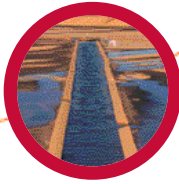


1999 Environmental Report



Working  
together to  
respect  
the environment



**VIVENDI**

# Vivendi

Operations in over 100 countries

Consolidated net sales

41.6bn euros

Net sales outside France

17.8bn euros



## Vivendi Environment

### Water

#### **Vivendi Water**

70,000 employees

The world's top water company, Vivendi Water serves over 100m customers in 100 countries.

### Waste Management

#### **Onyx**

56,200 employees

Present at all stages of waste management, Onyx is the world's 3<sup>rd</sup> largest waste company, serving 50 million inhabitants worldwide and 70,000 industrial companies.

### Energy

#### **Dalkia**

25,000 employees

Europe's top energy-related services company, Dalkia is present in 21 countries and manages 250 heating networks.

### Transport

#### **Connex**

35,500 employees

Europe's top public transport company, Connex transports over 1 billion passengers a year by road and rail.

Net sales in 1999

22.4bn euros

Operating income

1,654m euros



## Vivendi Communications

### Internet

#### **VivendiNet**

Established on January 1, 2000.

Comprises Vivendi Communication's internet developments, including the joint development with Vodafone AirTouch of the first European multi-access portal (MAP).

### Audiovisual Activities

#### **Canal+**

4,600 employees

Europe's leading pay TV company, Canal+ is present in 11 countries with about 14 million subscribers.

### Telecommunications

#### **Cegetel**

8,000 employees

With close to 9 million subscribers at the end of 1999, Cegetel is France's top private telecommunications operator.

### Publishing – Multimedia

#### **Havas**

20,000 employees

Present in 40 countries, Havas covers the main fields of publishing, i.e. news, education, knowledge, leisure and entertainment.

Net sales in 1999

8.6bn euros

Operating income

552m euros

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This first Environmental Report covers all of our activities in France and abroad, including those of subsidiaries more than 50% owned by Vivendi, with the exception of USFilter, which was acquired in June 1999 and has not been included.

Statistics have been used only insofar as they are on a like-to-like basis, so as to avoid distortions due to changes in the scope of consolidation, which can sometimes explain the trends recorded.

Figures given in absolute value terms generally date from 1998. One of the objectives that will be met by the

next Report will be to consolidate the information system.

# Our commitments

Vivendi undertakes to enhance the environmental performance of all its business sectors by implementing an action plan over several years. For the 2000-2005 period, Vivendi has set itself the following priorities.

**1** To draw up and implement environmental **performance indicators**, some specific to each business sector and some that apply to Vivendi as a whole.

**2** To define **measuring methods and instruments** that will enable expert teams to analyse the impact on the environment of each business sector's activities.

**3** To **systematically monitor compliance with regulations** and to develop employees' ability to act in **anticipation** of future environmental risks, thanks to proactive monitoring of environmental developments.

**4** By systematically introducing ways to **save energy**, to **reduce waste** and to fight against water wastage in our own service sector locations, wherever they may be.

**5** To increase our **research and development** effort in favour of a better quality environment, with a view to encouraging and achieving technology transfers, particularly on an international basis.

**6** In our industrial facilities and related processes, to systematically promote procedures likely to reduce both the consumption of materials and the production of rejections.

**7** To foster a **transparent and realistic dialogue** with all environmental players and partners, i.e. customers, elected representatives, public authorities, consumer and environment protection organizations, schools, the scientific community, suppliers and sub-contractors.

**8** To mobilize all our in-house and **external training resources**, with a view to developing our professionalism and environmental awareness.

**9** To **report regularly** on the progress and results of the implementation of our multi-annual environmental action plan.

**10** To use the **new information and communication technologies** (NICTs) to speed up the adoption and implementation by all of Vivendi's business sectors of the group's environmental policy priorities; to foster fruitful exchanges with environmental players and partners; and, more broadly speaking, to build up a modern environment management system.

**Editorial** Although it is true that, through Vivendi Environment's business sectors, our group produces services and technologies such as water treatment and waste management that protect the environment, it is no less true that our activities also impact on the environment.

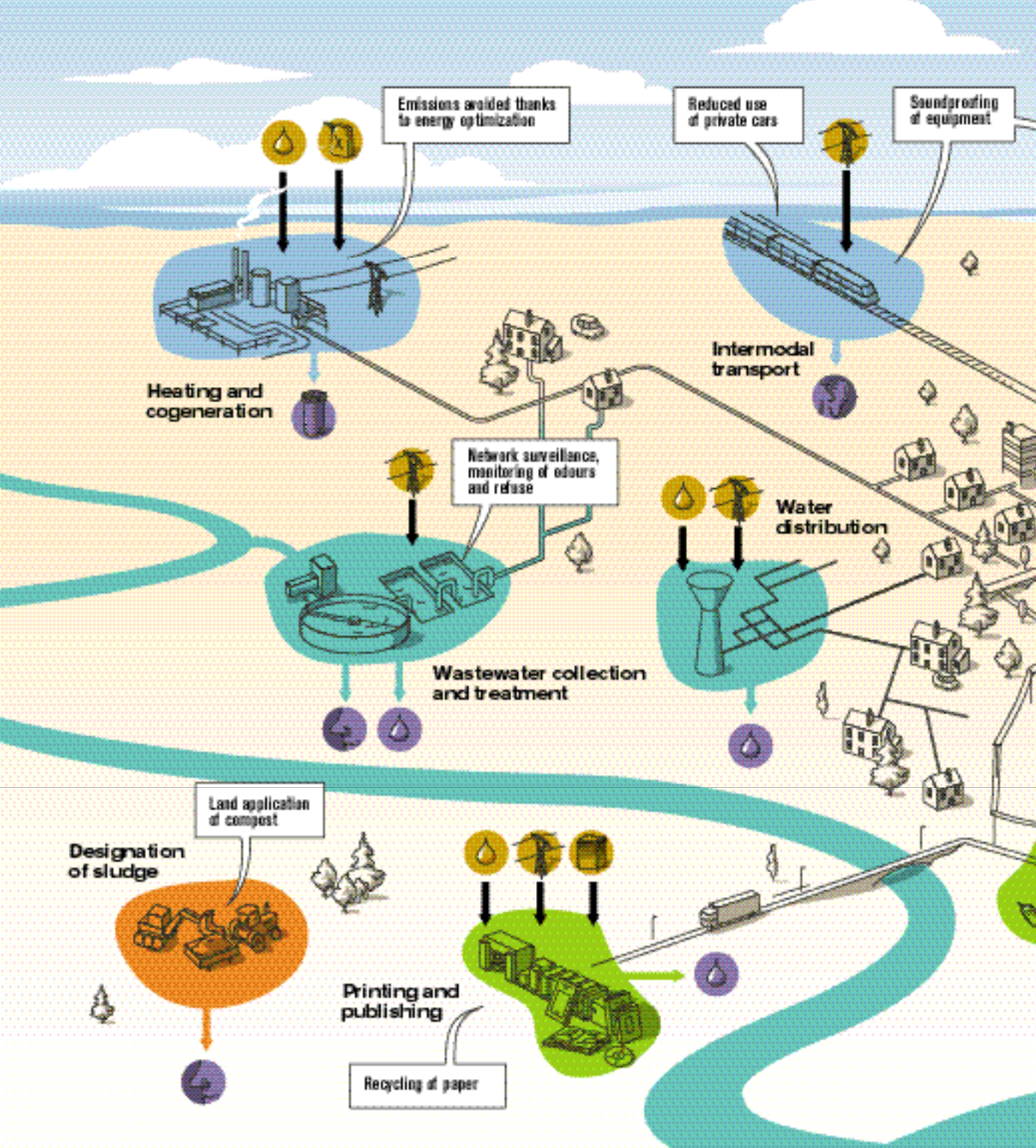
Vivendi is so aware of its great responsibility in this respect that it intends to be even more vigilant, by enhancing its expertise and permanently developing the most appropriate solutions to environmental quality concerns. We owe this ongoing effort to our customers, shareholders and to all those who put their trust in us. For this reason, we have decided to set in place an environment management system, of which this report is the first step. Ours is a responsible and determined approach. It combines technological innovation, product and service quality, and control over pollution and nuisance. It is based on a straightforward idea: value creation is sustainable only if it does not bring growth into conflict with the protection of the environment. Environmental parameters are neither secondary nor superfluous. On the contrary, they are our natural imperatives. It is our duty not only to make them an integral part of all our actions, but also to anticipate changes by putting a lot of effort into research and development.

This Report is therefore the first of a long series: every year, Vivendi's Environmental Report will be the best guarantee of the fulfilment of our commitments. It will also foster a dialogue with all our partners. This dialogue must become more intense, both within our group and outside it, in France and in all the countries in which we are present.

