

CHAPTER IV: Waste Management

Introduction

Waste management is a challenging issue from an environmental, political, legal and social point of view. Growth of large urban areas, tourist flow, rise of living standards and change of consuming patterns, have led to an increase of the produced volumes of municipal waste with a simultaneous change of its composition. At the same time, there is a growing concern on the site allocation for waste management installations. Furthermore, until recently, big quantities of useful materials (i.e. paper, glass, aluminium, plastic, metal and wood) have not been, in some cases, exploited to their full potential, through recovery and recycling. However, in recent years, significant progress has been accomplished in solid waste management, through increased allocation of funds, focusing largely on the promotion of recycling and the expansion of the number of managed sanitary landfill sites through out the country.

Greece, as an EU member state has incorporated into its national legislation and is implementing all related European Community waste management legislation. Thus, waste management is fully covered by a wide range of enactments for all waste types, hazardous and non-hazardous, e.g. municipal, industrial, hospital etc. Moreover, all means and options for waste management are also fully covered by corresponding technical specifications, from collection, transportation and transfer, to processing, utilisation, incineration and final disposal/landfilling. Within this context, a series of more detailed technical enactments regulate particular issues like waste management sites (hazardous, non-hazardous, municipal and inert); small sanitary landfills; the technical specifications of management projects; waste incineration; management of hospital and hazardous waste; as well as the processes for alternative management of specific waste streams like packaging material, used tyres, end-of-life vehicles (ELVs), used lubricants, batteries and accumulators, waste of electric and electronic equipment (WEEEs) etc.

Solid waste : state and impacts

i. Solid waste

Over recent years, total waste generation in Greece has presented an increasing trend. Mineral and solidified waste represented 72.8 % of total waste in 2006. Between 1990 and 2007, municipal waste generation increased by 62.6 %, from 3,075 kt to 5,002 kt. The main contributors in 2007 were putrescibles (39.7 %), paper (22 %) and plastic (10.5 %) (NCESD, 2010). In terms of landfills, many fully engineered sanitary landfills are in operation throughout the country; currently unmanaged sites have been or are being rehabilitated while the ones still in operation (155) are expected to be fully closed soon.

ii. Packaging Waste

Between 1997 and 2007, packaging waste generation increased by 47.7 %, from 710.8 kt to 1.050 kt. Glass, metals, paper and fibre board, and plastics accounted in 2007 for the majority of packaging waste generated (94 %). The EU target to recycle 25 % of packaging waste in 2001 has been met and exceeded (33 %). In 2007, the average recycling rate over Greece reached 48 %, with Paper and Fibre Board having the biggest shares (63.1 % in 2007) followed by glass, metals, plastic and wood.

iii. Batteries

Use of portable batteries and accumulators slightly decreased (9 %) between 2007 and 2008, while the amount of collected batteries increased by 12 %.

Table 1: Batteries and Accumulators

Portable batteries and accumulators (t)	2007	2008
Used	2100	1908
Collected	442	496
Industrial and automotive batteries and accumulators (t)		
Used	41 000	41 000
Collected lead and acid batteries	32 000	32 500

Source: National Centre of Environment and Sustainable Development (NCESD), 2010

iv. WEEE

Between 2007 and 2008, recycling of WEEE increased by 50 %. In 2007, the WEEE collected for recycling represented 71.4 % of the total annual amount of 44,000 tonnes, which is the national target under the EU directive. In 2008, the EU collection target was surpassed (44,300 t).

Table 2: WEEEs trends

WEEE (t)	2007	2008
Generation	170 000–175 000	190 000–200 000
Recycled	31.4	47.1

Source: National Centre of Environment and Sustainable Development (NCESD), 2010

v. Construction and Demolition waste

Rough estimations indicate a production of around 12-15 million tonnes annually, in 2010.

vii. ELV

In 2007, collected ELVs amounted to 66,000 with a recycled rate of around 84 % (i.e. 49,000), thus exceeding the EU target of 80 %.

viii. Hazardous Waste

Hazardous waste slightly decreased since 2004 (by 0.5 %), whereas recycling of hazardous waste increased by 6.3 % and incineration by 80 %.

In more detail, around 330,000 tonnes of hazardous waste are being generated annually in Greece, principally by industry, healthcare facilities and transport activities. Overall, 42% of total hazardous waste production is oil and liquid fuel waste (which is almost all recovered); 14.5% is end-of-life and out-of-specification products and 13.4% is waste from thermal processes, especially steel and aluminium. Hazardous waste are mainly produced in Attica (48.5%), Central Macedonia (12.6%), Sterea Ellada (10.2%), Thessaly (6.9%) and Western Greece (5.2%). Of the total volume of hazardous waste produced, 4,442 tonnes were exported in 2006, compared to 3,262 tonnes in 2003 and 905 tonnes in 2001. The largest amounts of hazardous waste exported were biocides and phytopharmaceuticals, waste dyes, inks and paints, and PCBs (polychlorinated biphenyls). Greece imports only waste oils and lead batteries for recovery purposes. Greece has not imported hazardous waste for disposal.

Table 3: Hazardous waste production

Hazardous waste (t)	2004	2005	2006
Total	335,000.0	333,155.0	333,155.0
Recycling	111,820.0	109,270.0	118,870.0
Incineration	1,546.5	2,231.0	2,793.4
Energy recovery	5,005.6	7,255.6	7,346.0
Landfill	13,997.0	7,313.8	14,763.3
Other	202,630.9	207,084.4	189,382.2

Source: National Centre of Environment and Sustainable Development (NCESD), 2010

Key drivers, pressures and trends of solid waste generation

Between 1991 and 2001, the Greek population increased with an average annual population growth rate of 0.66 %. This rate is estimated to decline from 0.326 % in 2005 to 0.065 % in 2020, according to data from the Hellenic Statistical Authority (ELSTAT). The number of individuals per household is estimated to decrease, reflecting ageing of population and new living arrangements.

