

# Methane to Markets Partnership Landfill Subcommittee

## Italian Country-Specific Profile

### Summary of solid waste management sector

Landfilling is the most widely adopted disposal solution in Italy. However, several analyses on the Italian municipal waste management give a trend of increase of other treatment solutions (e.g. composting and thermal valorization<sup>1</sup>) and a slight decrease in landfilling.

The reason of this trend is mainly the policy of incentives for separate waste collection, as well as the development of composting and thermal valorization.

In 2001, a total amount of about 29.4 million tons of MSW has been produced:

- about 66.7% of municipal waste (around 19.7 million of tons) was disposed of in landfills;
- 8.8% was sent to incineration plants (mostly with energy recovery);
- 12.8% was sent to selection plants with production of dry fraction and/or waste fuel (*Combustibile Da Rifiuto* (CDR)<sup>2</sup>);
- 5.9% was sent to composting plants for selected fractions;
- 5.8% was sent to other recovery structures.

Concerning the Italian hazardous waste management, 2001 data analyses outline that:

- 40.5% of hazardous waste (about 37.2 million tons) was sent to material recovery operations<sup>3</sup>;
- 2.4% (about 2.2 million tons) was sent to industrial plants for energy recovery;
- 15.5% (about 14.2 million tons) was sent to chemical-physical or biological treatment plants, preliminary to disposal;
- 1% (about 870,000 tons) was sent to incineration plants;

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<sup>1</sup> “Thermal valorization” refers to waste incineration with energy recovery.

<sup>2</sup> *Decreto Ministeriale* of 5.02.1998 defines the characteristics of CDR (humidity, calorific power, ashes, chemical composition) and foresees its use in incinerators and in specific industrial plants (cement plants, carbon thermoelectric power station).

<sup>3</sup> *Decreto Legislativo* of 5.02.1997, n.22 (*Decreto Ronchi*), specifies the material recovery operations of hazardous waste which the text refers to.

- 2.9% (about 2.7 million tons) was managed by authorized entities for temporary storage and preliminary deposit;
- 12.9% (about 11.8 million tons) was located in stocks near storage plants or other plants that carry out recovery operations;
- 1.5% (about 1.1 million tons) was sent to preliminary reconditioning;
- 23.8% (about 18 million tons) was sent to authorized landfills.

The total amount of operative landfills in 2001 was about 619, irregularly located throughout the national territory:

- 126 in Northern Italy;
- 68 in Central Italy;
- 425 in Southern Italy.

Compared to previous years, the number of landfills appears to be almost constant in Central Italy, slightly increased in the North and clearly decreasing in the South.

Table 1 provides an overview on the existing disposal sites in Italy. It must be noted that in the North of the country the number of landfills is significantly lower than in the South. In fact, even if the waste amounts are absolutely comparable, different management systems are adopted:

- in the North, bigger landfills are capable to receive greater volumes of waste, with a higher percentage of separate waste collection and a higher number of plants for separate fractions recovery;
- in the South, smaller landfills are dislocated over the territory, serving smaller areas.

	Number of Landfills		MSW Disposed Quantity (1000*t/year)	
	2000	2001	2000	2001
North	133	126	8.376	6.935
Centre	68	68	4.708	4.885
South	456	425	8.833	7.885
<b>Italy</b>	<b>657</b>	<b>619</b>	<b>21.917</b>	<b>19.705</b>

**Table 1, number of landfills and waste disposed quantity for the years 2000 and 2001. (APAT)**

As to hazardous waste, the total amount disposed to landfill was about 20.9 million tons in 2000 and about 22 million tons in 2001, with a substantial trend of increase.

Further information on the Italian solid waste management can be found in the following publications:

- “Rapporto Rifiuti 2004”, Agenzia per la Protezione dell’Ambiente e per i servizi Tecnici (APAT)
- “Annuario dei Dati Ambientali 2003”, Agenzia per la Protezione dell’Ambiente e per i servizi Tecnici (APAT)

Reference webpages:

<http://www.apat.gov.it/site/it-IT/Temi/Rifiuti/>

[http://www.apat.gov.it/site/it-IT/APAT/Pubblicazioni/Pubblicazioni/rapporto\\_rifiuti\\_2004.html](http://www.apat.gov.it/site/it-IT/APAT/Pubblicazioni/Pubblicazioni/rapporto_rifiuti_2004.html)