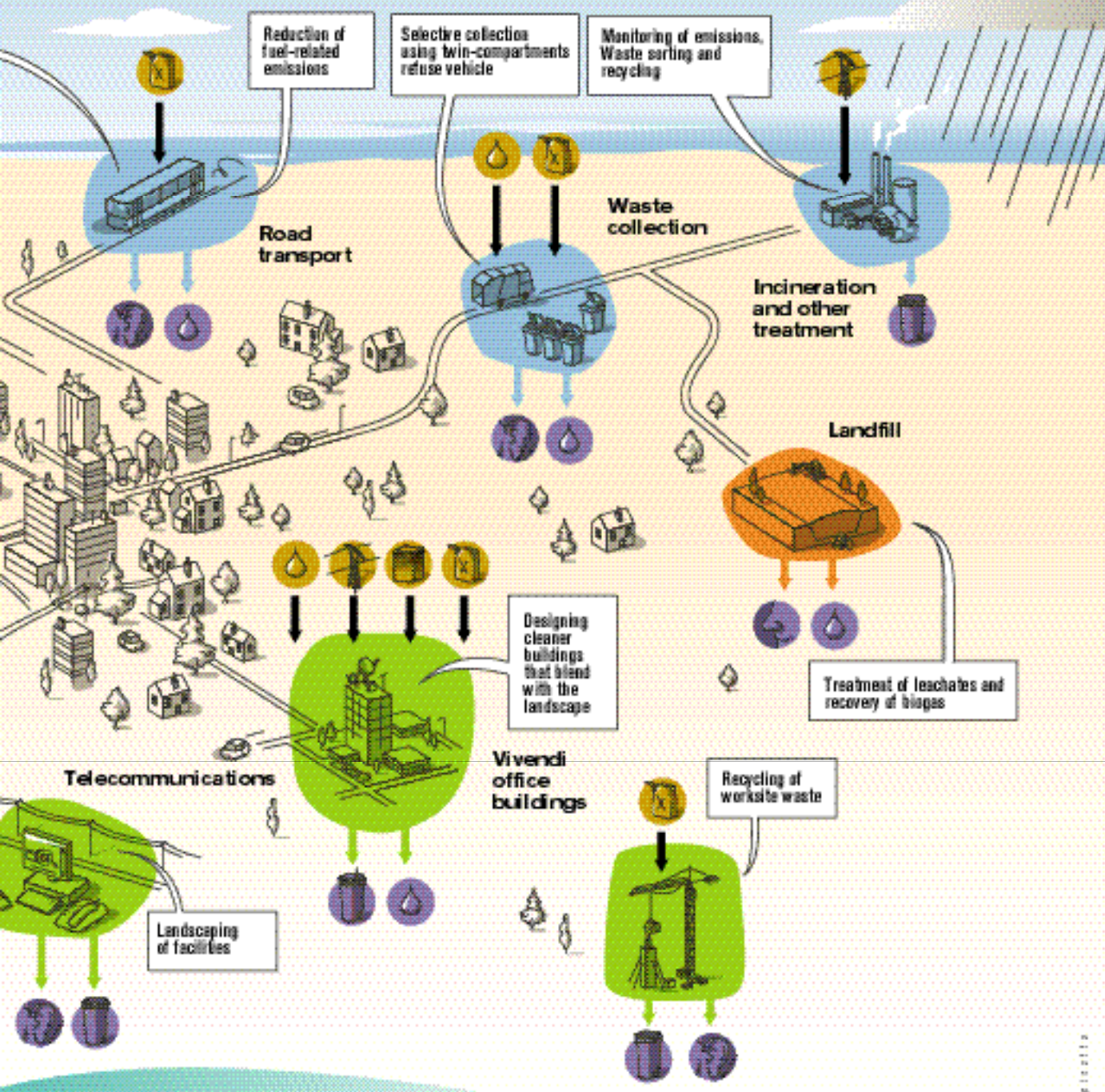


**Jean-Marie Messier**  
Chairman and Chief Executive Officer





# The impact of Vivendi's activities on the environment

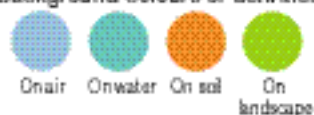


For each of the group's business sectors, this diagram shows:

**Resources used**



**Impact on the environment**  
(background colours of activities)



**Indirect pollution**



The balloons indicate **our environmental protection action**



# The environment in 365 days



## January

**Substitution** Beginning of work on the Autun facility in Burgundy. It is the town's heating plant and is 95% powered by wood. By encouraging the use of alternative fuels, Dalkia is actively participating in the fight against energy wastage.



## February

**Recycling** Sarp Industries, of the waste management business sector, signed a contract with the Batrech S.A. company for the optimization of battery processing capacity in Switzerland. Vivendi thus proved its commitment to the treatment, recycling and recovery of special waste.

## March

**Treatment** Vivendi has made a major acquisition in the water sector in the United States by taking over USFilter, the leading company in advanced microfiltration technologies (Memcor) and a wastewater treatment specialist.



## April

**Wastewater collection and treatment** In South Africa, Générale des Eaux signed an agreement under the Business Partners for Development (BPD) programme for supplying drinking water and providing wastewater collection and treatment services to deprived urban areas, which lacked these services completely.





## September

**Partnership** • Vivendi and the RWE company, Germany's leading electricity company, signed a contract with the municipality of Berlin for the production and distribution of drinking water, and the collection and treatment of wastewater, serving the 3.5 million inhabitants of Germany's capital city.

- Vivendi Water was launched in Berlin, following the merger of Générale des Eaux with USFilter.



## November

**Nanofiltration** For the first time ever in the world, a drinking water production plant was opened that uses nanofiltration. Thus, over 800,000 consumers will benefit from fresher, softer and more environment-friendly water produced by the Méry-sur-Oise plant near Paris, France.



## December

**Restoration** The Vivendi Foundation announced that it would contribute 1,5 million euros to the restoration of French forests devastated by last December's storms. The Foundation has also backed numerous nature conservation and recycling projects, leading to the creation of 1,500 jobs.

## October

**Energy recovery** Vivendi Environnement starts operating two power plants fuelled by biogas recovered from the fermentation of landfill waste, which will supply over 60,000 people with electricity for at least 15 years.



## July

**Integration** On July 12, the Cegetel-SFR company and the two other French mobile telephony operators, Bouygues Telecom and France Telecom Mobiles, signed a National Charter of Environmental Recommendations on the blending of radiocommunication installations into the French landscape and architectural heritage.



## June

**Collection** Onyx, of the waste management business sector, acquired the Superior Services company, the 4<sup>th</sup> largest US waste management company, which manages 49 waste collection companies, 23 landfill sites, 20 transfer stations and 15 waste recycling units for companies, local authorities and private individuals.



## May

**Cogeneration** In France, the Solvay company has entrusted Dalkia, of the energy business sector, with the job of building and operating a cogeneration plant producing 90 MW of electricity for its chemicals facility at Tavaux, in the Jura. This will reduce dust, sulphur and nitrogen oxide emissions into the air by 50%.

## August

**Innovation** Générale des Eaux and Culligan agreed to jointly develop a lead-free tap, which will comply with new European standards for the lead content of drinking water.

## Our objectives\*

Vivendi's priorities over the next five years  
in favour of protecting the natural environment

**Air** To reduce direct CO<sub>2</sub> emissions by 10% over  
the reference period and on a comparable basis.

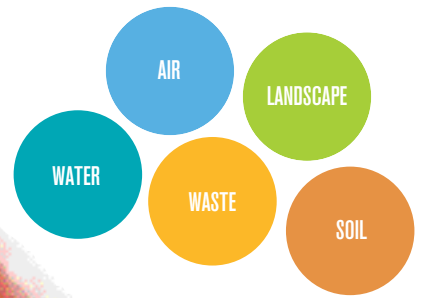
**Water** To improve average output rates of water distribution networks in Europe, bringing  
them up to between 80% and 90%, and to continue our worldwide efforts.

**Waste** To continue implementing action plans for developing the recovery of biogas and the treatment of  
leachates in landfill sites managed by Onyx, and for improving the treatment of incinerator plant emissions.

**Landscape** Prior to the location, development or redevelopment of major industrial or service  
facilities, to analyse the quality of its blending into the natural environment.

**Soil** Through pilot sites, to develop processes for quality control of sludge and  
compost thanks to synergy between the water and waste management sectors.

\* on a like-to-like regulatory and consolidation basis



Preserving  
the quality  
of

# air

**By the next century, global warming could increase by 2° centigrade. The Kyoto conference established that solving the problems posed by this is a top priority. To prevent the quality of air from deteriorating irreparably, all atmospheric emissions must be brought under control.**

There are several ways for companies to preserve the quality of air, ranging from limiting local pollution, such as odours etc., or reducing the local impact on ecosystems of fuel dust and acid pollutants, to keeping emissions of greenhouse gases under control. Hence Vivendi's decision to do all in its power to stabilize its emissions, particularly of CO<sub>2</sub>, in compliance with France's international undertakings. In 1998, carbon dioxide emissions generated by Vivendi's worldwide activities are estimated to amount to 4,4 million metric tons of carbon equivalent. This figure includes newly acquired companies, which have had priority in benefiting from environmental performance enhancement programmes.

## Integrated energy systems

Vivendi's policy priority being to enhance its energy efficiency, it has focused its efforts on customer facilities, particularly the management of heating facilities. This involves regularly and meticulously maintaining such facilities, continually adjusting them for temperature changes, installing thermostatic valves, and so on. The results have been significantly measurable in terms of energy saving and conservation, both in France and across the world.

In 1999, Dalkia's energy savings in France represented 0.5% of its total energy consumption for heating network purposes, i.e. nearly 100,000 metric tons of crude oil equivalent, compared with only 0.3% in 1997. Dalkia has also been actively involved in reducing energy wastage across the world. It has signed a framework agreement with the European Bank for Reconstruction and Development (EBRD) on the development of energy efficiency programmes in Eastern Europe. In particular, in Hungary, Dalkia's subsidiary, Prometheus, has achieved energy consumption savings for heating systems of 20% on average and has used much less polluting fuels. Thus, in Dorög, coal, the traditional fuel, has gradually been replaced by gas. Another example of Vivendi's energy conservation activity is the cogeneration technique used by Dalkia: it allows the heat of emitted gas to be recovered and used to produce energy for heating and hot water distribution networks, thereby reducing the consumption of fossil fuel energy. Through its 210 units in Europe, and under a three-year programme, Dalkia has multiplied by eighty the number of MegaWatts per hour produced using the cogeneration technique. These results testify to the success of Vivendi's efforts.



**Breakdown by sector of CO<sub>2</sub> emissions by all Vivendi activities**  
(in Ktec in 1998)







### Cogeneration at industry's service.

As early as 1993, Zeneca Avecia, a leading player in the bioscience market, embarked on a vast programme to enhance its environmental performance. It did so with the help of Dalkia Utilities, to which it entrusted the setting up and operation of two cogeneration units in Huddersfield and Grange Mouth in the United Kingdom. The energy optimization provided by Dalkia Utilities allowed Zeneca's Huddersfield site alone to save £2.5 million worth of energy expenditure and to cut dioxide emissions by 40%.

### An innovative anti-energy wastage concept by Prometheus.

Dalkia's subsidiary in Hungary, Prometheus, has developed an innovative concept, which it has been selling to numerous local authorities in Central Europe: "long-term" operation of energy networks with a performance guarantee. Investing in the improvement of outdated district heating infrastructure reduces energy wastage by 20% on average. Prometheus's recipe? Combining the automatic regulation of boilers with the use of gas instead of heavy fuel oil.