The majority of waste streams derive from Industry, Construction and Agriculture. The industrial sector represents 64.6 % of total waste generation in 2006. Due to variations in tourism demands over time (mainly summer) and space (many islands and coastal areas), population can increase locally two to ten times, affecting municipal waste generation. Municipal waste generation per capita has an annual increase rate of 1.1 % since 2003, whereas GDP increased over the period 2003-2007 with an annual rate of 4.3 %. Therefore, the generation of waste has shown a relative decoupling from the country's economic growth. Packaging waste generation in Greece presents a significant decoupling from GDP growing by 12.4 % between 2000 and 2007. At the same time, real GDP increased by 33.6 % and recycling of packaging waste increased by 62 %. Over the decade 1997-2007, per capita packaging waste generation increased by 9.6 % (from 65.3 kg per person to 92.7 kg per person), while per capita recycling showed an overall increase of 58 %.

Figure 1: Generation of waste by waste category (2004, 2006)

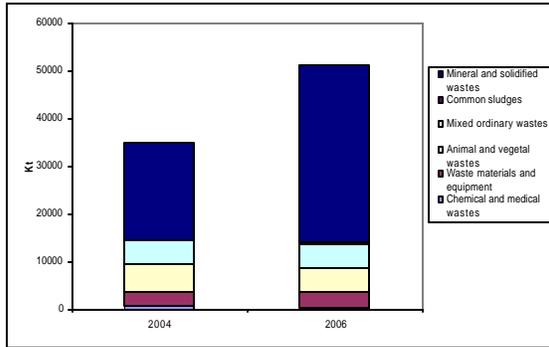


Figure 2: Generation of waste by waste category (2006)

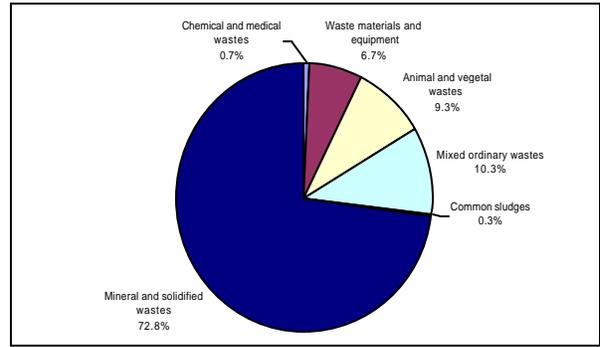


Figure 3: Estimated composition (%) of MW generated (1990-2007)

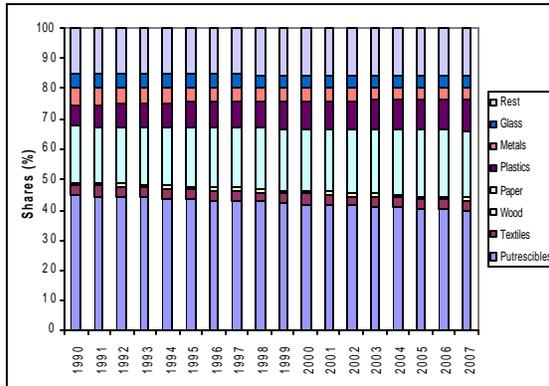
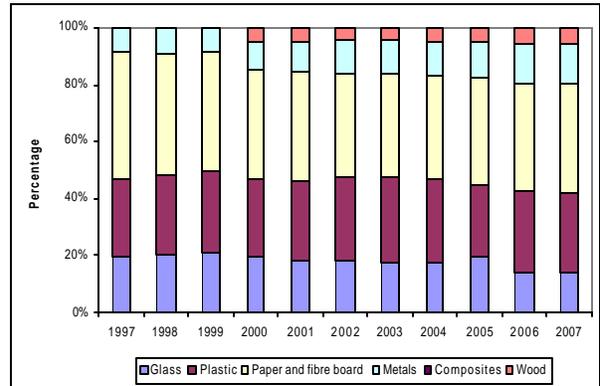


Figure 4: Generation of packaging waste by waste type (1997-2007)



Source: National Centre of Environment and Sustainable Development (NCESD), 2010

Figure 5: Recycling of packaging waste (1997-2007)

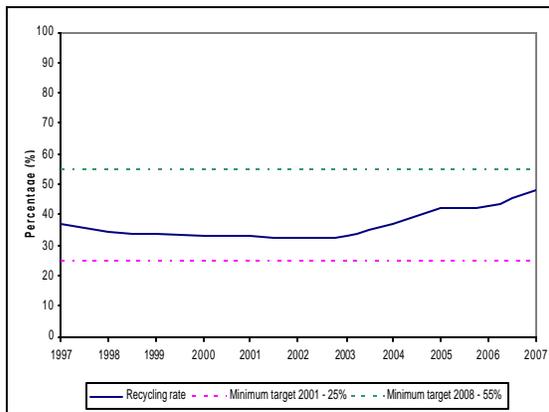
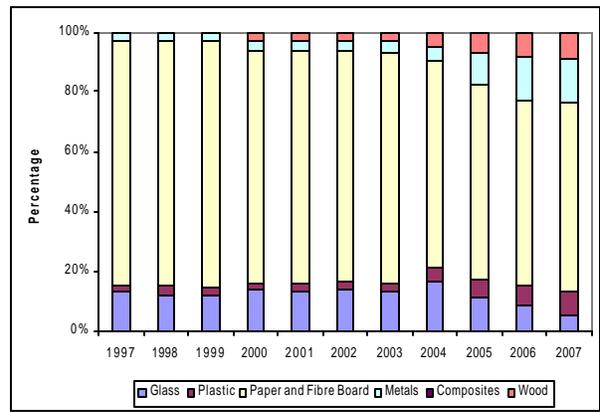


