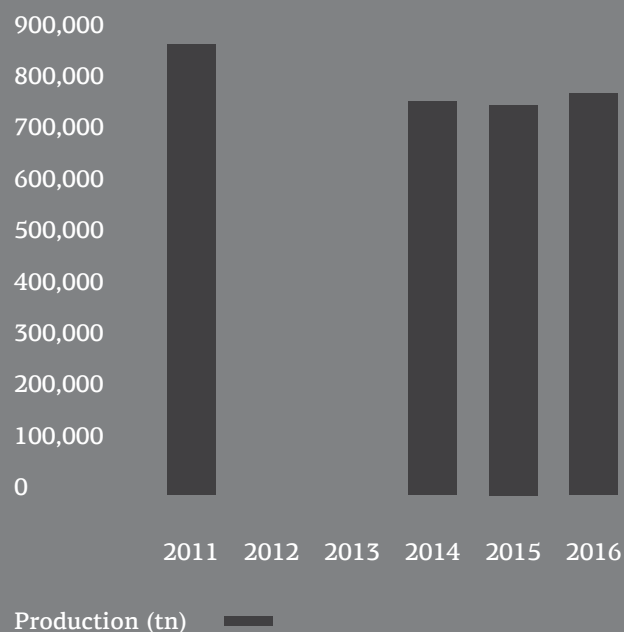
To this date, 3 collective and 1 individual alternative management schemes have been approved for packaging and packaging waste. The quantitative data and the indicators for

packaging and packaging waste production are presented per packaging category for the years 2014-2016:

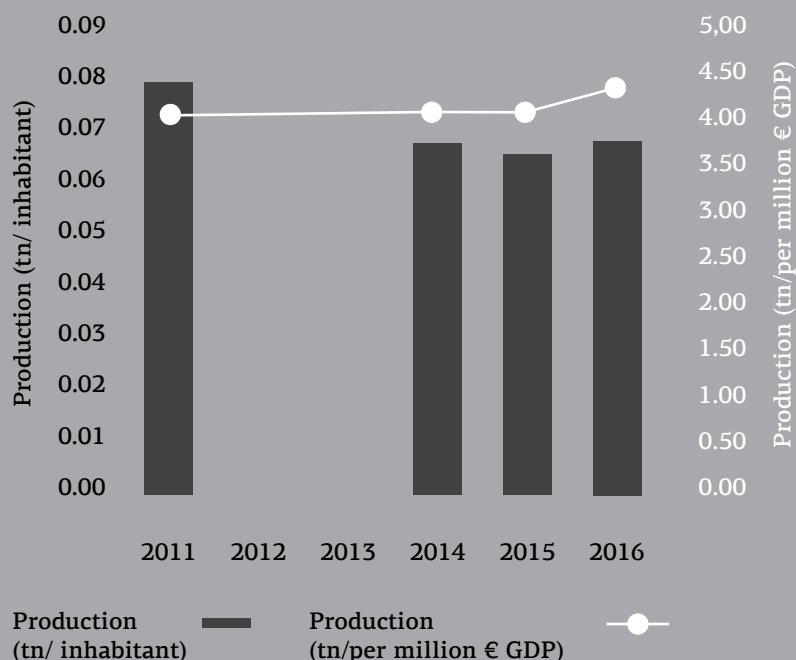
Table 6.10.
Quantitative data and indicators for packaging waste production