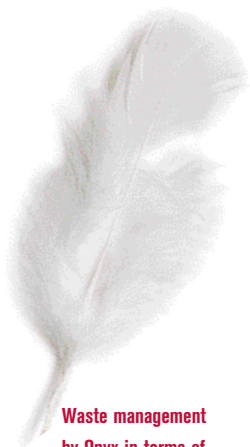
### Come on board the communicating motor car!

By introducing the new information technologies into the world of the motor car, PSA Peugeot Citroën and Vivendi have entered the era of the multimedia vehicle. For the first time in Europe, private cars will be equipped with an IP address, a Global Positioning System and GSM technology. By means of a hands-free kit, an access button and a screen incorporated in the dashboard, motorists will be in direct contact with a dedicated call centre. Services such as road assistance traffic information and navigation tools will enhance their mobility and enable them to make optimal use of the other means of transport available and reduce energy consumption.



### Biogas: from a nasty pollutant to a source of clean energy.

When waste is stored in a landfill site it decomposes and the ensuing fermentation produces biogas, which has a methane content of about 50%. This biogas contributes much more to the greenhouse effect than CO<sub>2</sub>, making it a pollutant both locally and globally. However, through recovery and treatment, biogas can be turned into a source of clean energy for profitable use by industrial facilities. As far back as 1986, Onyx set up a biogas collector network in its Plessis-Gassot and Claye-Souilly landfill sites in the Paris area. In cooperation with Dalkia, these two sites have now been equipped with biogas-fuelled power plants, which cater to the needs of 60,000 inhabitants.



## Limiting waste-related emissions

Vivendi's waste management business collects, recycles and processes the household waste produced by 50 million people across the world. In addition, it recovers 11 million metric tons of non-hazardous, special, liquid and solid industrial waste. Vivendi's waste management business also involves collecting and transporting waste. The fuel consumed by this business emits greenhouse gases. In order to limit the impact of this on the air, Onyx and Vivendi's transport business sector Connex, have been implementing a joint alternative energy sources action plan, whose aim is to reduce emissions of greenhouse gases, such as CO<sub>2</sub> and NO<sub>x</sub>, and other pollutants. In the same spirit, rail and river means of transport have already been made available to certain local authorities in France and Great Britain.

### Waste management by Onyx in terms of CO<sub>2</sub> emission

For carbon dioxide alone, the worldwide results of Onyx's activities show the large amount of emissions avoided.

(Global data)

#### Collection & transport

|                    |    |
|--------------------|----|
| Direct Emissions   | 60 |
| Indirect Emissions | -  |
| Emissions Avoided  | -  |

#### Treatment

|                    |        |
|--------------------|--------|
| Direct Emissions   | 874*   |
| Indirect Emissions | 37     |
| Emissions Avoided  | -518** |

in Ktec

\* excluding methane and Nox

\*\* energy recovery by incineration plants and recovery of waste biogas (alternative to fossil fuels)

The waste incineration business also adds to the greenhouse effect, owing to the fossil fuel products incinerated, such as plastics, for example. However, this means of treating waste is unavoidable, notably in an urban environment. The energy produced by waste recovery replaces energy from fossil fuels. It therefore helps to reduce emissions of greenhouse gases.

Similarly, the storage of household waste in landfill sites generates methane-rich biogas produced by the fermentation of the biodegradable parts of the waste. The burning of biogas turns it into CO<sub>2</sub> and steam. Energy recovery not only produces electricity and heat, but also saves fossil fuel resources. Today, over one third of Onyx's landfill sites across the world treat biogas, and the company already has 25 MW of installed capacity fuelled by recovered biogas. Furthermore, a research programme has been undertaken into biogas, which includes computer modelling of its production. The aim is to exploit 100% of a landfill site's emissions.

## Treatment of emissions and dioxins

Needless to say, Vivendi also keeps under control the air pollutants emitted by the industrial facilities for which it is responsible: power plants are fitted with devices that treat dust and smoke with filters that hold back solid particles or with post-combustion processes that eliminate carbon residues.

In waste incineration plants, the emphasis is on eliminating dioxins, mainly through their absorption by activated carbon. Between 1998 and 1999, the number of plants with the required treatment process increased by 72%. This is an ongoing effort: the objective is to continue increasing the number of equipped plants in absolute terms. The number rose from 31%





**Connex UK: fostering multimodal public transport.**

Since 1998, the measures taken by Connex to encourage people to use public transport have increased the number of passengers by 8% a year. An advertising campaign aimed at motorists has focused on the comfort and punctuality of the Connex train service. Nearly half of the stations have been renovated and fitted with closed circuit TV surveillance to enhance passenger security. Above all, twelve bus and rail networks have been integrated and interconnected by a single enquiry service, ticketing procedure and timetable, thereby providing a multimodal public transport system, that is, one that combines several means of transport.

**Dioxlab: a laboratory that analyses incineration plant waste.**

In 1998, Onyx was the first private-sector transport operator to equip itself with a laboratory for analysing dioxins, known as the Dioxlab. It analyses 500 samples a year of incinerator emissions in order to measure dioxins and furans. It works both for the company and customers such as local authorities and industrial firms. It enhances knowledge of dioxins and their traceability in waste-related businesses. The current programmes are mainly focused on emissions discharged by facilities. Future programmes should cover other areas, such as soil, food products, and so on.



**Aquazole: a new and cleaner fuel for buses.**

The Vivendi group first tested Aquazole, a new fuel, in the Chambéry area in eastern France in 1995. It was so successful that the company decided to extend its use. Aquazole is an emulsion made up of water (13%), gas oil (84%) and organic additives (3%). It considerably reduces the emission of polluting particles and the thickness of discharged emissions, without requiring any changes to bus engines. It reduces nitrogen oxide by 20 to 30%, solid particles by 30 to 55% and black emissions by 50 to 70%. Several hundred Connex buses now use this fuel throughout France.



air

in 1998 to 52% in 1999, in spite of the inclusion of many newly acquired plants not equipped for such processes, particularly outside France. Since 1998, risks have been monitored by a testing and analysis system based on regular sampling, known as the Dioxlab.

## Fostering “cleaner” transport

Connex is particularly aware of air quality problems, as it transports one billion passengers a year all over the world. It has therefore increasingly resorted to means of transport that reduce urban pollution, such as electrically powered vehicles in Great Britain and Germany or tramways in major urban areas in France and Australia. At the same time, the fleet of new buses is gradually migrating to clean fuels, such as natural gas or electricity and the extension of Aquazole in France. At the same time, in its training programmes, Connex includes modules dedicated to fuel-efficient ways of operating. The group’s other business sectors have also actively participated in improving the quality of the air by using cleaner fuels to power their fleets of vehicles. In the same spirit, a campaign is under way aimed at making group purchasing managers more aware of the environmental implications of their work, particularly when choosing vehicles powered by cleaner fuels.

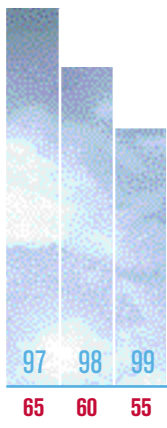
Finally, Vivendi has been increasingly asserting itself as a major player in information and communication technologies. These will gradually make it possible to replace physical travel, thereby also helping to reduce air pollution, although it is still difficult to assess the impact of this. In partnership with the scientific community, Vivendi has chosen to study this theme in depth. A good example of what can be achieved in this area is the concept of “the communicating motor car.”

## Recovering alternative energy sources

Dalkia’s 120,000 units in Europe, ranging from school boilers to the district heating networks of large urban areas such as Ostrava in the Czech Republic, heat the equivalent of 20 million inhabitants. Thus, the choice of fuel is of decisive importance. In cooperation with Onyx, Dalkia has been developing energy sources such as geothermics or energies derived from waste : like wood-fired power plants using waste from wood or recovered from packaging (pallets), and recovery of waste biogas. Thanks to these treatment methods, Vivendi’s waste management and energy business sectors help preserve the world’s fossil fuels and reduce the emission of greenhouse gases.

### Reducing energy consumption

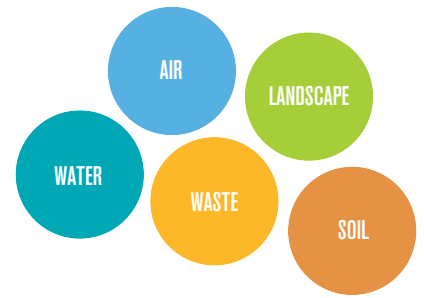
In water-related business sectors, energy-saving measures have also been taken. As shown in the chart below, Vivendi Water regularly measures the quantity of electricity used to operate its water production plants.



Trend in kilowatt-hours per inhabitant supplied with water







Protecting a  
scarce resource

# water

**Water is a vital but scarce resource. Although it covers over 70% of the surface of the globe, only 1% of our water reserves is really available for industrial and domestic use. For this reason, preserving the planet earth's water and using it properly have now become part of the key prerequisites of humanity's sustainable development.**



Water supply is already a problem in various parts of the world and this problem is likely to worsen in the future. In the most densely populated regions, especially urban areas, over-exploitation of aquifers has been causing water reserves to diminish to such an extent that the natural cycle can no longer renew them. This is why Vivendi has continued to concentrate its efforts on three main policies: water conservation; efficient treatment of wastewater; and improving the quality of water.

## Water conservation

As a specialist in water management, Vivendi is keen to assist in the protection of this resource. The group endeavours to do this by greater control over risks of water losses, the creation of wastewater treatment systems, and a policy of reducing water consumption on its own industrial sites and in its corporate offices.