<http://www.enea.it/>

## 1. Key stakeholders in the solid waste disposal sector and LFG industry

The main key competences regarding the Italian waste management are organized as follows:

- The central government addresses, coordinates and defines general requirements and methodologies for the integrated waste management.
- Regions are responsible for arrangement, adoption and update, after consultation with Provinces and Municipalities, of the Regional Plan for Waste Management, for the regulation of waste management activities, as well as municipal waste collection, including hazardous waste, and for project approval of new plants for waste management
- A net of environmental protection agencies supports Regions in carrying out such functions. The agencies net is composed of the Agency for Environmental Protection and Technical Services (APAT) and 21 regional (ARPA) and provincial (APPA) agencies. Main duties of the agencies are monitoring and control of territory and human activities, environmental impact assessment of plans and structures and technical-scientific support to Regions, Provinces as well as Municipalities in the environmental field. In particular, APAT carries out, under the supervision of the Ministry for the Environment and Territory, all the technical-scientific functions concerning the monitoring and control in the environmental protection sector, the organizational and functional readjustment of soil and water protection and the functions related to technical coordination of Regional Agencies on environmental protection.
- Provinces are responsible for administrative functions concerning the planning and organization of waste disposal at provincial level, periodical control on all the management and commercial activities of waste, the identification, on the basis of the “territorial coordination plan” of the suitable areas for the localization of disposal and recovery plants for municipal waste, the organization of waste collection of municipal waste. Province’s employees responsible for controls are authorized to perform inspections, verifications and sampling inside plants or enterprises which produce or

carry out waste management activities.

- Municipalities are responsible for municipal waste management, choice of collection, transport and disposal modalities, as well as waste recovery.

In order to guarantee the laws application, referring in particular to the prevention of production and hazardousness of waste and the efficacy, efficiency and cheapness of waste management, packaging and packaging waste, as well as the protection of public health and environment, the National Waste Observatory has been set up by the Ministry for the Environment and Territory.

Landfills can be owned by public entities (Regions, Provinces, Municipalities), as well as by private companies, consortiums or cooperative societies. In order to open a new landfill, the interested entity needs to present the specific application to the competent Region, which, after a detailed evaluation of the proposed project, refuses or accept it and provides the specific authorization.

Further information on the Italian solid waste management can be found in the following documents:

- D.L.vo 5 febbraio 1997, n. 22. (Decreto Ronchi)
- D. Lgs 13 January 2003, n° 36

## 2. Overview of LFG potential from existing disposal sites

On the basis of to the data reported in Section 8.2, “Solid waste disposal on land” of “Italian Greenhouse Gas Emission Inventory, National Inventory Report 2004” (Agency for the Protection of the Environment and for Technical Services, 2004), the estimation of Methane potential is shown in Table 2.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
CH <sub>4</sub> net emissions (Gg)	453,9	461,8	416,7	421,1	437,4	457,2	462,2	462,8	455,1	447	451,7	457,5	443,7
CH <sub>4</sub> recovered/flared (Gg)	24,1	43,4	117,5	140,9	156,7	163,9	168,7	173,5	178,4	183,2	188,0	192,8	197,6
% of gas recovered/flared on total CH <sub>4</sub> from LF	5	9	28	33	36	36	36	37	39	41	42	42	45

**Table 2, Net methane emissions and methane recovered from solid waste disposal sites 1990-2002**

The methane recovered or flared reaches in 1990 a value of about 5% and increases during the years until the value of about 45% in 2002.

Reference Documents:

“Italian Greenhouse Gas Emission Inventory, National Inventory Report 2004”, Agency for the Protection of the Environment and for Technical Services (APAT), 2004.

Reference webpages:

<http://www.apat.gov.it/site/it-IT/Temi/Rifiuti/>

[http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/2761.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/2761.php)

<http://www.enea.it/>

### 3. List of existing or planned landfill gas capture and/or use projects

The production of electric energy from landfill is significantly growing: the production was in 1996 around 125.9 GWh, in 2000 already around 523.5 GWh and in 2003 around 843.2, with a growth of about seven times from 1996 to 2000.

Cogeneration technologies show a constant trend, with no significant increase over the territory. Figure 1 shows trends from 1996 to 2003.