Material		2014	2015	2016
Glass	Production (tn)	98,000	88,800	90,500
	Production (tn/ inhabitant)	0.0091	0.0082	0.0084
	Production (tn/ million euro GDP)	0.54854	0.50365	0.51952
Plastic	Production (tn)	184,400	183,800	186,600
	Production (tn/ inhabitant)	0.0170	0.0170	0.0173
	Production (tn/ million euro GDP)	1.03215	1.04247	1.07119
Paper & Paperboard	Production (tn)	330,700	326,100	334,300
	Production (tn/ inhabitant)	0.0306	0.0301	0.0309
	Production (tn/ million euro GDP)	1.851043	1.849562	1.919070
Metals	Production (tn)	88,800	87,800	84,600
	Production (tn/ inhabitant)	0.0082	0.0081	0.0078
	Production (tn/ million euro GDP)	0.497045	0.497981	0.485651
Wood	Production (tn)	45,600	50,200	50,800
	Production (tn/ inhabitant)	0.0042	0.0046	0.0047
	Production (tn/ million euro GDP)	0.255239	0.284723	0.291621
Other	Production (tn)	5,400	5,300	5,500
	Production (tn/ inhabitant)	0.0005	0.0005	0.0005
	Production (tn/ million euro GDP)	0.030226	0.030060	0.031573
TOTAL	Production (tn)	747,900	742,000	752,300
	Production (tn/ inhabitant)	0.0691	0.0686	0.0696
	Production (tn/ million euro GDP)	4.18626	4.20845	4.31862

Graph 6.1.
Packaging waste production.
According to the National Waste Management Plan, the production of packaging waste for the year 2011 amounted to 866,000 tn



Graph 6.2.
Indicators for packaging waste production



As indicated by the analysis of the quantitative data presented above, although the production of packaging waste is decreasing compared to 2011, the indicator of production/per million euro GDP has remained almost unchanged over the years, a fact that demonstrates the correlation between the packaging waste production and the country's economic figures.

Table 6.11.
Performance – Target achievement for
packaging and packaging waste

		Current Targets	Performance 2016	EU Performance 2016
Recovery (recycling, other material recovery, energy recovery)		60%	67.2%	79%
Recycling		55%	66.1%	65.8%
Minimum recycling target per material	wood	15%	21.9%	---
	paper	60%	98.5%	---
	plastic	22,5%	38.2%	---
	aluminum	50%	61.7%	---
	metal	50%	61.7%	---
	glass	50%	36.9% *	---

* The failure to achieve the set EU target is noted with orange color

5. Waste Electrical And Electronic Equipment

The recycling of Waste Electrical and Electronic Equipment (WEEE) is of particular importance both for the recovery of the materials from which the appliances are composed of and for the management of hazardous materials that may be present in many of them. Since 2016, the minimum collection rate to be achieved on an annual basis has been set at 45%, and calculated on the basis of the total weight of WEEE collected in a given year. It is expressed as a percentage of the average annual weight of electrical and electronic equipment (EEE) placed on the market over the previous three years.

For waste electrical and electronic equipment, the indicators that are important to be mentioned are:

- the quantities of EEE placed on the market (PoM)
- the collected quantities of WEEE
- the managed quantities of WEEE.

The total quantities of EEE placed on the market according to the data of the 2 Collective Alternative Management Schemes operating are 123,552.87 tn, which correspond to 63,932,069 invoiced pieces of all categories of EEE.

The total quantity of WEEE collected for the year 2016 by the 2 Alternative Management Schemes corresponds, at a rate of 47%, to the average annual weight of EEE placed on the market during the years 2013, 2014, 2015, leading to the result that the national target (45%) has been achieved in the year 2016.

Table 6.12.
Quantitative data and indicators for EEE placed on the market

	Invoiced Quantities (tn)	Invoiced Pieces
PoM	123,552.87	63,932.069
PoM/ inhabitant	0.0114	5.9107
PoM/ million euro GDP	0.71	367



Table 6.13.