Vivendi supplies over 100 million people with water throughout the world. According to estimates by World Bank experts, over 40% of the world's available water is lost through poor pipe maintenance. This is why the group is particularly concerned to prevent wastage, through better control over its water distribution networks. Because of the poor condition of the pipe networks it manages throughout the world, Vivendi has often had to invest heavily in rehabilitating them. Some networks recently entrusted to the group originally had output rates of less than 50%! In spite of the difficulties, Vivendi performance targets remain equally high, whatever a network's initial performance level. This has been the case in countries as diverse as Hungary, the Czech Republic, Kazakhstan and Mexico, where Vivendi's priority has been to rehabilitate piping systems. In Great Britain since 1995, General Utilities, Vivendi Water's British subsidiary, has been implementing a large-scale leak identification programme. In France, Générale des Eaux has used geotechnical measuring instruments for automatic centralized detection of leaks, using sensors placed in existing pipe networks. In the water distribution services managed by Vivendi in Paris, the output rate has risen from 75% to 91% in 10 years.

In the group's other business sectors, conservation of water is also a major concern. In heating network management, water saving is one of the performance criteria for assessing the quality of network maintenance. In the transport sector, wastewater-recycling systems have been installed for cleaning buses. Between 1998 and 1999, the number of buses operating out of a Connex depot equipped with a washing water recycling system rose from 2,000 to 4,000.



Output rates achieved by Vivendi's networks as a result of its investments and operating techniques





### Environmental aid mission in the Balkans.

As part of a United Nations environmental programme, Krüger, a Danish subsidiary of OTV (Vivendi Water) has been contributing its experience of soil and ground water rehabilitation to a technical investigation mission in the Balkans. The purpose of this mission is to report on the extent of soil and water contamination around the most heavily damaged industrial sites in Kosovo, Serbia, Montenegro and Macedonia. In addition, Générale des Eaux teams equipped with mobile water treatment units have been active in Turkey since the earthquake, Nicaragua and Honduras since Hurricane Mitch, and China since the floods in the summer of 1998.

### In the United Kingdom, the fight against leaks is a priority.

Supplying 3.2 million people with 900 million litres of water a day, General Utilities (Vivendi UK) is a major player in the United Kingdom water industry. Since the 1995 drought, extension projects have been undertaken to deal effectively with pipe network leaks, which account for the loss of 20 to 30% of treated water. Nearly 50 specialists have been scouring the 7,000 miles of network for leaks. Three Valleys, one of General Utilities' four subsidiaries, has reduced the leakage rate to 16% and expects to achieve a 90% output rate. The other subsidiaries are offering a "leakage insurance" scheme and financial incentives to help domestic users monitor the private sections of their piping networks.



### USFilter treats Sunoco's industrial water.

In order to focus on its strategic core businesses, the Sunoco oil company, a US "major", has delegated the management of processing water and the treatment of wastewater at its Toledo, Ohio, facility to USFilter. By taking charge of the facility's treatment unit for rehabilitation and recycling, Vivendi has achieved optimal wastewater management, featuring the separation of oil from water, the introduction of a filtration system and the recovery of used oil. USFilter was acquired by Vivendi in 1999, boosting its industrial water treatment capacity.



## Effective wastewater collection and treatment

In the absence of treatment, wastewater destroys environmental balances and jeopardizes public health. A billion people still do not have access to adequately clean water, and half of the world's population does not enjoy basic standards of hygiene. In developing countries, about 95% of illnesses are caused by contaminated water\*.

Given its control over collection networks, the quality of water admitted and the volume of water it treats every year, Vivendi pays particular attention to wastewater management. There are two indicators for monitoring the performance of such facilities: first, the reduction of pollution, as shown by comparing intake and output flows of treatment plants; second, changes in the tonnage of sludge produced by the plants. The increase in volume represents the rate of pollution per cubic metre, the number of cubic metres treated and the quantity of matter extracted from the water. Thus, after treatment, the water returned to the natural environment has been purged of its main impurities.

## Distinctive specialized techniques

The decontamination of industrial effluent is often effected in the industrial facilities that generate it themselves. This is the case with group companies such as Global Environnement, Aquarex, OTV Industries, etc. Since acquiring USFilter\*\* in 1999, Vivendi has significantly boosted its industrial water treatment capacity to 351,000 cubic metres per day, while the number of facilities has increased by 30 over three years.

With regard to agricultural effluent, treatment requires action upstream. This often takes the form of constructing structures or giving advice to farmers on how to store fertilizers or to protect effluent collection points in areas where livestock is kept, such as Brittany in France for example. These are general needs that take into account pollution risks and threats to public health. The measures to meet these needs are taken in consultation with all the players involved, i.e. elected representatives, farming professionals and the public authorities.

Leachates are also a cause for concern. They are caused by rainwater percolation and can constitute a hazard for the soil and aquifers. To prevent such pollution, Onyx has been gradually installing special drainage and watertightness systems.



**Vivendi Water's domestic wastewater treatment capacity** in millions of population equivalent.



**Changes in pollution reduction rate** for all treatment plants with capacities of >50,000 population equivalent



\* Source: WHO (World Health Organization).

\*\* As it has been acquired recently, USFilter has not been included in the 1999 Environmental Report, but will be in next year's edition.



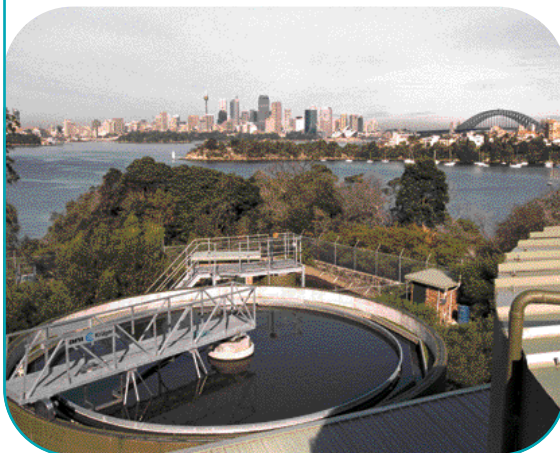


### Nanofiltration, a physical screen for all forms of pollution.

At Méry-sur-Oise, France, nanofiltration makes it possible to deliver high quality drinking water without the slightest taste of chlorine. Originally used for the treatment of surface water, this membrane technique's main benefit is that it greatly helps to reduce the use of chemical reagents. After thorough pre-treatment, the water is pressure-filtered through membranes, whose cutting threshold is about one nanometre (a billionth of a metre). These membranes can retain infinitely small organic matter, bacteria and parasites. The Méry-sur-Oise plant's nanofiltration unit, operated on behalf of the Ile-de-France regional Water Authority, treats 140,000 cubic metres of water a day and supplies 800,000 inhabitants living north of Paris.

### Sydney Zoo recycles its wastewater.

The Taronga Zoo in Sydney, Australia, is home to numerous rare creatures from all over the world. Previously, waste drained off by wastewater from the cages or moats used to be discharged into the sea in Sydney Bay, thereby badly polluting the water. OTV-Krüger, a subsidiary of Vivendi Water, has undertaken the rehabilitation of the wastewater treatment plant, allowing it to be recycled after treatment: a dual process of filtration on membrane and ultra-violet disinfection eliminates the living organisms. The treated water is then reinjected into the water distribution circuit, which carries it to the moats, feeding troughs and sprinkling systems.



### Keeping a watchful eye on wastewater collection networks.

The purpose of the "network policing" project financed by the European Union is to guarantee the quality of sludge produced by wastewater plants, by controlling the entry of pollutants into the wastewater collection network. The sludge could then be recycled for agricultural purposes. This has resulted in the creation of Actipol, a database that links economic activities with potential pollutants. It is now used by nearly all Générale des Eaux regional technical branch offices to assess the risk of sludge contamination. Moreover, in less than two weeks, it can identify potential producers of one or more pollutants within a given geographical area.



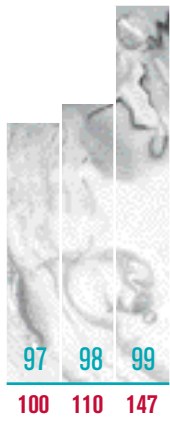
Buried under the waste, these systems capture the polluted water, which is then treated by specific techniques, such as biofiltration, catalytic ozonation and evapo-oxydation. The treated water is then returned to the natural environment without any risk of pollution. The number of landfill sites with leachate recovery systems operated by Vivendi increased by 18% between 1998 and 1999. Over half of the 130 supply centres managed by Onyx worldwide are equipped with a system for recovering or treating leachates.

## Enhancing water quality

Drinking water production processes and pipe network management methods are permanently subject to quality targets. Thanks to 300 quality parameters and three million analytical results a year throughout the world, Vivendi's laboratories can really monitor the quality of the water it treats and distributes. This enables Vivendi to watch developments on behalf of concessionaires and outsourcing authorities, and to alert them. Thus, in France, Vivendi has been helping the city of Saint-Malo's local government authorities to implement their ambitious programme of investment in protection of swimming water. In Lyons Rhone-Alpes region, Vivendi has developed the Rosalye computer program, which simulates underground water flows and predicts scenarios in case of accidental pollution. The system manages eight reinjection pools with a total surface area of 73,000 square metres.

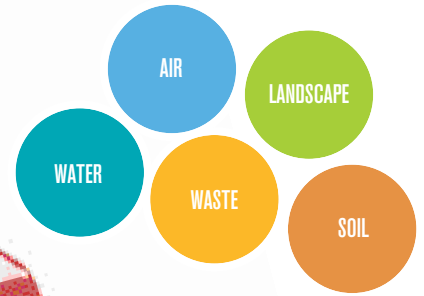
The quality of drinking water also depends on enhancing the performance of the techniques or equipment used. Membrane filtration techniques, such as nanofiltration and microfiltration (Memcor), enhance the stability of the water produced and distributed. Another benefit is that they limit the addition of chemical reagents. In addition, to comply with standards and meet consumers' legitimate demands, particularly for health-related enhancements, Générale des Eaux has been equipping itself with mass spectroscopy or ICP-MS devices, capable of detecting very low concentrations of trace elements such as heavy metals.

The know-how Vivendi has gained in preserving and enhancing water quality is recognized throughout the world. It explains the success of Vivendi's international operations, particularly in regions where drinking water distribution has had to be restored urgently in sometimes very dramatic circumstances, such as Nicaragua, Kosovo, etc. For manufacturers whose production cycles require particularly pure water, such as the pharmaceutical companies, Vivendi can provide water supply reliability and guarantee good water quality. In 1999, USFilter, Vivendi's new subsidiary, published an "Environmental Compliance Manual" listing all the protective measures that have been taken to avoid disturbing production cycles.