Figure 6: Recycling of packaging waste by waste type (1997-2007)



Source: National Centre of Environment and Sustainable Development (NCESD), 2010

Figure 7: Generation of waste by economic activity (Shares, 2006)

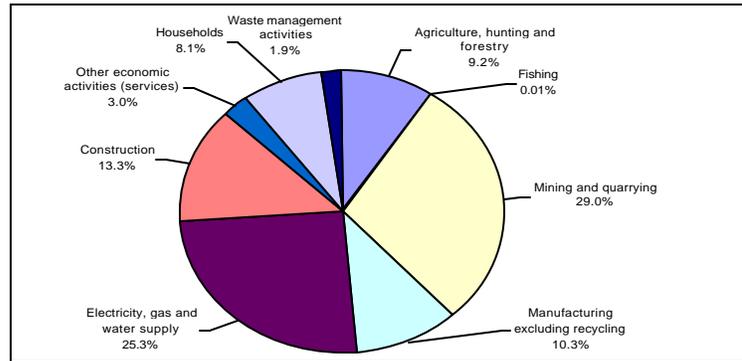


Figure 8: Municipal waste generation per capita in Greece (1990-2007)

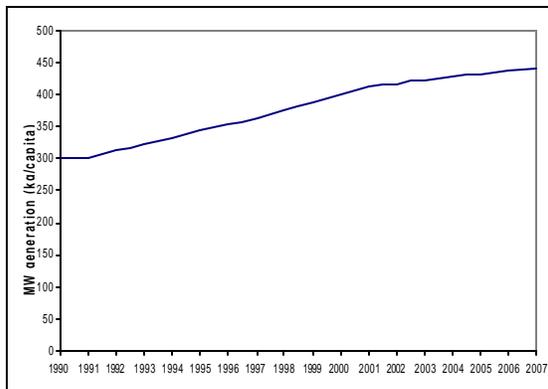
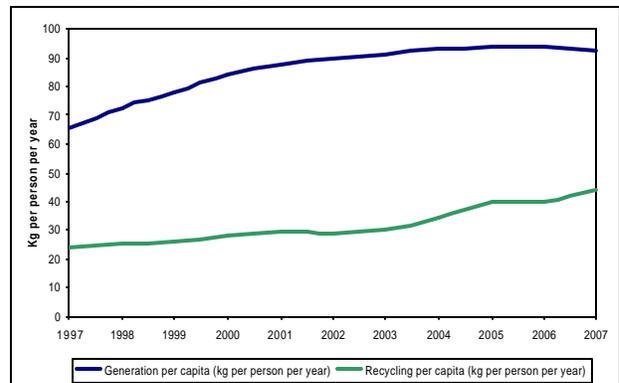


Figure 9: Per capita generation and recycling of packaging waste (1997-2007)



Source: National Centre of Environment and Sustainable Development (NCESD), 2010

Wastewater

Considerable progress has been achieved in Greece during the last decade in constructing more sewerage and treatment systems which are operated by the Public Company of Water Supply and Sewage of each municipality, thus satisfying the objectives of the EU Urban Waste Water Directive. 90% of the about 8 million inhabitants living in settlements greater than 2,000 population-equivalents were connected to a sewerage network at the end of 2008, and 91% had a wastewater treatment plant in their area. This latter figure translates to about 65% of the total population connected to public wastewater treatment plants (with secondary treatment), up from 45% in the late 1990s. The wastewater load generated by smaller settlements, where about 2.9 million people live, is collected by individual systems (e.g. septic tanks) and transferred to the nearest treatment plant.

Contribution of the waste sector in greenhouse gas emissions generation

In terms of contribution of the waste sector in greenhouse gas (GHG) emissions in Greece, in 2007, GHG emissions from waste (2.4 % of the total emissions, without Land Use, Land Use Change and Forests-LULUCF), decreased by 28.4 % since 1990. GHG emissions from solid waste disposal on land present an increasing trend. Solid waste disposal on land is the major source of GHG emissions from waste. GHG emission projections (for all source categories) are presented in Table 5. Methane emissions from solid waste disposal on land show an increase of 16 % in 2010 (2.09 Mt CO₂eq) as compared to 1990 levels (1.81 Mt CO₂eq) and a decrease of 15 % in 2020 (1.53 Mt CO₂eq) as compared to 1990 levels. The decreasing trend after 2010, is mainly due to the implementation of EU Directive 99/31 regarding the recovery of organic waste.

Table 4: GHG emissions from waste, per source and category

	2010	2015	2020
GHG emissions from waste, per source category (kt CO₂eq)			
Solid waste disposal on land	2,089	1,828	1,532
Domestic wastewater	621	619	612
Industrial wastewater	107	104	101
Human sewage	4,444	6,993	9,541
GHG emissions from waste, per source gas (kt CO₂eq)			
Carbon dioxide	4,444	6,993	9,541
Methane	2,435	2,163	1,854
Nitrous oxide	381	388	392
Total	2,821	2,557	2,255

Source: National Centre of Environment and Sustainable Development (NCESD), 2010

Decision-Making, Legal and Regulatory Framework, Policy Instruments

Main objectives of the Greek waste management policy include full coverage of all urban and rural areas with modern installations for final waste disposal; promotion of measures for prevention and reduction of volumes of produced waste; exploitation of materials with maximisation of recycling and recovery of products and energy, as well as elimination of the remaining unmanaged solid waste disposal sites.

