

# Management and promotion of infrastructures of waste

## Executive summary



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# MANAGEMENT AND PROMOTION OF INFRASTRUCTURES OF WASTE

## REPORT

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Consell de Treball,  
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## 1. Executive summary

The *Report on the management and promotion of infrastructures* that we are just presenting contains a reflection about the waste management model existing in Catalonia. The Report presents several items for discussion related to the development of the waste policy and of infrastructures in recent years and it is divided into several sections that deal with issues such as the legal framework, planning and scheduling of waste management and investment, the evolution of the demand and supply of infrastructure, funding model and costs. The aim of this Report is to present future challenges in the management and promotion of waste infrastructure, as well as the considerations made by the CTESC from the statistical, bibliographical and documentary analysis.

### 1.1. Legal frame

The first section of the Report describes the general rules affecting the management and infrastructure of waste and the specific ones for certain installations.

In that line, we first set the boundaries of the concept of waste, that includes the by-products, the end of the waste condition and the description of the different waste categories, such as municipal solid waste (domestic and commercial), industrial, hazardous (special) or non-hazardous, among others. Secondly, we describe the priorities required in terms of waste management, ie prevention, reuse, recycle, and dispose (to incinerate or landfill). Thirdly, the principle of self-sufficiency and proximity of facilities, and fourth, the distribution of powers between the State, the regions and the local authorities. Fifth, we present the infrastructure planning and the objectives established in the various programs and plans for the management of municipal, industrial and construction waste; sixth, the system of administrative intervention. We also present rules on planning and urban planning, and on the economic system (incineration canon and controlled disposal fee), according to the producer's responsibility and the "polluter pays" principle.

This section also sets out the specific points of the legal framework for incinerators and controlled disposal facilities.

### 1.2. Future challenges of planning in the field of waste management and infrastructure

In the second section we have made a pursuit of the quantitative and qualitative objectives of the current planning in Catalonia to prevent waste generation and improve the management of municipal, industrial, environmental services and construction waste. The most important observations are summarized below.

#### Municipal waste

The evolution of municipal waste generation (4.1 million tons in 2011, 1.47 kg/inhab./day in 2011) confirms the low generation forecast of the Program for the municipal waste management in Catalonia (2007-2012 PROGREMIC). So, the most ambitious goals for the generation reduction are achieved.

The selective collection has increased, between 2005 and 2011, from 29% to 41%, and the valorization too. If considering the methanation of the remaining fraction, valorization is closer to the target. The valorization of glass, paper and cardboard is also heading towards the goal, but the collection of paper and cardboard and other waste disposal units dropped in 2011. The valorization of bulky and lightweight packaging waste has achieved the objectives, but the inappropriate materials of the light packaging containers are still high.

Although three-quarters of municipalities collect selectively the organic fraction, valorization targets for household waste and organic waste recovery are far from being achieved.

Only about a fifth of the remaining fraction (compost, methanation of organic waste and recovery of materials for recycling or energy) is treated. The primary treatment of rejection is low.

### Industrial waste and environmental services waste

The waste no longer has this condition and has become a useful resource for the replacement of materials, including energy. The production of industrial waste was reduced (3.9 Mt in 2011) and is under the provisions of the Industrial Waste Management Program in Catalonia (2007-2012 PROGRIC).

As for **industrial waste**, the PROGRIC targets for its complete and material valorization have been achieved. The physicochemical treatment and other treatments prior to the final disposal of industrial waste, as well as incineration and controlled disposal, are on track to achieve the goals by the year 2012.

The evolution of the **water treatment plants waste** is below the forecast of the program, since for the past four years the waste has not increased in parallel to the population. Energy valorization of sludge from wastewater treatment plants is heading towards the goal, but the material one is far from the target. However, the treatment of sludge in treatment plants rose more than expected in the program. However, the direct incineration or disposal have reduced, though controlled disposal is still far from the target.

The number of **industrial waste managers** and the tons handled have increased these years, but the ratio by day and manager has declined. In percentage, the waste valorization of industrial managers is below this target. The management through the inputs treatment has exceeded the program target. Incineration is moving towards the goal, but the controlled deposition overcomes it.

### Construction and demolition waste

The goal of waste reduction in the Program for the management of construction waste (PROGROC 2007-2012) has been fully achieved as a result of the reduction in construction activity. The recovery, reuse and recycling of construction materials has also reached the goal, but it fell in 2011 compared to 2010.