Changes in the quantity of sludge produced by water treatment plants  
1997 = 100  
(Vivendi Water)





Mastering  
the chain of

# waste

In addition to the constant increase in the volume of waste generated worldwide - Europe generates on average 450 kg of municipal waste per inhabitant per year - modern society has to deal with the growing diversity and complexity of the waste it produces. It is therefore essential that we should achieve total control over management methods to ensure that the natural environment is protected.

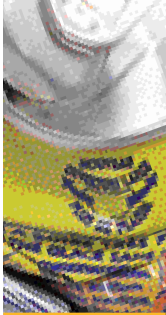


Whether domestic or industrial in origin, waste directly affects the quality of life (olfactory and visual pollution), as well as public health. Moreover, waste management must take into consideration major environmental issues such as controlling effluent and atmospheric pollution, saving natural resources, and keeping greenhouse gases under control. With this in mind, Onyx, Vivendi's waste management division, is involved at all stages of the life-cycle of waste, that is, cleaning, collection, treatment, recycling, and storage.

## Keeping treatment sites under control

To be more respectful of the environment, Onyx uses “clean” processes in its treatment facilities (materials recovery centres, incineration plants, landfill sites, etc.), in order to control and limit the impact of its activities on the environment. Treatment of emissions by household waste incineration plants, recycling of landfill site biogas, recovery and treatment of leachates are all techniques very much in line with the proposals made by major international organizations for the protection of air, water and soil. In July 1998, to provide scientific answers to questions pertaining not only to the environment but also to public health, Onyx set up a dioxin analysis laboratory in France, called the “Dioxlab”. The group, for its part, has also been developing emission treatment and residue management processes. This overall approach to controlling the environmental impact of treatment facilities also requires the thorough monitoring of incoming waste, emissions and residues to ensure traceability. The progress made by Vivendi's waste management division in controlling the effects of its activities is gradually spreading to all the countries in which the group operates, thereby transferring its environmental know-how.

|              |        |
|--------------|--------|
| Liquid waste | 733    |
| Toxic waste  | 735    |
| Solid waste  | 13,957 |



|              |               |
|--------------|---------------|
| <b>Total</b> | <b>15,325</b> |
|--------------|---------------|

**Breakdown of types of collected waste in metric tons (thousands) (1998)**

## New recycling processes

Vivendi's waste management division is heavily involved in the recycling of materials, and manages 100 materials recovery centres throughout the world. It recycles paper, cardboard, glass, aluminium and steel. With the help of CREED (Centre for research on the environment, energy and waste), and of Vivendi's energy and waste management sectors, the group







**Real-time sorting: a successful test in New Zealand.**

The city of Christchurch in New Zealand wanted to recycle household waste collected from its inhabitants, but without setting up sorting centres. The only way to resolve this conundrum was to sort the waste directly during collection. With that in mind, Onyx-New Zealand suggested an original system consisting of directly sorting the waste in the refuse collection vehicle, not only when stationary but also in motion. The back of the vehicle is fitted with five compartments and thus receives the waste ready-sorted according to type. This waste is then recovered at the depot for treatment using the most appropriate techniques and processes.


**In the USA: managing toxic waste throughout the process.**

Advanced Environmental Technical Services, owned by Onyx and located in Philadelphia's industrial zone, has a portfolio of a thousand customers, including Elf-Aquitaine, Mobil, Rhône-Poulenc and IBM. The group offers US manufacturers a comprehensive solution to their toxic waste problems, such as how to dispose of out-of-date medicines and manufacturing surpluses from the giant pharmaceutical and cosmetic companies. All the waste is sorted and then incinerated at the Montgomery plant, the only one licensed for such use in Pennsylvania.



**Recycling fluorescent tubes in partnership with industry.**

Since 1998, fluorescent tubes have been classified as "hazardous waste" owing to the mercury they contain. The Sarp Industries and Philips Lighting BV companies have pooled their considerable know-how to organize the recycling of end-of-life tubes in France. Together they have developed effective recycling technology, making it possible to recycle almost all of the fluorescent tubes collected. First, after dismantling the lights, the components are separated. Next, the various separate parts collected are sent to treatment units. Finally, after the removal of the mercury, the glass and powder are recovered by Philips Lighting, and the metal parts are passed on to metal reprocessing specialists.



has developed recovery and recycling businesses for dispersed toxic waste, such as batteries and fluorescent tubes. Similarly, through Triade, Onyx is very much involved in the recovery of end-of-life electronic products, such as computers, television sets, telephones, etc., and is participating in research programmes on the treatment of automotive industry waste (used oil, batteries, etc.) and large items of domestic refuse. Other innovative processes have also been developed for improving the collection and recycling of fatty waste from food products (30,000 tonnes treated every year) and sewage sludge.

## Energy recovery and biological recycling

These recycling techniques are all the more efficient for being part of an overall treatment and recycling plan. If the technology is available, recovered products not capable of being recycled then undergo a process of energy recovery or biological recycling. Vivendi's waste management division operates over 75 thermal treatment units and 65 composting sites throughout the world. Every year Onyx produces over 4 million MWh of electricity and thermal energy from waste incineration. This electricity is either used on site, or sold to district heating networks and industrial facilities or to the power grid.

Agronomic recycling of waste is a major challenge: if properly managed, it is particularly valuable for soil quality, especially in terms of organic content.

Onyx has long been involved in waste composting and urban sludge recycling, and is a long-standing investor in the development of fertilizers, with the help of companies specializing in this field such as Angibaud, Sede, Orval. The group has developed know-how in the treatment of compost to improve its quality, at one end of the chain, and in the sale of products tailored to farmers' needs, at the other end. With that in mind, in collaboration with Générale des Eaux, it has started work on an ambitious programme of sludge quality improvement, meeting the major environmental and public health concerns of the farming and agribusiness industries. Only product traceability can provide these industries with sufficient guarantees for the continuing safe use of these processes.



WASTE

**Triade deals with end-of-life electronic products.**

Very few television sets, computers, telephone decoders and other items of electronic equipment are treated for environmental protection at end-of-life. Yet cathode ray tube glass, for example, is charged with metallic oxide. Anticipating the tightening of regulations, CREED has embarked on a research programme, which has led to the introduction of an industrial recycling system. Managed by Triade, it consists of sorting and pre-treatment, after which products are obtained for the manufacture of new cathode ray tubes, ceramics or glass foam. These products have high added-value, thus achieving significant savings in raw materials and energy.



**Collex: the front runner in environmental protection in Australia.**

Present on the Toyota manufacturing site in Altona, near Melbourne, since 1994, Collex, Onyx's Australian subsidiary, completely manages the 4,500 metric tons of waste produced by the Japanese car plant every year. An original system has been set up in the assembly shops: everything is directly recovered on the production lines. In the warehouses, the collected waste, such as paper, cardboard, wood, and so on, is sorted and then recycled. Collex has provided specially adapted containers for collecting paint sludge. Every day, some four and a half metric tons of cartons are gathered in, plus 760 kilos of plastic a week. A compactor designed by Collex allows part of this material to be recycled. The process has resulted in the volume of waste sent to landfill being reduced by 1,000 metric tons a year.

**ISO 14001 certification for energy recovery.**

Located in the London area, the SELCHP plant is one of the group's biggest waste-to-energy facilities in Great Britain. With some 400,000 metric tons of waste incinerated every year, it generates about 200,000 MWh of electricity a year, serving 30,000 homes. In Asia, TA-HO, Onyx's Taiwan subsidiary, has just been awarded an ISO 14001 certificate for its Taichung and Shulin plants, which between them generate 267,000 MWh of electricity entirely from waste combustion. Finally, the group's Montgomery plant in the United States of America is the first waste-to-energy facility to be awarded an ISO 14001 certificate in this country.







## Treatment of special waste

The disposal of special industrial waste is all the more important to environmental protection as its toxicity can have serious effects on human health, particularly through water resources. Via Sarp Industries, Vivendi's waste management division manages 32 treatment plants and 29 storage centres for special industrial waste, treating 2.7 million metric tons a year. Since its formation, the group's division has developed numerous recycling processes to treat and recycle paint, solvents and other chemical residues.

Vivendi's waste management division is involved in all types of special waste processes, and can offer industry a wide range of treatments. Since the processes are closely associated with the nature of the waste, the product control systems consist both of a sample analysis before acceptance and of monitoring the waste, providing strict traceability from the producer to the collector and through to the processor.

|              |             |
|--------------|-------------|
| Others       | 0,5         |
| Composting   | 0,9         |
| Sorting      | 2,5         |
| Incineration | 8,0         |
| Landfill     | 10,5        |
| <b>Total</b> | <b>22,5</b> |

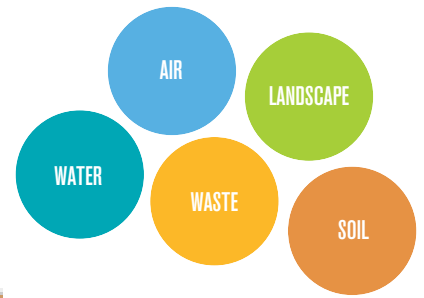
**Domestic and other waste treatment processes**  
in millions of metric tonnes (1998).

## A comprehensive waste management solution

Because its treatment processes complement one another, Onyx can offer both local authorities and manufacturers a comprehensive waste management solution. The group is able to handle the whole waste management system, whatever the nature of the waste - domestic refuse, non-hazardous industrial waste, special industrial waste, etc. It helps customers to improve their control over the environmental impact of their activities. And its services are not limited to treatment. They also include preliminary work from production process design onwards. In Australia, Collex, a subsidiary of Onyx, not only treats all the waste generated by Toyota, its customer, but is also drawing up a plan for reducing the volume of waste produced on site. In Europe, Global Environnement has signed an agreement that will ultimately involve it in the management of all the waste generated by Renault's 34 European locations. In addition, it fully exploits the know-how of the group's other businesses (water, energy, etc.). It does its utmost to improve the environmental performance of its industrial customers by creating synergy between the various businesses that make up Vivendi's environmental services division.