Performance – Target achievement for Waste Electrical and Electronic Equipment

Target completion period 15/8/2015 - 14/8/2018

Category	Targets of preparation targets for recycling and reuse	Targets for recovery	Performance 2016*	EU Performance 2015 (Recovery)
1/ Large household appliances	80%	85%	91.6%	89.1%
2/ Small household appliances	55%	75%	89.2%	87.8%
3/ IT and telecommunications equipment	70%	80%	96.50%	86.5%
4/ Consumer goods	70%	80%	94.30%	90.9%
5/ Lighting equipment	55%	75%	80.10%	88.0%
5a/ Gas discharge lamps	80%	---	93.10%	90.5%
6/ Electrical and electronic tools	55%	75%	98.90%	85.8%
7/ Toys, leisure and sports equipment	55%	75%	73.30*	92.3%
8/ Medical devices	55%	75%	100%	88.4%
9/ Monitoring and control instrument	55%	75%	89.80%	89.6%
10/ Automatic dispensers	80%	85%	100%	86.9%

* It is noted that recovery coincides with recycling and reuse

* The failure to achieve the set EU target is noted with orange color

6. Waste Batteries And Accumulators

Under Greek law, batteries and accumulators are subjected to alternative management and therefore all companies that produce or import batteries and accumulators on the Greek market are obliged to organize a scheme for the alternative management of waste batteries and accumulators. From this obligation the producers who place on the market exclusively batteries or accumulators incorporated into electrical and electronic devices or vehicles are exempt, only if they participate in the respective WEEE or End-Of Life Vehicles Schemes, covering the associated costs of managing such batteries and accumulators.

The produced amounts of waste batteries and accumulators according to the National Waste Management Plan in 2011 were:

→ **1,100 tn**
of waste portable batteries and accumulators
→ **47,000 tn**
of waste vehicle and industrial accumulators

Moreover, the quantitative production data for the years 2011, 2014-2016 are presented in the following table.

Table 6.14.
Quantitative data and indicators for waste batteries and accumulators

	2011	2014	2015	2016
Portable batteries and accumulators	1,100	608	567	632
Vehicle and industrial accumulators	47,000	25,526	33,319	36,498
Total batteries and accumulators	48,100	26,134	33,886	37,130
Production of B. & A. (tn/ inhabitant)	0.0044	0.0024	0.0031	0.0034
Production of B. & A. (tn/ million euro GDP)	0.232	0.146	0.192	0.213

Table 6.15.
Performance – Target achievement for waste batteries and accumulators

	Current Targets	Performance 2016	EU Performance 2016
Portable batteries and accumulators	Collection rate of at least 45%	38.9%	41%
Vehicle and industrial batteries and accumulators	Collection of the total quantity of waste	76.43% (Lead-acid accumulators) 194.11% * (Nickel-cadmium, accumulators)	No EU-level data available

* The quantity collected is greater than the quantity of products placed on the market, possibly due to the small amount of collection during the previous years, and the long life of the Ni-Cd accumulators

* The failure to achieve the set EU target is noted with orange color

Recycling facilities should achieve the following minimum recycling efficiencies:

→ Recycling of the 65% by average weight of lead-acid batteries and accumulators, including the recycling of lead content to the highest possible degree technically feasible, without excessive costs. The average recycling efficiency of Pb-acid accumulator recycling plants for the year 2016 amounted to **76.2%**

→ Recycling of the 75% by average weight of nickel cadmium batteries and accumulators, including the recycling of cadmium content to the highest possible degree technically feasible without excessive costs and - recycling of the 50% by average weight of other waste batteries and accumulators. The Greek market does not currently have a recycling infrastructure for their recycling.