The existing legislation fully covers all aspects of waste management in Greece while setting obligations for the producers and owners of waste, for institutional bodies like Municipalities and Management Bodies of Solid Waste within each Administrative Unit, for the supervisors of management sites and, overall, of all the involved parties in waste management.

Waste management policies in Greece are aligned with EU objectives, obligations and standards and governed by 2 general overarching National Plans for Waste Management aiming at their integrated and sound management:

- The "National Plan for the Management of Non-Hazardous Waste" that has been enacted in 2003 with Joint Ministerial Decision (JMD) 50910/2727/2003; and
- The "National Plan for the Management of Hazardous Waste" that has been enacted in 2007 with JMD 8668/2007.

These two National Plans cover policies, objectives, targets, actions and priorities for their implementation, aiming to ensure environmental protection and safeguard public health. The "National Plan for the Management of Hazardous Waste" is being implemented through the producers and owners of waste whereas the "National Plan for the Management of Non-Hazardous Waste" is specifically adapted to the requirements of each one of the 13 administrative Regions of the country, through their respective "Regional Plans for Solid Waste Management".

The "National Organization for the Alternative Management of Packaging and Other Waste", provisioned in OJG 179/A/2001, became operational fairly recently, while its duties, until then, had been carried out by a Department within the former Ministry of Environment, Physical Planning and Public Works (previous title of YPEKA).

The operation of the Hellenic Environmental Inspectorate (EYEP), under YPEKA, established by Law 2947/2001, contributes considerably to the enforcement of environmental legislation in Greece, with particular focus on sound waste management. EYEP's main responsibilities include: control and monitoring of implementation of environmental terms and conditions laid down for projects and activities in the public and private sectors, and recommendation of penalties in case of non-compliance; collection and evaluation of environmental enforcement data; as well as national representation at European and international levels on environmental compliance. Through on-site visits and examinations of all relevant factors and effluents, violations of environmental legislation can be detected; in case the violation persists, an official certification of environmental law violation can be issued, proposing an administrative sanction, usually a fine. Between 2004 and 2008, EYEP performed about 970 inspections and proposed fines for nearly EUR 20 million for private and public sector activities.

Non-Hazardous waste

Prevention, minimisation and environmentally sound management of solid non-hazardous waste and sewage, in the context of integrated planning and sustainable management of land resources, is the key

goal of the “National Plan for the Management of Non-Hazardous Waste” of Greece. In more detail, the National Plan has the following policy objectives:

- The design of integrated waste management policy that has the following prioritised aims: prevention and reduction of waste generated (quantitative reduction) as well as reduction of their load in toxic substances (qualitative enhancement); increase of the utilisation of materials deriving from waste by increasing energy and material recovery and recycling; reduction of the biodegradable fraction of municipal solid waste disposed at sanitary landfill sites; final disposal of waste residues and waste that cannot be managed in any other way that is environmentally friendly and sound.
- The elimination of the remaining unmanaged solid waste disposal sites and thus the negative impacts from their operation, through their termination and full remediation so that these sites, once rehabilitated, can be fully integrated into their surrounding environment.
- The increase of use and recycling of solid waste by setting incentives and counter-incentives aiming at prevention of waste generation and promotion of products that are easy to dismantle, reuse and recover.

Hazardous waste

Based on EU policy, Greek policies aim to promote the use of waste as secondary raw materials and to reduce the amount of hazardous waste generated, by providing subsidies and other incentives based on the “polluter pays” principle, giving particular emphasis on the producer’s responsibility. The focus has been on promoting the application by industry of advanced technologies for recycling and recovery as well as introducing cleaner technologies in the production process.

In more detail, the key policy objectives of the “National Plan for the Management of Hazardous Waste” in Greece include:

- The prevention of waste generation and the reduction of produced volumes as well as the hazardous load of waste produced. This is achieved through the promotion of clean technologies for a more efficient use of natural resources; the production and distribution in the market of products that, at their end of life, do not contribute or contribute very little to the generation of waste and pollution of the environment by hazardous substances; and the development of adequate techniques for the final disposal of hazardous substances contained in waste that can be reused.
- The exploitation of waste by increasing recycling, reuse and recovery rates or by promoting any other process that aims at generating secondary materials coupled with “sorting at source” or by using waste as an energy generation source.
- The full remediation and rehabilitation of sites polluted by hazardous waste.

Alternative Management of packaging and other products

In the framework established by EU legislation concerning some specific waste streams, in August 2001, Law 2939/2001 regarding “Packaging and Alternative Management of Packaging and Other Products- Foundation of National Organization for the Alternative Management of Packaging and Other Waste” was enacted and published in the Official Journal of the Government (OJG) (OJG 179 / A / 2001).

Law 2939/2001 apart from the implementation of the EU Packaging and Packaging Waste Directive 94/62, also sets the guidelines and the general framework of alternative management of waste for a series of other products such as ELVs, used car tyres, used oils, batteries, accumulators, WEEEs and waste from demolition and construction. For these waste streams respective Presidential Decrees (PD) have been already published, with the exception of demolition and construction waste which is covered by a JMD, in order to define the necessary procedures for their management.

Law 2939/2001 was recently amended by Law 3854/2010 (OJG 94 / ? / 23.06.2010).

More specifically:

- *Tyres*: PD 109/2004 (OJG 75 / A / 5.03.2004);
- *Oils and waste oils*: PD 82/2004 (OJG 64/ A / 2.03.2004);
- *End of Life Vehicles (ELVs)*: PD 116/2004 (OJG 81 / A / 5.03.2004) incorporating EU Directive 2000/53 in national legislation.
- *Batteries and accumulators*: PD 115/2004 (OJG 80 / A / 05.03.2004) and JMD 41624/2057/?103/28.9.2010 (OJG 1625 / ? / 11.10.2010) incorporating EU Directives 2006/66 & 2008/103
- *Waste of Electrical and Electronic Equipment (WEEE)*: PD 117/2004 (OJG 82 / A / 5.03.2004) incorporating EU Directives 2002/96/EC and 2002/95/EC in the national legislation.
- *Demolition and construction waste*: JMD 36259/1757/?103/23.8.2010 (OJG 1312 / B / 24.8.2010).