Protecting the  
living environment  
and

# landscape

**A comprehensive approach to protecting the environment should take into account all aspects of the quality of life and encompass all forms of pollution, including excessive noise and disfigured landscapes, which are no longer acceptable or accepted.**

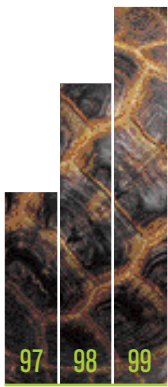


It is difficult to arrive at an evaluation of adverse effects on quality of life by using statistical indicators. Eliminating such effects is less a matter of ambitious action than of numerous initiatives taken repeatedly as and when required in order to foster “environment friendly responses.” This is the approach Vivendi has adopted: when it analysed the environmental impact of its activities, the group decided particularly to focus on the various forms of pollution and nuisance encountered in daily life, with a view to controlling and reducing them, and to preserving and enhancing our natural and cultural heritage.

## Controlling and reducing environmental nuisance

Noise, unpleasant odours and deteriorating landscapes are a plague on our daily lives, which we suffer and endure because they are always with us. However, it is possible to act effectively against them. Whether the nuisance offends our nostrils, ears or eyes, Vivendi can intervene to reduce its effects. For odours, especially from wastewater treatment plants, Vivendi has developed two processes, “Aquilair” and “Alizair”, which make it possible to eliminate bad odours almost completely. This particularly applies in the South of France, where wastewater plants located in urban areas are operated without causing any unpleasant odours for the people living nearby. So far as visual disfigurement is concerned, the group responds by systematically blending its sites into the natural landscape. This is listed as a major objective in all of Vivendi’s business sectors: telecommunications, water treatment, energy production, recycling plants, landfill sites, etc.

To date, only 33% of the masts erected and used by the SFR telephone operator are not shared with other operators. Sharing has reduced the number of masts. Cegetel-SFR is a signatory to the National Charter on Environmental Recommendations for the Protection of the Landscape signed on July 12, 1999 between the French government and mobile telephone operators, strictly committing them to compliance with their environmental obligations regarding the deployment of their networks.



1,033 1,579 1,995

Number of transmitters  
shared by Cegetel  
with other operators



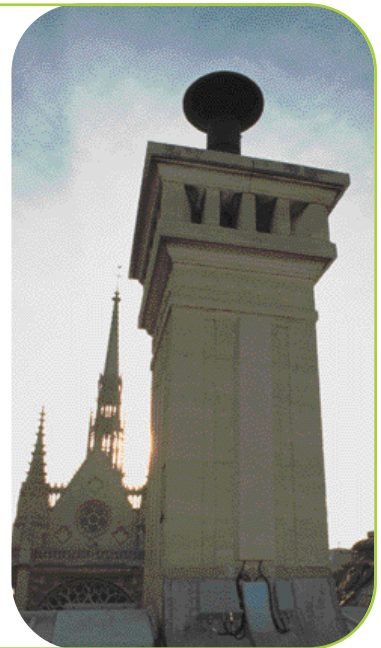
LANDSCAPE



**Keep Australia beautiful...** Since 1998, Vivendi Water Australia has sponsored a major awareness campaign by KAB (Keep Australia Beautiful), Australia's most reputed environmentalist association. In the State of Queensland, over 300 municipalities and hundreds of schools have participated in the association's initiatives. Vivendi Water has involved itself in the Clean Beach Challenge, whose purpose is to keep beaches clean; a number of local managers are also associated with it. This campaign, which is at present limited to keeping beaches clean, is expected to move on to taking initiatives for improving water quality.

**Fostering quiet waste collection.** To prevent local people from suffering from excessive noise during waste collection, Onyx has fitted some of its refuse trucks with a dual system: an electric motor for "stopping and going" during waste collection, and an internal combustion engine for normal driving. Traditional refuse trucks are also undergoing sound-insulation work. Finally, special training on how to handle containers, keep voice levels under control, and behave in a quiet way will help employees achieve quiet waste collection!

**Unobtrusive mobile telephone equipment.** In 1999, the three mobile telephone service operators in France and the French Ministry of Urban Planning and the Environment signed a national charter on environmental recommendations. It set guidelines for locating and installing mobile telephone equipment. Operators agreed to respect the natural environment and the existing architectural heritage, and to inform the government of their plans for listed sites. Since the signing of this document, many Cegetel transmitters have been installed in classified historic sites, in perfect compliance with these new guidelines.



**Aquilair and Alizair treat wastewater treatment odours.**

The collection and treatment of wastewater produces unpleasant odours for local residents living in the vicinity of treatment plants. The group has therefore developed the Aquilair and Alizair processes to keep these odours under control. They are caused mainly by sulphur and ammonia fumes. One process scrubs the air chemically by transferring odour-bearing molecules in liquid phase, while the other process removes odours by means of biofiltration.

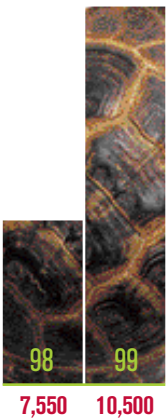


Finally, to deal with noise nuisance, the increasing use of quieter vehicles for public transport by Connex and for refuse collection by Onyx in inner city areas has considerably reduced noise levels. Similarly, invasive techniques, which make it possible to explore and replace inner-city piping networks without having to dig trenches, have also helped to reduce noise nuisance in cities.

## Protecting our natural and cultural heritage

In many sectors, it is clearly possible to combine the most modern technologies with respect for historic sites. This applies both to Cegetel's works carried out under the supervision of French state architects, particularly in classified or listed buildings, and to the precautions taken to blend water treatment plants (Amphitria, Antibes, Monaco) or heating installation stacks into the landscape.


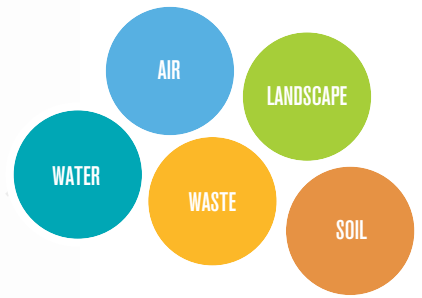
Also worthy of mention are our actions to save fauna and flora, and to prevent the landscape from deteriorating. In Great Britain, 119 sites located in areas in which General Utilities operates have been listed as "of Special Scientific Interest." In Australia, Vivendi Water Australia has embarked on a "Clean Beach Challenge" programme. In the United States, USFilter has played an active part in saving Salton Sea Lake in southern California. On behalf of the Urban District of Lyons, France, Vivendi has assumed responsibility for a nature reserve, in which environmental protection is strictly enforced: shooting and fishing are prohibited, and subcontractors must observe a strict set of specifications. All these initiatives are the results of the implementation of our environmental priorities.



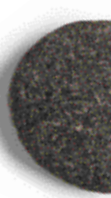

Number of drinking water connections replaced by Sade, a subsidiary of Générale des Eaux, using "trenchless" techniques.










# Conserving the structure of SOIL



**Spontaneous soil regeneration is a very slow process because a new 2.5 centimetre layer of soil takes five centuries to form. The prevention of soil degradation and restoration of degraded soil to health are among the major environmental challenges future generations will have to face.**





Soil conservation calls first and foremost for the strict management of the sludge generated by water and waste treatment plants. The challenge is all the more complex as the generation of sludge has been increasing automatically due to improved wastewater decontamination processes. In 1998, the total volume of sludge generated by water and waste treatment plants amounted to around 490,000 metric tons of dry matter. Today, however, 60% of such sludge is recycled, which means it has to be stabilized and disinfected to eliminate metallic and organic micro-pollutants.

## Decontaminating the soil

Through Générale de Restauration des Sols-Valtech (GRS Valtech), a subsidiary of Onyx, Vivendi provides techniques originally developed for rehabilitating landfills. A wide range of treatments is now available, such as ventilation or the injection of “pollution-eating” bacteria. Research is still in progress: it is now targeting the treatment of particularly harmful forms of pollution such as that caused by mercury, cadmium or arsenic. These research programmes qualify for recognition as Grands Projets Innovants (GPIs or “Major Innovation Projects”) by the French Ministry of Industry, and are supported by European Union subsidies.

Vivendi’s accumulated expertise in the treatment of contaminated soil is applied on the sites the group manages. It also translates into the provision of services to industry or local authorities, meeting demand for the decontamination of derelict industrial land whose use is going to be changed. The idea is to keep health risks under control so that old factory sites, for example, can be converted into sports facilities.

There are other initiatives aimed at preventing soil degradation. One example is Socorail, a subsidiary of Connex specialized in private branch lines. It has decided to use hydraulic traction to solve the problems caused by deposits of lubricants on rail tracks. This initiative is a good example of strict control of polluting activities down to their slightest effects, and a contribution to the fight to maintain soil structure.





### Industrial site decontamination: real know-how.

At Ollainville, in the Paris Ile-de-France region, the Akzo company had to carry out soil decontamination work on its industrial site by order of the local central government representative. This former paint factory is located close to a residential area. Two rivers flow nearby and beneath the subsoil there is a large aquifer. Over a period of two years, GRS Valtech treated 95,000 metric tons of soil in situ. For the first time in France, 80,000 metric tons were treated by thermal desorption, i.e. heating the soil in high-temperature furnaces, and 15,000 metric tons by biological methods, i.e. injecting oxygen and nutrients to stimulate the bacteria present in the contaminated soil. At the same time, the water in the aquifer was treated by "air stripping": the air was evacuated in bubbles to discharge the pollutants into the atmosphere, and the gaseous effluent was treated as required in a biofilter.



### The "Green tip" in Montreuil-sur-

**Barse.** In Montreuil-sur-Barse, in the Paris area, Vivendi's waste management division has set up a pilot storage site for waste soil. This landfill site is a real "green tip", operated with strict regard to environmental management, featuring: integration into the landscape; protection of the soil, subsoil and ground water; capture and recycling of biogas; optimal energy consumption; and so on. Every day, ten per cent of the 350 metric tons of waste soil delivered to the site are poured into four experimental containers, in which various hermetic sealing devices are tested. The performance of the various types of soil is analysed over a period of time and used to produce computer models. The devices introduced as a result of this have allowed the plant to qualify for ISO 14001 certification, the international environmental management standard. This is a good illustration of the benefits of heightened environmental awareness leading to the implementation of practical solutions.