	Year							
	1996	1997	1998	1999	2000	2001	2002	2003
Production of electric energy from Landfill (GWh)	125.9	296.1	452	539.6	523.5	593.8	779.2	843.2
Cogeneration from landfill (GWh)	67.9	64.5	26.8	26.8	27.8	70.8	42.8	67.3

**Table 3, Gross energy production from landfills. (ENEA)**

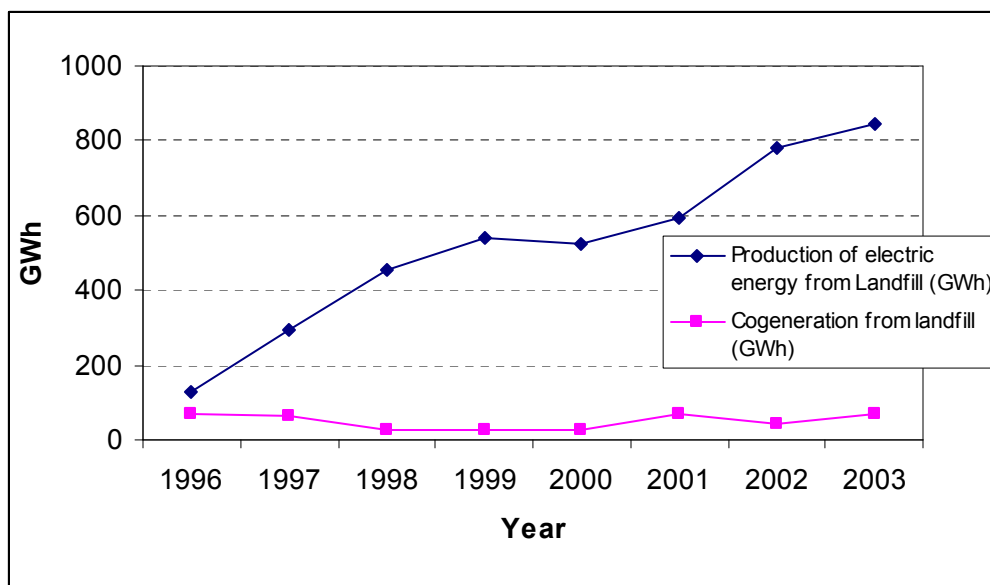


Figure 1, Gross energy production from landfills. (ENEA)

Table 4 shows the trend of growth of the number of landfills with simple electric energy recovery and the number of landfills with a cogeneration system;

	2002	2003
Number of landfill with simple electric energy recovery	118	137
Number of landfill with cogeneration plant	9	13

Table 4, Number of landfills with only electric energy production and with cogeneration plant for the years 2002 and 2003. (APAT)

Further information about the Italian Landfill Gas generation can be found in the following publications:

- “Impianti di Generazione”, 31/12/2003, Gestore della Rete di Trasmissione Nazionale (GRTN), available at [www.enea.it](http://www.enea.it) .
- “Energia Elettrica da Fonti Rinnovabili, Bollettino dell’anno 2003”, Gestore della Rete di Trasmissione Nazionale (GRTN), available at [www.grtn.it](http://www.grtn.it) .
- “Electricity from Renewables, 2002 Bulletin”, Gestore della Rete di Trasmissione Nazionale (GRTN), available at [www.grtn.it](http://www.grtn.it) .

Reference webpages:

<http://www.apat.gov.it/site/it-IT/Temi/Rifiuti/>

<http://www.enea.it/>

<http://www.grtn.it/>

#### **4. Challenges and/or priorities to greater LFG recovery and use**

##### Legal Framework

The Legislative Decree n. 79 of 16 March 1999, known as “Bersani Decree”, transposed European Directive 96/92/EC (concerning common rules for the internal market in electricity) into the Italian legislation. The Decree placed particular emphasis on integration of economic and environmental objectives, on development of renewable energy sources<sup>4</sup>, as well as on the constraints on greenhouse gas emissions imposed by the Kyoto Protocol.

With a view to encouraging the generation of electricity from renewables, the Bersani Decree stipulates that operators importing or generating electricity from non-renewable sources in any given year shall inject a given proportion of electricity from renewables into the national power system in the following year. Such proportion is currently equal to 2% of the electricity from non-renewable sources generated or imported in the reference year and exceeding 100 GWh.