### 1.3. The role of infrastructure for waste management in the socioeconomic development of Catalonia

This section emphasizes that infrastructures contribute to the socioeconomic development in the region, since they increase the waste valorization and contribute to the circular economy, ie, the efficient management of resources, waste and pollution prevention associated with the cycle of life of the products, because waste is a material and energy resource, and goals for preventing its generation, for its valorization and the reduction of the environmental impact have an influence on people's health and welfare.

Catalonia generates every day 33,924,925 pounds of waste, and it is interesting to note that, since 2007, there has been a decoupling between waste generation and the evolution of the economy. This year 58,000 pounds of waste per million euros of GDP have been generated, almost half of 2005.

Finally, we offer a summary of the variables that affect the planning of infrastructure, such as waste generation, the evolution of the population, the pattern of consumption and production, the budgets of Public Administrations, funding sources and financial resources and the effect NIMBY (not in my back yard).

### 1.4. Diagnosis of the current situation and needs

#### Waste generation: the demand for infrastructures

As for the **municipal waste**, its generation has increased in absolute terms between 2000-2011, 16.4%, but since 2007 it has begun to reduce. Waste generation per capita has also fallen and it stands at 1.43 kg/inhab./day in 2011. In fact, there has been a decoupling between waste generation and the evolution of the Catalan economy. In the Catalan model of municipal waste management, valorization has gained weight, and deposition predominates over incineration.

41% of the generated municipal waste has been selectively collected (1.6 Mt), above the average for the EU-27, and 30% has been valorized. The weight of waste collected selectively has more than doubled. The electrical and electronic equipment and textiles are the fractions of the selective collection that have increased most, and Tarragona has gone ahead of Barcelona regarding the selective collection.

The remaining fraction of municipal waste was reduced 20% during the period 2000-2011, even though the population has grown 24%. There is a certain territorial heterogeneity in terms of the model of municipal waste management, regarding particularly the remaining fraction: incineration in the case of the Tarragona area (46%), controlled deposition in the case of Lleida and Girona (100 and 90%), and mixed in the case of Barcelona, where pretreatment is very important (37%). The energetic valorization of the remaining fraction is less than the average for the EU-27.

As for **industrial waste**, we can also observe the progressive decoupling between waste production and industrial GDP since 2008. The coefficient of industrial waste generation per unit of industrial GDP has improved 49 points over the period 2005-2011 and the maximum efficiency (100 tons of waste/M € of industrial GDP) was achieved in 2011. In addition, 77.6% of industrial waste produced (3.9 million tons in 2011) has been valorized physically and 1,1% energetically. The prevailing kind of

valorization is the material and external one by third parties (65.3% in 2011). Valorization as a byproduct (7.8% in 2011) has increased during the period 2005-2011.

The physicochemical treatment and others prior to the final disposal and, especially, the controlled industrial waste disposal have decreased during the period 2005-2011, and they represented 3.7% and 15.7%, respectively, of the total in 2011; incineration has remained stable (1.8%).

In reference to the **waste generation of wastewater treatment plants**, Catalonia, with half a million tons (0.54 Mt in 2011) stands below the EU-27 average in kilograms per inhab./year. Most of the sludge in the treatment plants is physically valorized (56.7% in 2011) or it is subjected to drying processes before being valorized (23.5%) as fertilizer or fuel (clinker), and it has increased in recent years. The energetic valorization from sewage sludge represents 9.9%. Direct incineration and, specially, controlled deposition were reduced during the period 2005-2011.

The waste management industry is mainly private, except for the controlled disposal of special waste in external plants. The number of **industrial managers** and tons handled almost doubled during the period 2005-2011, from 480 to 857 managers, and 7.5 to 14.5 Mt of entries, but the ratio for manager and day (9,4 t / manager / day) decreased in 2011. 68% of the entries managed by managers are industrial waste; municipal waste is 20% and the remaining 14%, other construction waste, treatment, management or livestock.

Pretreatment and others and incineration have increased during the period 2005-2011, and the controlled deposition has decreased. Valorization accounted for 59% of the total in 2011. In addition, 5.5% of the inputs come from outside Catalonia and 9% of the outputs go outside Catalonia. The outputs of secondary waste have been reduced during the period 2005-2011 almost one fifth part, but the exit rate of waste for management companies outside Catalonia has increased.