7. End-Of Life Vehicles

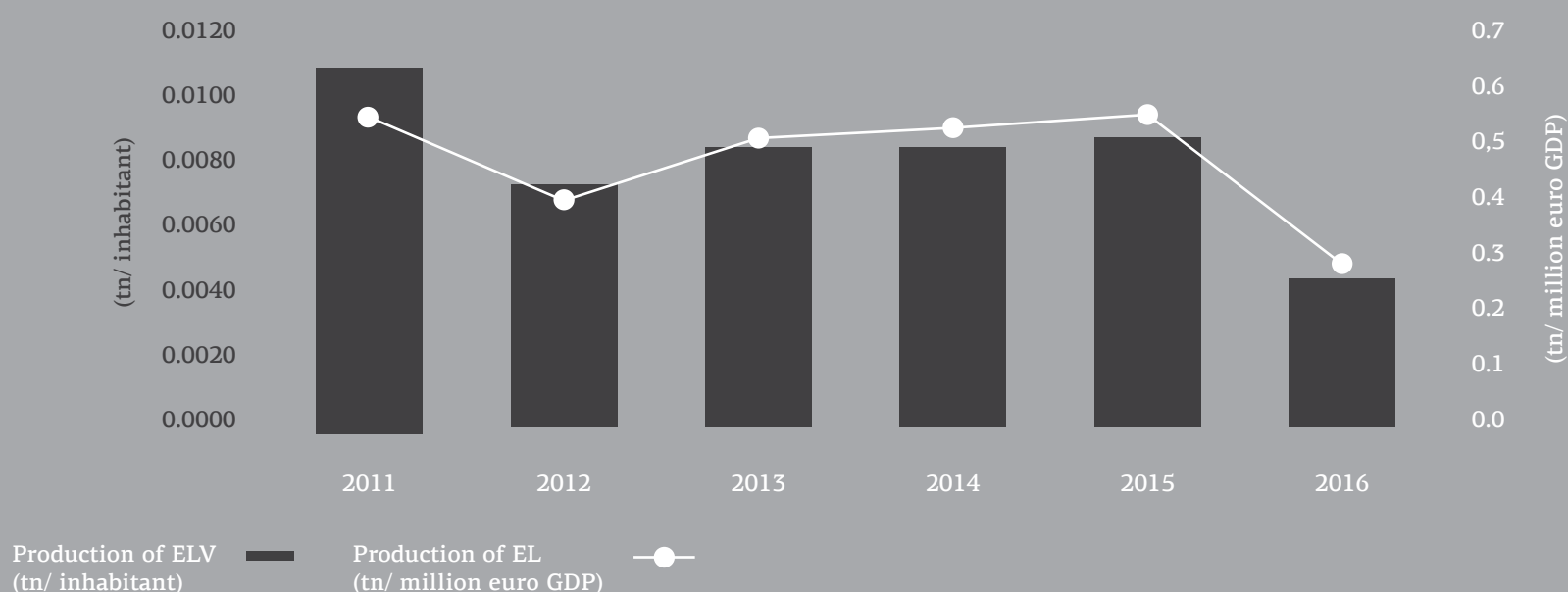
The management of end-of-life vehicles is regulated by Presidential Decree No 116/2004, which was issued in line with Directive 2000/53/ EC of the Council of the European Communities. Pursuant to Article 11 of Presidential Decree No 116/2004, from 1 January 2015 onwards the target for the recovery and

re-use of products resulting from the management of end-of-life vehicles is 95% by weight, and the re-use and recycling should be at least 85% by average weight per vehicle per year.

Table 6.16.
Quantitative data and indicators for end-of-life vehicles waste

	2011	2012	2013	2014	2015	2016
Production of ELV (tn)	117,189	81,495	89,844	90,406	93,645	46,572
Production of ELV (tn/ inhabitant)	0.0108	0.0075	0,0083	0.0084	0.0087	0.0043
Production of EL (tn/ million euro GDP)	0.56605	0.42622	0.49733	0.50603	0.53113	0.26735

Graph 6.3.
Indicators for the production of end-of-life vehicles waste



At this point, it should be noted that the significant variations observed for end-of-life vehicles waste compared to the other waste streams examined in this report are largely due to the subsidised withdrawal measure in force, during these years.