On the other side there is a concrete effort in proceeding towards the disincentive of the production of waste and its disposal to landfill. In particular, since 1<sup>st</sup> January 2007, waste with a calorific value of more than 13000 kJ/kg will not be allowed to be disposed to landfill (Legislative Decree 36/2003). This will force important volumes of waste such as fluff coming from car milling, to be managed with alternative solutions.

Finally, the objective of reducing the biodegradable fraction of waste to be disposed of to landfill, fixed by the Legislative Decree 36/2003, should bring to a more rapid growth of the biological aerobic and anaerobic waste treatment which will be sent to valorisation circuits.

##### Climate change position

Italy has ratified the Kyoto Protocol on 1<sup>st</sup> June 2002 (Law 120/2002). The ratification law prescribes that Italy’s greenhouse gas (GHG) emissions can not exceed 476.1 Mt CO<sub>2</sub>eq. in the period 2008-2012 (-6.5 % on 1990 levels).

In order to achieve this goal, on 19 December 2002, the Interministerial Committee for Economic Planning (CIPE), approved the *National Action Plan for the Reduction of Greenhouse Gas Emissions*. This Plan is based on:

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<sup>4</sup> Renewables energies are defined as sun, wind, water resources, geothermal resources, tides, waves and the conversion of vegetal products or organic and inorganic wastes into electricity.

- the *emissions trend scenario*, that includes measures that have already been adopted under the current legislation: in 2010, according such scenario GHG emissions will be 613.3 Mt CO<sub>2</sub>eq. (leaving a gap of 138.3 Mt CO<sub>2</sub>eq. emissions reductions);
- the *emissions reference scenario*, that, starting from the trend scenario, includes the effects of measures adopted under domestic laws, even if not already implemented: in 2010, according such scenario, GHG emissions will be 575.7 Mt CO<sub>2</sub> eq. (leaving a gap of 100.7 MtCO<sub>2</sub> eq. emissions reductions);
- specific measures to enhance carbon sinks: it is expected that national sinks may determine CO<sub>2</sub> absorption equal to 10.8 MtCO<sub>2</sub> in the period 2008-2012 (leaving a gap of 89.9 MtCO<sub>2</sub> eq. emissions reductions);
- bilateral initiatives already undertaken by the Italian Government under the Clean Development Mechanism and Joint Implementation, that are expected to generate emissions reduction equal to 12 MtCO<sub>2</sub>/year in 2008-2012 (leaving a gap of 77.9 MtCO<sub>2</sub> eq. emissions reductions);
- *additional measures* to be selected among an “open” set of programmes and initiatives in the sectors of energy, transportation, industry, agriculture and in the international economic and technological cooperation under the Clean Development Mechanism and Joint Implementation in order to fill the gap to meet the Kyoto target. The open set of *additional measures* may generate emissions reductions of about 39.5 Mt CO<sub>2</sub>eq.

In this context and considering Italy’s poor supply of domestic fossil fuels, Italian Government gives strategic importance to renewable energy sources.

According to the trend scenario to 2010, an increase of 10 TWh respect to 2000 in the amount of contributions from renewable sources is obtained by improving capacity from hydroelectric sector (3 TWh), wind (1.6 TWh), thermo-valorisation of waste (1.3 TWh), and for the remaining amount by increasing biomass, biogas and photovoltaic energy. The scenario implements the obligation for large producers and importers of electricity to produce or acquire (through the so called “Green Certificate”), a minimum share (2%) of electricity from new plants using renewable sources (Law Decree 79/1999) and the completion of the CIP 6/92 mechanism (provision of the Interministerial Committee on Price n.6 of 1992), establishing prices at which private developers could sell electricity produced from renewable sources.

The policy aiming at spurring the expansion of renewable sources is further enhanced in the reference scenario. It indicates as feasible an additional expansion, by 2010, of 11 TWh, mainly on account of increased biomass, waste and wind contribution. In this context, electricity generated from renewables will reach 75 TWh, with a significant increase of production from all renewable sectors (from 9.2 TWh to 25.7 TWh), excluding hydropower, also thanks to the Law Decree n.387/2003 that increase of an additional 0,35% each year of the mentioned 2% obligation from 2004 to 2006.