The generation of **waste in construction and demolition waste** was reduced 63% during the period 2005-2011 as a result of reduced activity in recent years. The generation of construction waste has been decoupled from the construction GDP since the crisis started in 2008, and from population growth in 2009. Production of construction and demolition waste per capita in Catalonia is below the EU average. The recovery, reuse and recycling of construction materials has increased during the period 2005-2011 and it rose from 17.3 to 50.5%; it achieved the objective of the program in 2011, although it has decreased compared to 2010, due to the temporary suspension of the construction waste disposal canon.

### **The treatment capacity: supply infrastructure**

The supply of infrastructure should take into account the demand and the hierarchy of waste management. Thus, waste management plants can be grouped according to their type: transfer and collection centers, treatment centers (physicochemical or waste treaters), valorization centers (in agriculture, compost, anaerobic digestion, valorizers and energy installations) and availability centers (landfills and incinerators). The centers are concentrated where the population is concentrated.

The range of facilities must meet the gradual increase in collection and treatment. Thus, infrastructures for the **municipal waste** management have increased 43% during the period 2005-2011, specially the facilities for selective collection and compost

facilities except those for the collection of glass, paper and packaging and cardboard, which correspond to industrial managers. The number of controlled landfills has reduced and that of incinerators has remained stable.

The number of installed **industrial waste** management facilities has increased 37% during the period 2006-2011, especially facilities for the collection and transfer and incineration plants, parallel to the waste entries increase in the management companies (85%, from 7.9 Mt to 14.7), but also in the valorization ones, since valorization stands for the 3/5 parts of the industrial waste management. It should be noted that the entries in treatment centers and others have doubled, and that entries for incineration have increased sevenfold during the period.

Facilities devoted to manage **construction waste and demolition** have increased 75% during the period 2005-2011, especially recycling and sorting plants. It should be noted that construction waste reduced by 64%, mainly the waste intended for deposits of debris. The valorization has been maintained during the year (+1.6%).

## 1.5. The financial model of the waste infrastructures

The economic instruments to finance infrastructure waste are the cohesion and regional development European funds, the ARC (Catalan Waste Agency) budget, environmental taxation and contributions of producers and distributors, among others.

Some of the projects funded and approved within the Operational Programme for Cohesion Funds 2007-2013 in Catalonia are the selection and biotreatment waste plant in Sant Adria del Besos (80%) and the removal of chemical contamination of the Flix reservoir (80%).

The contributions of the Government of Catalonia to the ARC increased during the period 2005-2007 from 106.3 to 131.28 M €, and they have been reduced from 131.8 to 107.3 M € during the period 2007-2011, particularly current expenditure and current transfers, including the tax rebate to municipalities.

Regarding the environmental taxes, we should highlight, on the one hand, the entry fees on waste disposal facilities: incineration and controlled disposal, to finance the cost of implementing the sustainable management of municipal and construction waste, especially the organic fraction, the selective collection and valorization of other waste fractions, which penalizes municipalities that have not initiated the selective collection of the organic fraction. This year, the tax rate is 12.4 €/t that has been controllably deposited and € 5.7/t that has been incinerated.<sup>1</sup> The canon of controlled disposal of construction and demolition waste in force since 2009 (3 € / t) is temporarily suspended since October of 2011 for a period of two years. Moreover, some municipalities have implemented home and commercial trash fees that generate additional resources.

Finally, producers and distributors also contribute to finance the waste management of products introduced to the market, either directly or through contributions to integrated management systems for packaging waste, paper and cardboard, glass, pesticide containers, containers in the pharmaceutical sector, vehicles out of use, electrical and electronic equipment, tires which are out of use, industrial oils and used batteries.

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<sup>1</sup> In municipalities that have not started the selective collection of the organic fraction, the tax rate is 21.6 € / t, for controlled disposal and € 16.5/t, if incinerated

## 1.6. Cost analysis for waste management

From the **theoretical point of view** the main costs of waste management are those related to collection, transport, treatment and environment, and they vary according to the type of waste.