Table 6.17.
Performance – Target achievement
for end-of-life vehicles

	Current Targets	Performance 2016	EU Performance 2015*
Recovery and reuse of products resulting from the management of end-of-life vehicles	95%	107.37%	94.1%
Reuse and recycling	85%	94.68%	88.4%

* The rate includes quantities of products resulting from the management of end-of-life vehicles which were stored from previous years within the end-of-life vehicles plants

8. Waste Tyres

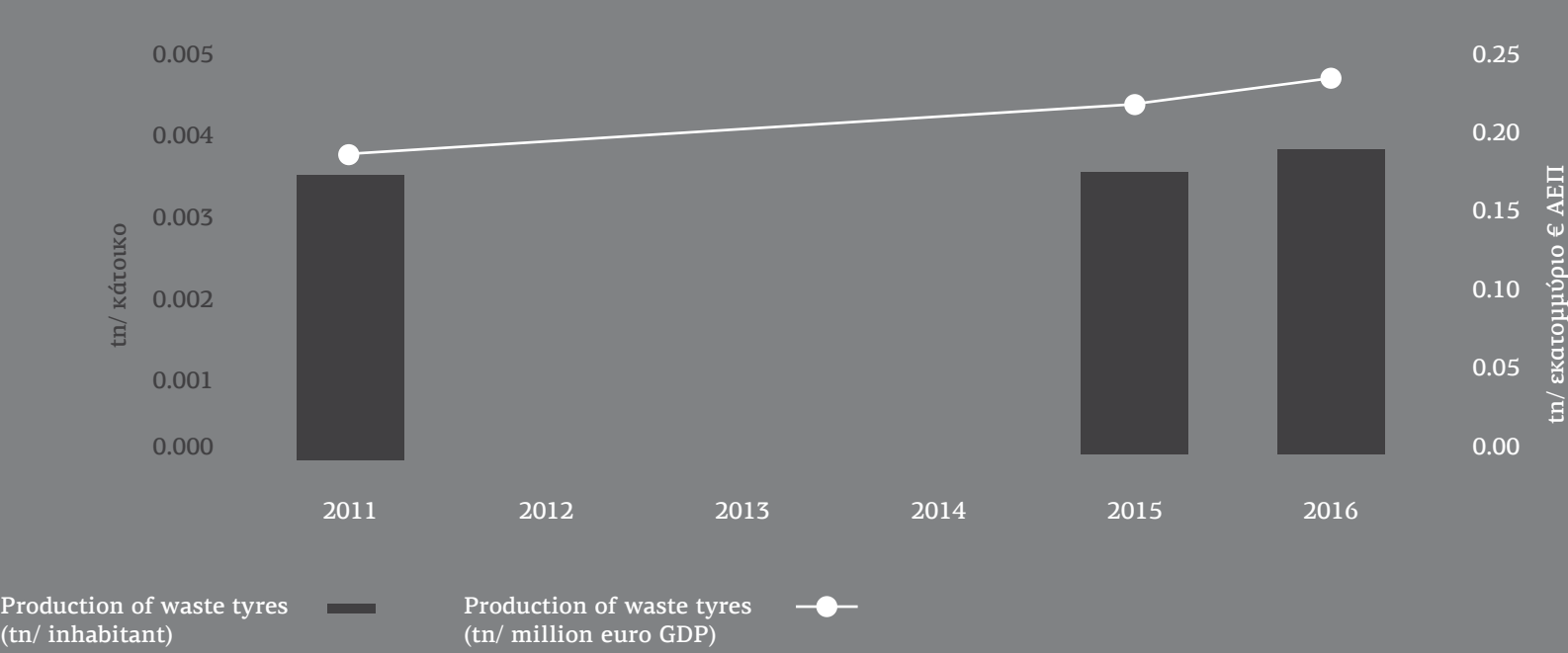
All vehicle tyres in Greece are imported. All tire importers as well as vehicle importers, who are obliged to participate in the Scheme under the Presidential Decree No 109/04, sign a cooperation contract with ECOELASTIKA for tyres fitted as spare parts on vehicles. The number of the liable tyre importers contracted

with ECOELASTIKA on 31.12.2016 amounted to 138 and the corresponding number of the vehicle importers amounted to 67. As far as waste tyres are concerned, the quantitative data and the indicators for their waste production are presented in the following Table and Graph.