The expansion of renewable is not sufficient and it would require other side support policies. They are mainly norms aimed toward the integrated management of waste cycle and the



definition of new policies in the agricultural sector in order to supply, in a regular and inexpensive way, biomass energy both for electric and heat generation.

Reference websites:

[http://www.minambiente.it/Sito/settori\\_azione/pia/att/kyoto/introduzione.asp](http://www.minambiente.it/Sito/settori_azione/pia/att/kyoto/introduzione.asp)

<http://www.mincomes.it/>

<http://www.italiancarbonfund.org>

## **5. Market assessment and reform issues,**

## **6. Financing Options**

### The Italian Carbon Fund

The Italian Ministry for the Environment and Territory has entered into an agreement with the World Bank, to create a fund to purchase Emission Reductions from projects that both benefit the global environment and transfer clean technologies for sustainable development to developing countries and countries with economies in transition. The Fund is a public-private partnership administered by the World Bank and supports projects eligible under the Kyoto Protocol's Clean development Mechanism and Joint Implementation, as well as the Emission Trading Scheme of the European Union.

At the same time, the fund is designed to assist developing countries and countries with economies in transition in achieving sustainable development, by leveraging substantial investment in modern energy services and technologies, including investments from the private sector.

The Fund's portfolio includes, inter alia, projects in power generation from landfill gas recovery, methane gas associated with coal mining operations, and gas flaring and venting in oil extraction.

Furthermore, the Italian Ministry for the Environment and Territory has joined other carbon finance initiatives, and has committed additional financial resources on the Community Development Carbon Fund and the BioCarbonfund.

## **7. Current cooperation among countries**

The Italian Ministry for the Environment and Territory has been promoting several bilateral and multilateral initiatives addressing cooperation, research and development in the field of methane sector.

Cooperation agreements have been signed with China, Mediterranean Countries, Central and Eastern European Countries, Latin American Countries and other developing Countries, with the involvement of international institutions and the private sector.

In the framework of such agreements, Italy has consolidated a long experience in the implementation of pilot projects in the natural gas technologies for Combined Heat and Power, Efficient Energy final uses in housing and transportation, landfill gas recovery, methane gas associated with coal mining operations, and gas flaring and venting in oil extraction.

In the framework of the cooperation between Italy and China, a pilot project on “Landfill Gas Recovery for Energy Production” has been implemented, in order to address both the waste management and local electricity needs.

The project will direct the preparation of national guidelines for the landfill gas recovery in China.

In addition, in cooperation with World Bank and the Chinese Authorities, we are designing a “stand alone” project on biogas recovery in a dairy farm.

To this regard, we share the suggestion of China about the inclusion in the priorities of the Partnership of the agriculture activities.

Moreover, under the cooperation with China, 300 innovative low emissions engines, fueled by natural gas, have been provided to the Beijing Municipality as a first step towards the sustainable mobility in the 2008 Green Olympic Games.

In Nigeria, Italy is promoting a Gas Flaring reduction pilot project, with associated electricity generation, which will allow a high potential in CO<sub>2</sub> equivalent emission reduction.

Besides reductions in gas flaring, this project will also produce reductions in emissions of Carbon Monoxide, Volatile Organic Compounds and other pollutants.

Furthermore, the project will positively impact employment, general economic growth and social development of the area.

The Mediterranean Renewable Energy Programme, a Partnership Initiative in the Mediterranean Region, launched by Italy with the participation of the countries, the energy agencies and the energy companies of the Region, UNEP and World Bank, is supporting hybrid technologies combining Renewables, biogas and methane natural gas to supply electricity.

## **8. References and sources**

### Reference documents

- “Rapporto Rifiuti 2004”, Agenzia per la Protezione dell’Ambiente e per i servizi Tecnici (APAT), available at at <http://www.apat.gov.it/site/it->

[IT/APAT/Pubblicazioni/Pubblicazioni/rapporto\\_rifiuti\\_2004.html](http://www.apat.gov.it/site/it-IT/Temi/Rifiuti/IT/APAT/Pubblicazioni/Pubblicazioni/rapporto_rifiuti_2004.html)

- “Annuario dei Dati Ambientali 2003”, Agenzia per la Protezione dell’Ambiente e per i servizi Tecnici (APAT)
- “Impianti di Generazione”, 31/12/2003, Gestore della Rete di Trasmissione Nazionale (GRTN), available at [www.enea.it](http://www.enea.it) .
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