The general principles followed, according to this national legislative framework, are:

- Prevention of waste generation and reducing of the harmful effects of wastes on public health and the environment;
- Reuse;
- Priority to recycling;
- Energy recovery without polluting ;
- "Extended producer responsibility " principle ;
- Shared responsibility of everyone who is involved to the management of products, i.e. suppliers of raw and secondary material, producers, importers, distributors, retailers, local authorities/municipalities, public authorities, consumers, recyclers (the whole recycling/recovery network);
- Publicity and free access to information;
- The "polluter pays" principle;
- Principle of entering no discrimination on products (imported or domestic).

In this framework, systems of alternative waste management are created by the economic operators. It is mandatory for the economic operators to organise and participate in collective (or individual) systems of alternative waste management, i.e. return, collection, transportation and recovery systems. Based on the principles of "polluter pays" and of "extended producer responsibility", producers of hazardous waste pay a fee to a system that is proportional to the annual quantities of the relevant product put on the market, the environmental impacts of each material and the cost-benefit analysis of the followed recovery/recycling process. The systems organise the whole process of collection, transport, storage, treatment etc by cooperating with accordingly authorised facilities and are responsible to contribute in achieving the national quantitative collection, recycling and recovery targets. The systems also establish public information/awareness campaigns and assist the adjustment of consumer's attitude and behaviour towards alternative waste management.

The systems are open to the participation of all interested parties and are designed to avoid discrimination against imported products, not to create barriers to trade or distortions of competition and to guarantee the maximum possible return of packaging materials and other products. They also ensure that packaging materials and other products are recycled (material) or recovered (energy) in an environmentally sound manner.

At the same time, Law 2939/2001 as amended by Law 3854/2010 provides the necessary administrative scheme to guide and supervise the alternative management of waste. The main administrative tool is the National Organisation for the Alternative Management of Packaging and Other Waste (NOAMPOW) that is operating under YPEKA.

The following table presents an overview of the related legal and regulatory framework in Greece, covering all waste types.

Table 5: National legislation on waste and recycling

National regulation	Reference	Targets
1. Landfill	MD 29407/3508 16.12.2002 (OJG 1572 / B/2002) (incorporation of EU Directive 99/31)	The targets set for reduction of biodegradable waste which is disposed at landfills are 75%, 50% and 35% for the years 2010, 2013 and 2020, respectively, compared to their production in 1995.
2. Incineration	JMD 22912/1117 (OJG 759 / B / 06.06.05) (incorporation of EU Directive 2000/76)	
3. Packaging	Law 2939/2001 (OJG 179 / A / 6.8.2001) amended by Law 3854/2010 (OJG 94 / ? / 23.06.2010) JMD 9268/469/2007 (OJG 286 / B / 2.3.2007) (incorporation of EU Directive 2004/12)	Until 31 December 2011, between 55% and 80% by weight of packaging to be recycled; Until 31 December 2011, 60% as a minimum by weight of packaging waste shall be recovered or incinerated at waste incineration plants with energy recovery;

National regulation	Reference	Targets
4. ELVs	Ministerial Decision (MD) 74362/5340/05/2007 (OJG 544 / B / 18.4.2007) (incorporation of EU Directive 2005/64) PD 116/2004 (OJG 81 / A / 5.3.2004) (incorporation of EU Directive 2000/53)	Ensure that a minimum of 85% of vehicles are reused or recovered and at least 80% must be reused or recycled; Increasing to 95% reused or recovered and 85% reused or recycled by 2015.
5. Tyres	PD 109/2004 (OJG 75 / A / 5.3.2004)	Until 31 July 2006 65% re-use rate and 10% recycle rate of collected tyres
6. WEEEs	PD 117/2004 (OJG 82 / A / 5.3.2004) (incorporation of EU Directives 2002/95 & 2002/96) PD 15/2006 (OJG 12 / A / 3.6.2006) (incorporation of EU Directive 2003/108)	Annual collection target: 65% of the average weight of Electrical and Electronic Equipment (EEE), placed on the market of the Member State in the three preceding years. 2016 is the first year of application. Regarding recovery targets, by 31 December 2011: - for cooling equipment and large equipment: 85% recovery and 80% preparation for reuse and recycling; - for screens and monitors: 80% recovery and 70% preparation for reuse and recycling; - for lighting equipment and small equipment: 75% recovery and 55% preparation for reuse and recycling; - for gas discharge lamps, 85% shall be prepared for re-use and recycled.
7. Batteries	JMD 41624/2057/?103/28.9.2010 (OJD 1625 / ? / 11.10.2010) (incorporation of EU Directives 2006/66 & 2008/103)	25% collection rate for waste portable batteries to be met by September 2012, rising to 45% by September 2016. The setting of recycling efficiencies to ensure that not later than 26 September 2011 a proportion of weight batteries is recycled: - 65% of lead acid batteries - 75% of nickel-cadmium batteries - 50% of other waste batteries
8. Construction /demolition	JMD 50910/2727 (OJG 1909 / B / 22.12.03) (incorporation of EU Directive 91/156) JMD 36259/1757/E103/23.8.2010 (OJG 1312 / B / 24.8.2010)	Re-use, recycling and other material recovery shall be increased to a minimum of: - 30% by weight, by 2012 - 50% by weight by 2015 - 70% by weight by 2020
9. Hazardous Waste	JMD 8668/28.2.2007 (OJG 287 / B / 2.3.2007) (incorporation of EU Directive 91/156) JMD 13588/725/2006 (OJG 383 / B / 28.3.06) (incorporation of EU Directive 91/689)	