Thus, the costs of collection depend on variables such as fuel prices, energy efficiency of vehicles, frequency of collection, the amount collected and the number of containers, conditioned by the size of the municipality and the population density. The costs of transportation depend on variables such as distance, fuel prices and energy efficiency. The cost of treatment depends on the type of treatment, the quality of waste at source, the price of energy, and the unrecoverable or sunk costs in form of infrastructures. The environmental costs are harder to quantify and they exist as waste prevention and negative externalities. Other costs that should also be considered from a theoretical point of view are labour costs, as well as variables related to the public or private nature of the company that manages the waste, the time of year when the waste is generated, or the fact if the management is local or supralocal.

From the **empirical point of view** it would be necessary to have available cost information by items and disaggregated by municipality, type of waste and treatment. Unfortunately this information is not public. In fact, the average cost involved in managing a ton of waste is not even available in Catalonia. Deficiencies of information on costs are originated in the municipalities, so a documentary and bibliographic analysis has been made of several studies that have used the survey technique of social research on a sample of municipalities to approach the costs of waste management and the variables affecting them.

Most studies focus on municipal waste. In this sense the unit costs of waste management based on the type of waste (municipal, selective, urban paper and cardboard, urban glass, organic fraction, remaining fraction) or phase (the entire cycle, collection, transport, transfer and treatment) range from the 18 to 30 €/t in compost treatment according to the state-wide study of the EC (2002), to 118 €/t of total service management of municipal waste in Catalonia in the study by Puig and Font (2011).

The literature and documentary analysis has also given guidance on the variables that affect the increase and decrease of costs. In this sense, in terms of costs of waste collection, the analysis focuses on the existence or not of scale economies, density and scope, on the differences in the frequency of collection by fractions (selective and others), higher in the residual fraction, and on the size of the municipality. Thus, according to the author or the study, the variables which increase the cost are the amount of waste generated, the collection frequency, the activity or the tourism intensity and, in some cases, the percentage of separate collection, the price of fuel in the zone, the taxes on waste disposal and the density in the remaining fraction collection, the volume generated, the interest rate and the participation level of the population in the recyclable fraction collection.

Transport costs depend on the location of controlled deposits, incinerators, anaerobic digesters, composting plants and screening plants, among others; so there will be differences between large cities and rural municipalities.

As for treatment costs, we should consider the fixed cost per tone treated from municipal infrastructure investment, as well as the useful life and design capacity of the

treatment. So the cost ranges between 3.3€/t in Ecopark 4 (40 years) and 29.5€/t of the treatment plant from FORM in Santa Coloma de Farners (20 years).

Finally, among the variables involved in environmental costs some authors consider the price of land, the price of energy, the materials recovery capacity, the structure of electricity production, as well as private and social costs.

## 1.7. Framing the discussion

In the last section previous to the considerations, an analysis is done about the three main areas of debate: the prevention of the generation, the management and disposal of waste. First, the debate revolves around the question whether prevention of waste generation should be made through public policies or whether it should be left to the market. However, the EU and the Waste Framework Directive prioritize prevention policy generation since it presupposes a model in efficient resource use, saving materials and energy, reducing the expense and mitigating the environmental impact.

Second, the discussion is placed in the waste management model in the early and middle phases: collection, storage, transfer, treatment and recovery of waste, and in the cost of each phase. The elements of the debate are: the waste selection or not in origin by the population and the relationship of this decision with the density of population, the economies of scale and those of scope, the need and the percentage of waste treatment, of recycling and recovery, and the profitability obtained by means of the waste valorization. Unfortunately there is not any information available on the cost of recycling, recovering and preparing waste for its disposal.

Finally, the discussion is centered in the final phase of the cycle of waste, the final disposal: to deposit in a controlled way or to incinerate, since EU policies tend to promote the material and energy recovery of waste and to replace landfills with recycling and incineration facilities including energy production and recovery. The debate centers on whether to prioritize policies addressed to the recovery of materials or to energy recovery. The relationship between incineration and controlled deposition in the EU-27 is 38% against 20%, and in Catalonia, 44% vs. 15%.

## 1.8. Considerations and recommendations

The waste management infrastructures of Catalonia have helped the sustainable and economic development of the country and have contributed to the reduction of environmental impacts, a value that should be recognized at all levels of society. In this sense, as for the **value of the waste management infrastructures**, the CTESC considers that,

1. Despite the current impasse, we must give value to what has been achieved in recent years in the field of management and waste infrastructure, such as reducing generation of waste or increasing waste material valorization.
2. The participation of society in this process is necessary. The various economic and social sectors should be involved in detecting the problems related to the management and waste infrastructure and to the proposed solutions, such as the specific location of infrastructures. In this line, it would be positive to encourage public and private

agreements.