# Our objectives

Vivendi has decided on its environmental priorities for the next five years.

## Research, development

The budget allocated to environmental services will be increased by 30% over the period in question.

## Training

In environmental service sectors, one third of total expenditure on vocational training and of all training courses will be dedicated to enhancing environmental performance.

## Environmental management

To increase the number of persons covered by ISO 14001 certification by at least 10% a year.





**Vivendi has adopted a genuine environmental protection strategy. The group's environmental policy has set priorities in areas as diverse as research and innovation, training and employee awareness enhancement, cooperation with partners, organization and management.**



# Research, innovation



**The Vivendi teams pursuing research, development and innovation devote all their efforts to environmental protection. Their work consists of developing the tools best suited to preserving each living environment affected by Vivendi's activities. Such tools include methods of analysis, treatment processes, recycling and recovery methods, in each of which they are determined to be precursors.**

Environmental research at Vivendi represents a budget of over 92 million euros, and mobilizes over 600 researchers entirely dedicated to environmental matters. This research work relies on an international network of more than 15 research centres and laboratories. They include Anjou Recherche for Water Research and the Centre for the Environment, Energy and Waste (CREED), the first private analysis centre in Europe, which covers all waste-related areas of research. It also focuses on energy, and notably alternative sources of energy.

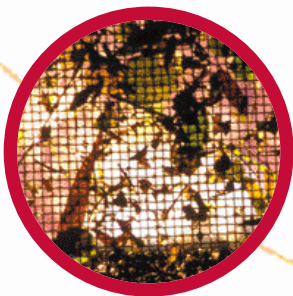
## **Air**

The CREED centre is interested in testing other renewable sources of energy such as biogas or biomass, with the installation of low power photovoltaic and wind demonstration systems. Connecting these systems to a fuel cell storage system has also stimulated thinking about overall energy management in self-sustained sites. Vivendi is also participating in studies on the impact that new information technologies will have on transport,

particularly when they can facilitate intermodal means of public transport.

## **Water**

Due to the many origins and forms of water pollution, more knowledge is needed in order to provide appropriate responses. This is one of the priority missions of research, which has two implications. On the one hand, increased vigilance against micro-biological contamination, leading in particular to the development of new methods of molecular biology. One of these methods allows pathogenic organisms present in water to be detected more quickly and more accurately than traditional methods that use cultures.





Developed at the Aquabiolab laboratory in partnership with the Pasteur Institute, these particular special probes should revolutionise quality control of drinking water. On the other hand, the development of membrane techniques is certainly the major technological breakthrough of recent years. Indeed, regulatory pressure in industrialised countries and the increasing shortage of water in other countries are leading to the use of these techniques in the production of drinking water and also in the recycling of wastewater. Today they are the right solutions to most water quality problems found in the world, in the study of which Vivendi has already invested considerably over the last ten years.

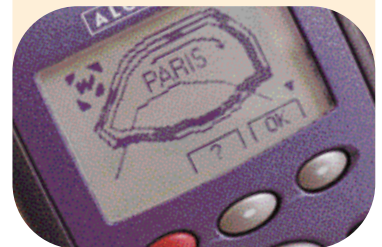


### **Waste**

The priority in this area is to reduce the migration of contaminating substances into the natural environment: water, air and soil. Waste collection efficiency is enhanced by the use of new technologies and methods, such as the optimization of waste collection vehicle itineraries, onboard IT systems to weigh loads during waste collection, the traceability of dispersed waste (used oil, grease, etc.). Optimum waste recycling and recovery requires the implementation of selective waste collection adapted to local circumstances, as well as special dismantling and recycling channels for electrical and electronic equipment, scrapped vehicles, plastics from industrial waste, batteries, and so on and so forth.

### **The positive impact of new information and communication technologies (NICT) on the environment.**

The internet boom has led Vivendi, a major player in this field, to innovate in the area of technology convergence between IP, mobility, fixed and mobile telephony, information systems, broadband technology, etc., with a view to accessing multimedia content and to fostering the development of e-commerce. Applied to environment protection, these possibilities are real and are specially aiming at better information for the public, remote equipment management and optimizing mobility.



# Research, innovation



## **Compliance with public health quality standards and guidelines.**

Analytical tools are essential for identifying new pollutants, understanding how they spread, developing adequate means to treat them and supplying plants with self-monitoring capabilities. Correct anticipation requires permanent scientific, technical and regulatory vigilance on both a national and international scale, as systems of reference often differ greatly from one country to another.



In terms of treatment, a full range of technically reliable processes that limit the impact on the environment of dioxin and NOx emissions are being developed, featuring incineration systems and structures for containing landfill sites. Finally, a comprehensive quality assurance procedure is systematically applied to recoverable products devised from waste, whether for the qualification of sludge for agriculture or for grading substitute fuels derived from grease or plastics, for example.

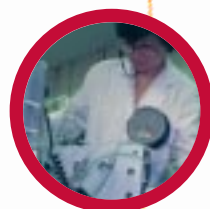
## **Soil**

Research has focused on metal-related pollutants such as chromium and arsenic, and on pollutants related to organic products such as hydrocarbons, chlorinated solvents, etc. The aim is to develop methods for identifying and diagnosing the pollutants to be treated, as well as economically efficient treatment processes. In-depth studies have also been carried out on the environmental effects of landfills and the impact of land application of sludge on soil.

## **Global partnerships**

Our research efforts are enhanced by continual cooperation, not only between researchers, engineers and industrial plant operators, but also with the whole scientific community. There are numerous partnerships with universities and large French and

international research organizations. Thus, in France, there are partnerships with the Pasteur Institute, the National Agricultural Research Institute, in the fields of sludge treatment and recycling and landfills; the BRGM and the Mining School, for the study of contaminated soils; Cemagref, in the area of selective collection and landfills; and the CNES, the French space research centre, for optimal water resource management\*. Outside France, there are partnerships with Georgia Tech University in the United States to study the socio-economic aspects of water management; EAWAG in Switzerland for pre-regulatory research into pollutants in traces; the Australian Water Quality Centre for the study of algae problems; the University of Science and Technology of Hong Kong, etc.



\* Under an agreement signed on November 2, 1999, France's CNES and Vivendi decided to embark on a joint study of the contribution of new space technologies in two areas: the evaluation and protection of water resources and vehicle fleet management ("Intelligent Transport System").





# Training, awareness

**In the activities of companies such as Vivendi, know-how and professionalism play an important part. For the group, employee training has long been a major concern in all business sectors. Today, a significant part of what we undertake in the field of employee training is specifically dedicated to environmental protection.**

## **A decentralized approach and innovative methods**

Set up in 1993 by Onyx, the Urban Environment Institute (UEI) was the first educational centre devoted to waste management and transport. It provides initial training for more than 500 young people annually and organizes numerous continuing training courses.

Two major initiatives were taken in 1999. First, the activities of the UEI took on an international dimension, particularly in Great Britain with the establishment of an "associate centre" near London, named the UK College of the Environment. Other similar centres are being set up in Spain, the United States and Australia. Second, a partnership was set up with the University of Paris IX Dauphine to establish a degree course focusing on environmental action.

The training centres of Vivendi's other business sectors also have

a strong environmental dimension. In 1999, Générale des Eaux allocated 3.2% of its annual pay-roll to vocational training. Exactly 34.8% of this allocation benefited to tuition relating to water production technologies, wastewater treatment and water quality control. Dalkia emphasized optimal plant energy use. As for USFilter the group decided to finance all employees who wished to intensify their training in a subject related to the environment.

In the classroom, great use is made of CD-ROMs. The educational software program "Monitoring a Pumping Station by Remote Control" has the reduction of energy consumption as a central theme. On the subject of wastewater collection and treatment, another CD-ROM sets out the rules governing the application of the European directive and emphasizes system safety.



# Training, awareness

## After the storms: Vivendi's support.

In the exceptional circumstances created in France by storms at the end of December 1999, Vivendi responded with an exceptional measure: it allocated 1,5 million euros to support initiatives aimed at restoring forest sites. These funds will go to purchase the required equipment and to hire the most suitable people.



In addition, interactive teaching aids are routinely used. These take the form of training kits such as 'Aqua' on drinking water quality, 'Amadeus' for improving the quality of analyses, and 'Formadeus', whose content is aimed entirely at reducing the environmental impact of the operation of treatment plants. The aim is to gradually train all employees working in this sector over a period of one to three years.

## The Vivendi Foundation

With a budget of 4,5 million euros per year, the Vivendi Foundation has provided support for 1,000 public utility projects since it was set up four years ago. It has also helped to create or consolidate 10,000 jobs in local community services. A quarter of the projects backed by the Vivendi Foundation have had a direct positive effect on the environment. They have raised awareness and enhanced education in environmental protection.



They also have led to the creation of new physical planning services in rural and highland areas such as the Pyrenees, along the Mediterranean coast or even in urban areas such as the left bank of the Seine in Paris. Thanks to the Foundation, people in difficult circumstances have found a job and obtained a qualification. New types of jobs have appeared, such as environment workers, coastal rangers and ambassadors of household waste sorting.

The formula whereby a Vivendi employee sponsors each project reinforces involvement of group staff in environmental problems.

## An ongoing dialogue

Educational tools along with visual aids and games are used at open days to inform school pupils about the hydrological and waste cycle, and to heighten their awareness of the need to preserve the natural environment. This approach is being developed internationally: Three Valleys Water, Vivendi UK subsidiary, has distributed 800 teaching packs to schools in the areas in which it operates. Havas, through its subsidiary Nathan, has also developed special expertise in this area of environmental education in the form of printed texts, more complex packages (teaching packs...), or Web sites for schools such as [www.internetecole.fr](http://www.internetecole.fr).

For example, a teaching pack on agriculture, translated into



13 languages, will soon be distributed to 60,000 schools in the 15 countries of the European Union.