Table 6.18.
Quantitative data and indicators for waste tyres

	2011	2015	2016
Production of waste tyres (tn)	38,000	37,440	40,999
Production of waste tyres (tn/ inhabitant)	0.00351	0.00346	0.00379
Production of waste tyres (tn/ million euro GDP)	0.184	0.212	0.235

Graph 6.4.
Indicators for the Production of waste tyres



There are no EU-set targets for used tyres, but only the targets set by national legislation.

Table 6.19.
Performance – Target achievement
for waste tyres

	Current Targets	Performance 2016	EU Performance 2013*
Recovery	65%	90%	98%
Recycling	10%	53%	46%

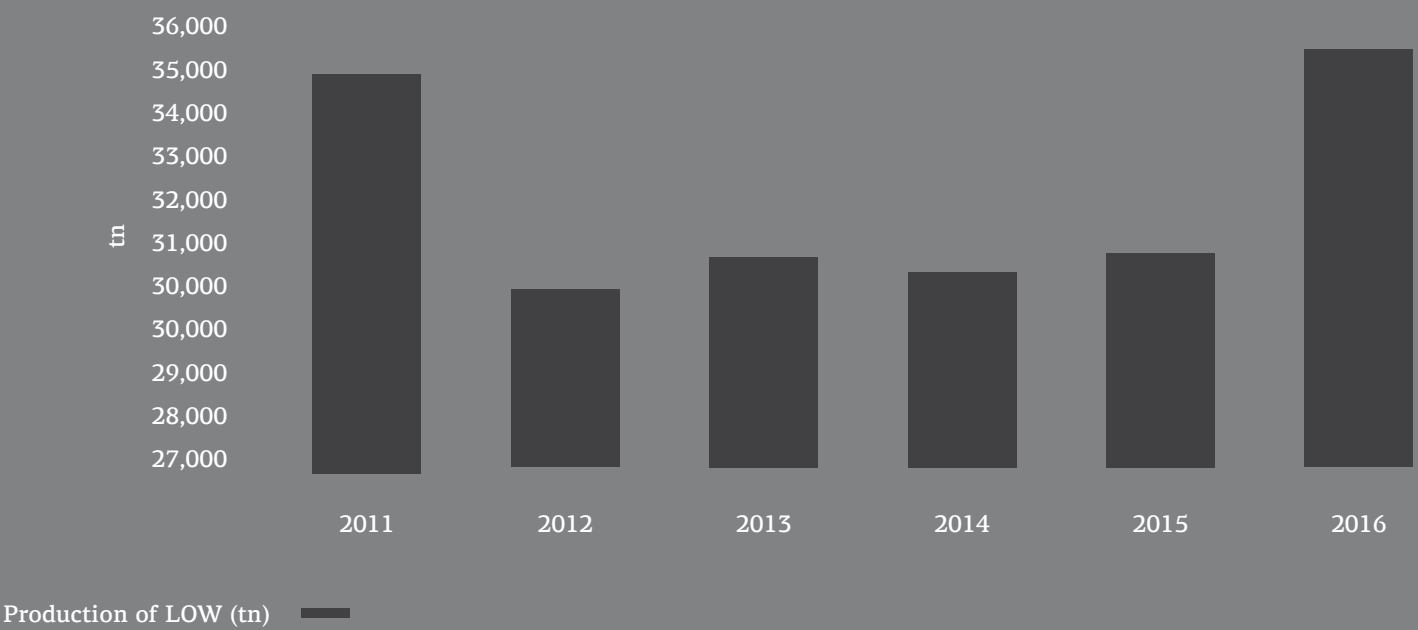
*The EU performance refers to 2013 data
(Source: European Tyre & Rubber Manufacturers' Association)

Waste oils include used engine and gearbox lubricants, hydraulic oils, cutting oils, insulating oils, and mixtures/emulsions with water or other organic solvents.