The report and the analyzed data highlight the need **to review the waste management model**, to rationalize expenditure and improve the quality of service, among other questions. In this area, the CTESC considers:

3. Waste policies have developed European directives without considering in depth the economic, social and environmental impacts of the various models. Own studies should be developed to identify weaknesses, especially in terms of funding, and define a better model for Catalonia.

4. Compared to the rest of the EU, the waste management Catalan model prioritizes pouring over incineration, although European directives indicate the predominance of energy recovery in the hierarchy of treatment.

5. Before building new waste management infrastructures, the treatment capacity of the existing ones should be optimized. For example, to use waste derived fuel (DF) in cement factories before building new incinerators.

6. The waste management model should consider the demographic, geographical and social conditions of each territory without forgetting the economic efficiency and environmental sustainability.

As for the **waste policy, ie regulation and planning in the field of waste**, the CTESC recommends that,

7. The waste policies should consider more strongly the three dimensions: environmental, political and economic dimension.

8. Despite taking into account the principle of proximity and adequacy, waste flows should be redirected efficiently between facilities on the territory, in order to leverage the capacity and streamline costs.

9. The whole society should receive updated data and quality information on technologies and infrastructures, as well as on global and local results about waste management, and the participation channels should be established.

10. The involvement of economic and social actors in the design of waste policy is an instrument available to the Administration in order to adapt the waste management policy to the economic and social context of the moment. Monitoring mechanisms should be established to help refine and correct management programs.

11. The diagnosis on the adequacy of installed capacity should be improved; this would require transparency in the aggregate data on this nominal capacity by type of facility.

12. The incidence that existing waste policies have on waste streams should be evaluated, to modify them if necessary.

As for the value of the used resources or the **management costs and the waste infrastructures**, the CTESC considers

13. The society as well as the Catalan population should be aware of all kind of costs

that the waste management and infrastructures generate.

14. Information on the investment costs and on the recovery and return of investment in waste management infrastructure already built in Catalonia should be accessible.

15. Instruments are required to report on the aggregate costs and costs of collection, transportation, storage, treatment, recovery and disposal of waste, depending on the fraction of residues considered, as well as on environmental, social and opportunity costs.

16. The costs and the environmental impacts of the waste management model and of the existing infrastructures must be accessible. In this regard, we should be able to answer the question about what represents to valorize, incinerate or pour a ton of waste, depending on the type of waste, in order to compare the advantages and disadvantages of various management models.

17. The efficiency and innovation in the field of waste management and infrastructure should be taken into account, using new technologies to reduce costs and environmental impacts.

18. This information should allow to know the costs distribution between the different social partners.

Finally, the CTESC proposes a **set of measures** which are specified below:

19. To publish data on investment, capacity, volumes of waste treated and waste outputs in the various waste management facilities.

20. To give support and enhance from the Administration ecoparks and eco-industrial parks opportunities (products, cost ...) to treat and exploit the different types of waste and to reduce the suspicions that hover over this type of industrial facilities, that have nothing to do with those existing years ago.

21. To evaluate the life cycle of waste through systematic procedures of inputs and outputs from matter and energy until the waste is used for a specific purpose, since there is demand and a market (recovered and recycled waste), or until its end (incineration or landfill).

22. To optimize the constructed facilities rather than to build new ones. Waste generation has been reduced, but the EU objectives determine the need for further progress in the prevention of waste generation.

23. To promote concrete measures to meet the objectives of the European directives, such as developing true working lines to minimize household waste.

24. To enhance individual and community composting, in homes and in large producer centers.

25. To analyze and evaluate the full treatment of the remaining fraction, aimed at reducing the pollution load and to allow secondary exploitation, to achieve better economic efficiency and environmental sustainability.

26. To encourage definitely plans minimizing the generation of hazardous industrial wastes.

27. To set collection channels and specific treatments for most hazardous waste and pollutants, such as batteries, asbestos derivatives and oils among others, or to prepare the existing facilities to manage this waste.

28. To sensitize the population about the need to collect separately, especially hazardous or special waste.

29. To check the export and import of waste to optimize the own waste facilities management, taking into account the Regulation (EC) n. 1013/2006 of the European Parliament and the Council on shipments of waste.