Source: National Centre of Environment and Sustainable Development (NCESD), 2010

Strategies, Plans, Programmes and Projects, Best practices

Following the reviewed first "National Plan for the Management of Non-Hazardous Waste", the measures, terms and restrictions on solid waste management were issued in 2003 (JMD 50910/2727/2003) aiming to achieve conformity with the EU Waste Framework Directive. Its main features included: the establishment of a national network for waste disposal, the closure of unmanaged landfills and the competence of the Regions for local planning. The "National Plan for the Management of Hazardous Waste" was approved in 2007 via JMD 8668/2007 (OJG 287 / B / 2.03.2007).

In order to improve enforcement of waste legislation, reinforcement of action by authorities against polluters and to implement the objectives of the two overarching National Plans for the Management of Non-Hazardous and Hazardous Waste, the following actions are envisaged and applied:

- Creation of integrated management systems for municipal solid waste;
- Construction of waste treatment/processing and recycling projects;

- Construction of the required managed sanitary landfills and of the sanitary sites for waste residue disposal, so that the whole of the country is fully covered by environmentally sound infrastructure for final disposal of waste;
- Setting up of robust and reliable bodies for the construction and operation of waste management projects.

Non-Hazardous waste

At national level, reduction of the biodegradable fraction of municipal waste disposed in landfills is mainly achieved by the adoption of the following programmes:

- Recycling of packaging wastes via the programmes of "sorting at source", which is facilitated by a network of mechanical separation and recycling units for packaging waste developed the last years and
- Recovering of domestic waste at the two units of mechanical recycling and composting.

Each Region is responsible for its own planning and target setting through their respective "Regional Plans for Solid Waste Management" for non-hazardous waste; thus a key objective for each Region is the promotion of integrated management plans and the clustering of similar projects within its jurisdiction. Responsibility for the implementation of the Regional Plans falls under each Region and the respective Management Bodies of Solid Waste of each Administrative Unit. All 13 Regions have in place fully approved Regional Plans that are being implemented at a very fast pace.

The first managed sanitary landfill sites for non-hazardous waste were constructed and started operating in Greece in the beginning of the 90s. Since then and until 2010, 72 managed sanitary landfill sites for solid municipal waste have already been constructed and are in operation, while the construction of another 16 is currently being finalised. The operation of these managed sanitary sites is coupled with installations for capturing and using the emitted biogas produced from waste degradation. Three units of energy production from biogas are currently operating in Greece (in West Attica, in Volos and in Tagarades), with a total production of 26,052.94 TerraJoule in 2008.

So far, there are no plants for non-hazardous solid waste incineration in Greece.

Hazardous waste

The units responsible for management of hazardous waste should apply best available techniques and operate in an environmentally sound manner. Thus their license of operation follows their environmental permitting which is granted to them as an Approval of Environmental Terms for their proper operation.

YPEKA keeps a registry for all hazardous waste collected, transported, treated, utilised and disposed in Greece, each year. Data is collected by annual reports that all hazardous waste producers are obliged to submit, as well as from companies that are managing hazardous waste in Greece. Data kept covers volumes of waste per category, method of treatment, method of disposal etc. Aiming at mapping polluted sites in Greece that require immediate rehabilitation and in order to best plan remedial measures in hot-spots, a special study is currently being commissioned by YPEKA.

Taking into account the "polluter pays" and the "extended producer responsibility" principles, small and medium size enterprises usually chose to give the hazardous waste produced by their production processes to officially licensed companies for their further treatment and/or disposal.

In particular, the "National Plan for the Management of Hazardous Waste" estimates that, of the 330,000 tonnes of hazardous waste produced each year, 62% is sent for disposal and the rest designated for recovery. An estimated additional 600,000 tonnes of hazardous waste are kept in storage by their producers. The recovery, environmental evaluation and rehabilitation of these storage sites are expected to be completed by the end of 2011.

In order to prevent illegal transportations of hazardous waste through Greece, Greece is fully implementing the UN Basel Convention (see more under Section on Cooperation) and EU Regulation 1013/2006, coupled with consistent controls by the Body of Environmental Inspectors and customs offices.

Alternative management of packaging and other products

In response to the respective abovementioned legislative framework, today there are eleven certified collective systems and one individual system for the alternative management of waste:

- For the alternative management of packaging wastes, in response to Law 2939/2001 amended by Law 3854/2010, there are three certified collective systems: HERRCO (www.herrco.gr) and REWARDING RECYCLING S.A. (www.antapodotiki.gr) that cover a wide spectrum of packaging materials as well as KEPED (www.eltepe.gr) only for the packaging of lubricants.
- There is one individual system that covers the packaging waste of a well-known chain of super-markets (www.ab.gr).
- There is one certified collective system for the alternative management of batteries, AFIS (www.afis.gr) and two certified collective systems for the alternative management of accumulators. These are SYDESYS S.A (www.sydesys.gr) and SEDIS-K, with the later operating in Crete.
- There is one certified collective system for the alternative management of used oils which, ELTEPE SA (www.eltepe.gr).
- The certified collective system for the alternative management of used car tyres is ECO-ELASTICA (www.ecoelastica.gr).
- The certified collective system for the alternative management of ELVs is AMVH (www.edoe.gr).
- There are two certified collective systems for the alternative management of WEEEs: RECYCLING OF APPLIANCES S.A (www.electrocycle.gr) responsible for all categories of WEEEs and FOTOKIKLOSI S.A. (www.fotokiklosi.gr) that is responsible for category 5, i.e. lighting equipment.