Table 6.20.
Quantitative data and indicators for lubricating oil waste

	2011	2012	2013	2014	2015	2016
Production of LOW (tn)	34,948	29,905	30,611	30,235	30,707	35,100
Production of LOW (tn/ inhabitant)	0.00323	0.00276	0.00283	0.00280	0.00284	0.00325
Production of LOW (tn/ million euro GDP)	0.169	0.156	0.169	0.169	0.174	0.201

Graph 6.5.
Quantities of lubricating oil waste generated



From the above data, it is noteworthy that while from 2011 to 2015 there was a significant decrease in lubricating oil waste generated, of the order of ~ 4.000 tn, in 2016 the quantities generated returned to the level of the year 2011.

Table 6.21.
Performance – Target achievement
for lubricating oil waste

	Current Targets	Performance 2016
Collection	70%	71.2%
Regeneration	80% of the quantities collected	99.7%

10. Excavation Construction And Demolition Waste

According to the National Waste Management Plan, in 2011 the estimated quantities of Excavation Construction and Demolition Waste were 1,307,000 tn. For the years 2014-2016, the quantities of ECDW traded by Collective Alternative Management Schemes from the Hellenic Recycling Agency data, as well as the indicators are presented below.

It is clear that the abovementioned quantities of ECDW are part of the quantities generated, which cannot be determined with certainty in their entirety.

Table 6.22.
Quantitative data and indicators for ECDW

	2011	2014	2015	2016
Production of ECDW (tn)	1,307,000	176,112	176,783	525,276
Production of ECDW (tn/ inhabitant)	0.1208	0.0163	0.0163	0.0486
Production of ECDW (tn/ million euro GDP)	6.313	0.986	1.003	3.015

11. Mining Waste

Mining waste must be managed:

- a/ without endangering human health,
- b/ without using processes or methods which could harm the environment, and in particular without risk to water, air, soil and fauna and flora,
- c/ without causing a nuisance through noise or odors and without adversely affecting the landscape or places of special interest.

For mining waste, the data presented below relates to the quantities processed outside their production facility on the basis of the data of the Annual Report of Waste Producers for 2014.

Table 6.23.
Quantitative data for mining waste management

	2014		
	Nonhazardous waste	Hazardous Waste	Total
Quantities of mining waste (tn) undergone Disposal Operations (D)	904,547.23	7,413.49	911,960.72
Quantities of mining waste (tn) undergone Recovery Operations (R)	8,928.00	200.04	9,128.04

12. Contaminated Soils

Two projects have been implemented concerning the investigation and assessment of contaminated sites:

1/ "Study for the investigation, evaluation and reclamation of uncontrolled contaminated sites/ facilities from industrial and hazardous waste in Greece", completed in 2009, with the contractor being the Department of Environmental Engineering of the Technical University of Crete.

2/ Following this, the project "Recording and initial risk assessment of contaminated sites from industrial and hazardous waste in the Region of Attica and in the following prefectures of Greece: Thessaloniki, Viotia, Euboea, Kozani, Achaia, Heraklion, Magnesia, Kavala and Halkidiki" which was implemented by the Contractor Consortium "ENVIROPLAN S.A. - EPEM S.A. - ENVECO S.A." and was completed in the year 2017.

In these projects a first assessment on contaminated sites, for operating facilities on one hand and on uncontrolled sites on the other, was carried out. The reading of the Technical Reports shows that further investigation is necessary for reasons such as the choice of pollutant parameters, the measurement of ecotoxicity only in uncontrolled sites, the selection of reference samples, the limited sampling. Consequently, the results of the project, with regard to the rating of the sites examined, are indicative.

It should be noted that since these projects were only a first assessment, further investigation is needed in order to finally conclude on the hazardousness of contaminated sites.

It should also be noted that the only officially contaminated sites in the country are the Illegal Disposal Areas which through the coordinated actions of the Ministry of Environment and Energy have been reduced from about 2,500 to 80. Their full reclamation is estimated to be completed, according to planning, by the end of 2019.