On a broader front, some Vivendi companies in the UK are involved in a "citizens' programme" called QE3 (Education, Employment and the Environment). Its achievements include helping to create a forest

discovery centre (the Onyx Environmental Trust) and financing a Chair of the Environment at the University of Hertfordshire (Three Valleys Water). In the energy sector, Dalkia in France has conducted a series of seminars on the problems of air pollution in hospitals, in conjunction with professionals and experts. Another initiative taken by Onyx was to set up an opinion barometer on environmental protection (BOPE) with the help of a centre specializing in public opinion surveys and research, to improve perception of demands from the public, especially regarding waste management. In the Brazilian state of Paraná, as part of the management of the Curitiba plants, teams of social workers have deployed an original method of raising awareness among the women leaving in the favelas.

This initiative, which takes into account the social and cultural dimensions of these underprivileged urban areas, is aimed at achieving a realization of the importance of wastewater collection and treatment systems. All the examples mentioned illustrate the importance of raising the environmental awareness of individuals, groups and institutions. To this end, modern communication and teaching methods and tools are very effective, provided the cultural specificities of each target audience are taken into account so as to maximize the impact.





# Organization, management of the environment



Meeting the expectations of consumers, customers and people active in community life calls for an environment management system that includes the protection of the environment at all stages of the production cycle. For more effective action in favour of the environment, Vivendi's approach to environment management revolves around four major features:

**1 Annual assessments of the environmental performance of each Vivendi site:** this initial assessment shows Vivendi's commitment to initiating an ongoing process of managing the environmental risks generated by its many business activities.

**2 Strengthening of internal networks for observing and analysing Vivendi's impact on the environment** using qualitative and quantitative indicators. The information thus collected is for both internal use, to help draw up action plans, and for the use of Vivendi's shareholders, customers, partners and employees, who are entitled to information on the risks run and the systems for keeping these risks under control. Furthermore, the supervision of compliance with regulations, already in place within each business sector, is now in the process of being established at group level.

**3 Implementation of a policy of environment friendliness based on quality control procedures.** Compliance with this policy will also be required of Vivendi's suppliers and subcontractors, who will be asked to sign undertakings to comply with this policy and with an environmental code of ethics. Each of Vivendi's business sectors has appointed a head of environment policy and set quantified objectives for improving environmental performance. Action programmes are being implemented, which include staff training in risk analysis as well as risk management.

**4 The development of "clean" production methods and the fight against new forms of pollution,** particularly through a research, development and innovation policy highly focused on environmental concerns, in partnership with members of the international scientific community.







**Quality control procedures**

In order to capitalize on the experience gained from ISO 9000 certification, Vivendi is now concentrating on ISO 14001 certification procedures, owing to their international scope and environmental content. The group already has 44 certificates. The first business sectors to take such quality-enhancing action in France and abroad were energy, water and waste management. For example, 25 Dalkia units have been certified in the fields of district heating networks and industry. In waste management, the Chatuzange landfill site in the Rhône-Alpes region was the first in France to be ISO 14001 certified. In the wastewater sector, the Antibes and Monaco plants operated by OTV-Générale des Eaux were pioneers in this respect.

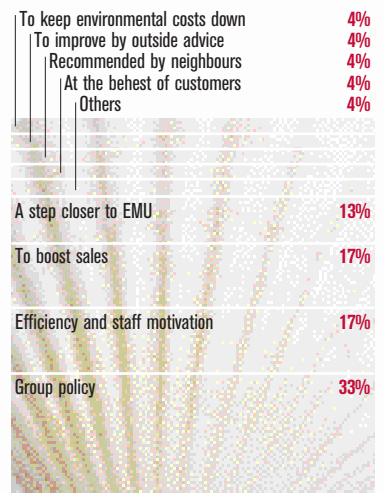
Vivendi has also obtained several ISO 14001 certifications in emerging markets, such as for the Shulin and Taichung incineration plants in Taiwan. In Australia, United Water,

a subsidiary of Vivendi, was the first company in the water sector to obtain such certification. In industry, ISO 14001 certification can contribute considerable added value to the services provided for companies faced with often complex environmental regulations. This explains why Vivendi participates in its customers' ISO 14001 audits. Thus, Global Environnement, a subsidiary of Onyx, has contributed to a Renault plant's ISO 14001 audit, in Flins near Paris.

However, the commitments made under certification procedures go beyond bringing staff to keep good environmental control over their facilities and to prevent pollution. They also include compliance with regulations, the cultivation of transparency in dealings with players from outside the company, such as neighbours, elected representatives, associations, etc., and an emphasis on cost-cutting. All these concerns are part and parcel of Vivendi's policy of environmental safety and quality.

**Vivendi and the ISO 9000 standard**

- 244 certificates have been awarded;
- involving over 70 companies;
- 45,000 employees in Europe work for a Vivendi company that has qualified for ISO 9000 certification.



**Why French companies undertake ISO 14001 certification.**



# Glossary

## **Biogas**

Gas discharged by the fermentation of waste in a landfill site. Because of its methane content, biogas is a source of energy: when captured by drains, it can be turned into electricity or thermal energy.

## **BOD / Biochemical Oxygen Demand**

The quantity of oxygen consumed at 20° over a given period of time (generally five days) to achieve the biological oxidizing of any organic matter present in water.

## **Cogeneration**

A technique that produces steam and electricity simultaneously. This blending of electrical and thermal KWh is considered to be the most economical way of producing electricity.

## **CO<sub>2</sub>**

Carbon dioxide, one of the major "greenhouse effect" gases.

## **Dioxin**

This is a family of chlorinated organic substances that appear during combustion processes of organic matter when chlorine is present. A by-product of thermal treatments, dioxin is generated by industrial processes, notably in the steel, metallurgy and waste incineration sectors. Out of the 210 dioxins in existence, only 17 are considered to be toxic.

## **Energy recovery through incineration**

Combustion of waste can produce electricity and/or supply a heating network with the required energy.

## **GPS / Global Positioning System**

Thanks to on-board equipment, it allows vehicles to be located wherever they are.

## **GSM / Global System for Mobile Communication**

A pan-European standard for mobile telephone networks.

## **Household waste or domestic refuse**

What you find in household dustbins (garbage cans), such as left-over food, garden waste, packaging materials, etc.

## **IP**

Internet Protocol.

## **KTEC**

Kilotonne of carbon equivalent.

## **Landfill sites**

The landfill sites of the 21<sup>st</sup> century have nothing in common with their predecessors, which all too often scarred our landscape. Modern sites are impervious, which means they can protect air, water and soil from pollution.

## **Leachates**

In waste storage sites, rain water can pick up pollutants when it runs off. This polluted runoff rain water is called "leachate" or, more familiarly, "leaching juice". Efforts are continually made to equip landfill sites with drains capable of catching leachates, which are then treated as required.

## **LPG / Liquefied Petroleum Gas**

A fuel which does not discharge lead or benzene, and whose sulphur content is very low. It therefore very significantly reduces noxious emissions: in the case of carbon dioxide, by 75% instead of 40%.

## **Methane**

A colourless and inflammable gas. It is discharged by vegetable matter in a state of decomposition, i.e. by the fermentable part of household waste.

## **NGV / Natural Gas for Vehicles**

This gas greatly reduces nitrogen oxide emissions and almost completely eliminates particle emissions.

## **NICT / New Information and Communication Technologies**

These are mainly internet-related or internet-enabled technologies.

## **Non-hazardous industrial waste**

Waste that is similar to household waste.

## **Nanometre**

A billionth of a metre

## **NOx**

Nitrogen oxide, composed of nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>).

## **Recycling of organic substances**

Transforming the putrescible part of waste into compost. On average, organic waste accounts for 65% of a metric ton of household waste.

## **Scattered toxic waste**

Toxic or hazardous waste from products used by small and medium-sized companies, the self-employed, farmers, laboratories, etc.

## **Special industrial waste**

This waste contains particularly hazardous pollutants, such as solvents, tar, acid, moulding sand, cyanide-treated hardening salt, etc., and needs to be treated in special facilities.



## Contacts

### Correspondents Vivendi Environnement

**Vivendi Water: Dominique Olivier**

E.mail: dominique.olivier@generale-des-eaux.net  
Tel.: +33 1 49 24 49 24 Fax: +33 1 49 24 69 01

**Dalkia: Patrick Schwartzmann**

E.mail: pschwartzmann@dalkia.com  
Tel.: +33 1 71 00 71 00 Fax: +33 1 71 00 72 10

**Onyx**

**Connex: Eric Lesueur**

E.mail: elesueur@cgea.fr  
Tel.: +33 1 46 69 30 00 Fax: +33 1 46 69 34 91

### Correspondents Vivendi Communication

**Havas: Michel Maurel**

E.mail: michel.maurel@havas.fr  
Tel.: +33 1 53 53 30 00 Fax: +33 1 53 53 32 86

**Cegetel: Stéphane Debarbieux**

E.mail: stephane.debarbieux@cegetel.fr  
Tel.: +33 1 71 08 32 34 Fax: +33 1 71 08 33 28

### Correspondents Vivendi

**Carol-Anne de Carolis**

E.mail: de-carolis@group.vivendi.net  
Tel.: +33 1 71 71 10 00 Fax: +33 1 71 71 11 79

**Jacques Hayward**

E.mail: hayward.jacques@group.vivendi.net  
Tel.: +33 1 71 71 10 00 Fax: +33 1 71 71 18 68

**Dominique Héron**

E.mail : heron.dominique@group.vivendi.net  
Tel.: +33 1 71 71 10 00 Fax: +33 1 71 71 10 15

**Catherine Moulin**

E.mail: moulin.catherine@group.vivendi.net  
Tel.: +33 1 71 71 10 00 Fax: +33 1 71 71 18 91

[www.bilanenvironnement.vivendi.com](http://www.bilanenvironnement.vivendi.com)

**Vivendi Strategy  
and Development**

**Vivendi Corporate  
Communications**

Design and production:



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Photo credits:

Vivendi, Jacques Boissay,

Bruno Delessard,

Philippe Lesage,

André Hampartzoumian,

Laurence Medard

and Philippe Perez Castaño.



42 avenue de Friedland  
75380 Paris cedex 08  
Tel +33 1 71 71 10 00  
Fax +33 1 71 71 10 01  
[www.vivendi.com](http://www.vivendi.com)

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