Specific examples of sustainable projects

The first environmental project to be constructed and operated in Greece through a Public Private Partnership (PPP), aiming at setting up an integrated scheme for the management of waste in the Region of Western Macedonia has been procured through the cooperation of YPEKA, Ministry of Regional Development and Ministry of Interior. The project, with a budget of EUR 116,4 million, aims at constructing a Waste Treatment Unit of 120,000 tonnes capacity that will include:

- an installation for automated mechanical sorting and recycling,
- an installation of biological treatment for the sanitary landfill of waste residues,
- maintenance and operation of the above installations,
- maintenance and operation of the feed-in networks to the Waste Treatment Unit that encompasses 9 already existing waste transfer points and one new that will be constructed through the project,
- energy recovery/generation.

The project will be a "turn-key" one, with the contractor undertaking funding, design, construction, maintenance and operation of the overall system for 27 years, with construction of foreseen installations financed by private funds and with guaranteed optimal operation level through-out its overall life span.

The project, apart from providing an environmentally sound waste management solution, also provides for the generation of energy from the utilisation of municipal solid waste, which is an option of critical importance for Greece. In practice, the project will contribute to reducing volumes of landfilled waste, reducing environmental impacts through adequate treatment of the biodegradable waste fraction and utilising waste as a source of material and energy production that can result in economic benefits and sustainable development.

This first PPP in a non-building sector in Greece, will constitute a positive model for the promotion of more environmentally integrated waste management projects, on a regional level, throughout the country, by leveraging public funds, creating added value, safeguarding citizens' health and protecting the environment.

Another integrated practice that could be referenced is the management of sludge in Athens. Sewage sludge produced daily at the Athens Metropolitan Area wastewater treatment plant (on the island of Psyttalia, off Piraeus) is turned into almost dry matter in a state-of-the-art drying facility completed in September 2007. A nearby cement factory uses the resulting product, which has a calorific value similar to lignite, as a fuel for its cement kilns, since the use of sludge for fertiliser and soil improvement in agriculture in Greece is limited due to the prevalence of shallow or rocky soils and the often steep terrain.

Education, Information and Awareness Raising

Greece has developed a National Plan for the implementation of the UNESCO and UNECE Strategy for Education for Sustainable Development (ESD), within the framework of the United Nations Decade of Education for Sustainable Development 2005-14. A National Committee for ESD, involving all relevant Ministries and environmental NGOs, was established to coordinate ESD initiatives and to prepare a Law on ESD and its approval. The Department of Health and Environmental Education within the Ministry of

Education, Lifelong Learning and Religious Affairs (YPEPTH) (www.ypepth.gr/) is responsible for environmental education and awareness in primary and secondary education and for the supervision of the Coordinators of Environmental Education from each school district

YPEPTH has promoted several ESD initiatives at school level, as well as specific training programmes for more than 20,000 educators. Since 2004, 40,000 programmes of environmental education have taken place in primary and secondary schools, including waste reduction, integrated management and recycling. Schools also participate in 31 national thematic networks on sustainable development, with a strong focus on sustainable waste management. About 12,000 environmental and health awareness initiatives have been promoted in schools each year, including contests on environmental themes, some of which have been on “creative recycling” of waste.

A successful recent example of environmental awareness activities in schools has been the contest for students of the three last grades of primary school and all grades of secondary school that was organised by YPEKA and YPEPTH to celebrate World Environment Day 2010. The contest entailed the creation of art pieces (sculptures, canvases etc) with zero cost, by the students, using waste as their material. The contest entitled “Recycling with art”, was based on the message “do not waste, do not throw away, save and reuse” in order to raise awareness and inspire school students. The best 50 projects were exhibited at the Benaki Museum, while the first 10 received an award by the President of the Hellenic Republic and were then placed in public buildings and spaces.

Some 50 schools participate in ESD activities within international networks sponsored by UNESCO. Information and communication technology instruments are increasingly used in Greece to support environmental education (e.g. dedicated web-forums hosted on YPEPTH’s website).

Sixty Centres of Environmental Education (CEE) are also operating in Greece, at regional level, and are linked in a National Network of CEEs and in 14 regional networks. Inter alia, they offer educational modules on sustainable waste management, reduction of waste volumes and promote sound practices such as “sorting at the source” of municipal solid waste.

YPEKA and the Ministry of Interior are the main responsible authorities for production of data, statistics and indicators as well as for reporting on waste management. Data is also collected and processed by the Hellenic Statistical Authority - ELSTAT (www.statistics.gr/portal/page/portal/ESYE) and the National Centre for Environment and Sustainable Development (NCESD). The latter has recently (2008) prepared an updated “State of the Environment” Report that includes a special, extended, section on waste management, covering all waste types of hazardous and non-hazardous waste (www.ekpaa.greekregistry.eu/). NCESD also calculates new waste related indicators to facilitate national reporting, inter alia to the European Environment Agency.

The implementation of the Eco-Management and Audit Scheme (EMAS) EU Regulation in Greece has had very positive results so far in raising the awareness of the voluntarily participating organisations on integrated environmental management and particular sound management of waste. Participating organisations from both the industry and service sectors (private and public) are obliged to submit to YPEKA an annual Environmental Statement presenting their environmental management system, containing detailed information on the volumes and composition of waste and wastewater generated, their waste management processes, their cooperation with certified bodies for the alternative management of packaging material and other products etc, also setting indicative targets for constant annual improvement. These environmental statements are posted on the Ministry’s website (www.ypeka.gr/Default.aspx?tabid=520&language=el-GR).

Financing

YPEKA is managing the implementation of the National Operational Programme “Environment and Sustainable Development” (OPESD), with a total public budget of EUR 2.25 billion (of which 80% from the EU Structural and Cohesion Funds) for the period 2007-13. The programme focuses on: integrated solid waste management, rational use of water resources, modern wastewater facilities, protection of natural resources and the efficient tackling of environmental risks e.g. desertification, droughts, fires, floods, and marine pollution. OPESD will contribute to economic growth through a more efficient use of resources, such as re-use, recycling and recovery of waste.

Compared to the previous programming period (2000-06), the 2007-13 share of total EU transfers for environmental infrastructure and nature protection increased by 11%. The water sector and mainly wastewater treatment absorbs 53% of total funding for environmental infrastructure expenditure (i.e. EUR 2.6 billion), whereas funds earmarked for waste management correspond to 16%.

The overall planned budget for environment-related investments in Greece for the same period, including funds earmarked from all related sectoral Operational Programmes, apart from OPESD (e.g. those for agriculture, energy and transport) will exceed EUR 6 billion, representing 26% of the total available EU funding to Greece for the implementation of the country's overall National Strategic Reference Framework (NSRF) 2007-13.

For the programming period 2007-13, estimates indicate that investments in the waste management sector from all sources will approximately reach EUR 1 billion.

More specifically, in order to assist implementation of the National Plan for the Management of Hazardous Waste" it is required to identify sites for the installation of hazardous waste treatment units and for their final disposal. This study has already been contracted, with a budget of EUR 135,300 from OPESD's priority Axis 5 on "Technical Support". In parallel, the study for the management of sludge and the management of hospital waste, though out the country, have already been completed. The outcomes and recommendations of these three studies will be incorporated in the new updated "National Plan for the Management of Hazardous Waste" that will be soon carried out with funds also from OPESD's priority Axis 5 on "Technical Support", aiming at fully incorporating EU Directive 2008/98/EC in national legislation, thus covering all types of waste produced in the country. Moreover, aiming at mapping polluted sites in Greece that require immediate rehabilitation and in order to best plan remedial measures in hot-spots, a special study is currently being commissioned by YPEKA, with a budget of EUR 800,000, also from OPESD funds.

! Cooperation

Transboundary movement of hazardous waste

Greece has been responsive to a variety of environmental commitments and obligations assumed under global and regional accords on the transboundary movement of hazardous waste. The UN Basel Convention (1989) on the Transboundary Movement of Hazardous Waste and their Disposal, which Greece ratified in 1994 (Law 2203/1994 – OJG 58 / A / 15.04.1994), establishes a control procedure for the export and import of hazardous waste among the convention parties. Greece has fully adopted the Basel procedures that require prior notification of waste exports and imports, and written consent from the concerned authorities before any transboundary movement takes place, based on waste lists agreed to by the Convention parties. At the moment, Greece is in the process of ratifying the amendment of the Basel Convention of 1995 ("Basel Ban"), which has not yet entered into force, prohibiting all exports of hazardous waste destined for disposal from OECD to non-OECD countries. The Basel Convention provisions, including the "Basel Ban" amendment, are already implemented by Greece through the EU Waste Shipment Regulation (EC) 1013/2006 (WSR). Greece's waste management activities are also compliant with OECD procedures and guidelines on transboundary movement of hazardous waste and with the Izmir Protocol (1996) to the Barcelona Convention, which prescribes controls on hazardous waste movement and disposal.

End-of-life ships

The management of end-of-life ships containing hazardous materials has become an important priority for Greece during the last decade. Efforts focus on preventing pollution of the water and soil in coastal areas, contamination of natural habitats and fishing grounds as well as human (including workers) health from the hazardous substances contained in old ships (e.g. asbestos, PCBs, tributyltin and oil sludge). Greece, as one of the world's leading maritime countries with a special interest in shipping, complies with EU legislation and International Conventions requiring the phasing-out of single-hull tankers. Indicatively, during the 2001-03 period, of the 20 companies worldwide that exported the most end-of-life ships, seven were Greek firms which together exported 80 of the 209 total vessels.

The IMO, in co-operation with the ILO and the Basel Convention Secretariat, has been co-operating in the development of the International Convention on the Safe and Environmentally Sound Recycling of Ships. Greek experts and officials from government and industry were actively involved in the ongoing analyses and negotiations in order to ensure that a truly worldwide and fair accord was reached regarding environmental and health obligations for all countries, in the Hong Kong Conference (May 2010). Another concern of the Greek shipping industry is to make sure that when the Hong Kong Convention enters into force, a sufficient number of ship recycling facilities worldwide will fulfil its environmental and safety requirements.

The Greek Government, until the entry into force of the new Convention, focuses on encouraging Greek ship owners to follow voluntary technical guidelines on "best practices" prepared by the IMO, ILO and the Basel Conventions to ensure that end-of-life vessels owned by Greek individuals and companies, wherever flagged, are sent to dismantling operators with good environmental records.

Greece has, at the moment, two small dismantling facilities (Bacopoulos and Savvas at Piraeus) with good environmental records which handle mainly relatively small end-of-life ships (ferries and fishing vessels).

Official Development Assistance (ODA)

Greece is committed, as both a UN and an EU Member State, to the global partnership to eradicate extreme poverty and contributes financially to the achievement of the Millennium Development Goals (MDGs). Through its bilateral and multilateral development cooperation, Greece provides financial resources to support national development initiatives and to address global developmental issues in the fields of sustainable development, health, environment, etc. A substantial part of Greece's ODA is channelled directly to institutions and/or policies aiming to address environmental issues at the global or regional level, while environmental sustainability is a cross-cutting objective of the programmes, projects and policies financed. Greece disbursed, in 2006-2007, around USD 300,000 in grants for bilateral assistance projects.