Report

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Air Pollution from Waste Disposal:

Not for Public Breath

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Tables and Figures

1. Introduction

This report addresses five case studies on incineration and co-incineration of waste in the European Union with regards to the accomplishment of the main Directives aimed at regulating air pollution.

Air emissions and air quality policies are among the older environmental policies. They have effectively made remarkable progress, particularly in the context of acid rain during the 80's[1]. However, as energy demand and energy prices increase, climate change continues to challenge industrial modes of production and consumption.

It is at the crossroads of the energy crisis (e.g. lack of fossil fuel reserves in the EU) and an increasing generation of waste that the incineration of waste as an option for disposal has gained momentum in the last decade. However, civil society has contested the incineration of waste from several perspectives[2].

First, from a health and environmental risk standpoint[3]. Despite the adoption of pollution abatement measures, the release of pollutants to air, soil and water is an unavoidable consequence of waste incineration. Among others, dioxins, heavy metals and particulate matter cause well-known respiratory diseases, cancer, immune system damage and reproductive and developmental problems[4].

Second, once incinerators are operating, a constant flow of waste (e.g. unsorted waste) is expected to be feeding these operations. Thus, they can potentially create a technological lock-in since further policy developments on waste prevention, separate collection, re-use and recycling will be discouraged.

[1] http://www3.epa.gov/region1/eco/acidrain/history.html
[2] http://www.zerowasteeurope.eu/2015/11/press-release-landfill-ban-a-false-path-to-a-circular-economy/
[3] http://www.bsem.org.uk/uploads/IncineratorReport_v3.pdf
[4] http://www.bsem.org.uk/recent-studies/the-health-effects-of-waste-incinerators/36/

Third, from the point of view of energy conservation, since according to life cycle analysis, incineration is less preferable than the re-use and recycling of materials.[5]

This report deals with pollutants released into the ambient air, as related to the limit values required by the EU Directives. Five case studies are addressed, navigating the most relevant dimensions of air pollution caused by incineration and co-incineration, namely emission limit values (e.g. values as measured at the point of emissions, for example a stack emissions), immission limit values (e.g. ambient air quality standards, values as measured by public monitoring devices), procedural conflicts in the issuing of permits and legitimacy conflicts when it comes to the valuation of alternative options for waste management.

[5] http://www.sciencedirect.com/science/article/pii/S0956053X0800439X

2. EU Policy framework overview concerning air pollution

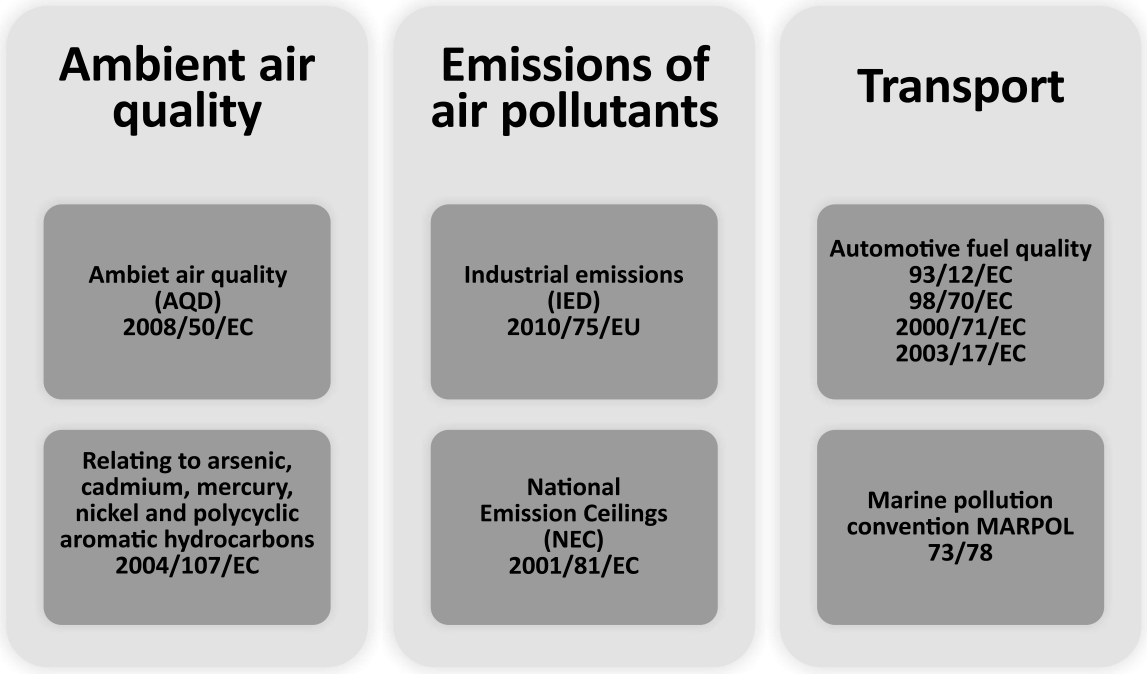
Air pollution policies have one of the longest backgrounds among environmental policies in Europe. The most recent packages of measures are the Thematic Strategy on Air Pollution[6] of 2005 and the Clean Air Policy Package[7] of 2013. These instruments set air quality targets for the period up to 2030.

Figure 1 shows the articulation of the European policies and Directives on air pollution. They focus in three main fields of action, namely ambient air quality (as measured by immission values), emissions of air pollutants, and transport. Fields 1 and 2 are the most relevant for the purpose of this work, since on the one hand waste incineration and co-incineration (e.g. cement kilns) are regulated (e.g. permits and limit values) under the legal frame of industrial emissions (Directive 2010/75/EU). On the other hand their effects on citizens is measured and regulated through the Directive 2008/50/EC on Ambient Air Quality (AQD). The following sections address the most relevant legislation on these two areas in order to set the benchmark for both emissions and immission limit values. These Directives set the quantitative, qualitative and procedural basis on which data from the case studies is checked against.

Moreover, the Waste Framework Directive (2008/98/EC[8]) is also taken into account, provided that it sets the so-called "waste hierarchy" criterion by which incineration is the second least preferable management option second only to landfill disposal.

[6] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52005DC0446&from=EN
[7] http://ec.europa.eu/environment/air/clean_air_policy.htm
[8] http://ec.europa.eu/environment/waste/framework/

Figure 1. Articulation of European Directives in the field of air pollution.



Source: Own elaboration.

2.1. EU LEGISLATION ON EMISSIONS

Regulation on emissions addresses two main points: National Emissions Ceilings (NECs), and Industrial Emissions.

Regarding NEC, the Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants (NEC Directive) "*sets upper limits for each Member State for the total emissions in 2010 of the four pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia), but leaves it largely to the Member States to decide which measures – on top of Community legislation for specific source categories – to take in order to comply*"[9]. This Directive is currently under revision[10] in order to set the targets to be met by 2020 and 2030.

For the purpose of this report, the regulation on industrial emissions is the most relevant since it set the limits to be met by individual industrial installations. In this field, legislation has evolved during the last decade resulting into an integrated framework as represented by the current Directive 2010/75/EU on industrial emissions (IED). The IED entered into force on 6 January 2011 and had to be transposed by Member States by 7 January 2013. On January 2014 the IED repealed and replaced previous legislation in place, namely Directive 2008/1/EC on integrated pollution prevention and control (IPPC), Directive 2000/76/EC on waste incineration, Directive 1999/13/EC on activities using organic solvents and Directives 78/176/EEC, 82/883/EEC and 92/112/EEC, concerning titanium dioxide production.

[9] http://ec.europa.eu/environment/air/pollutants/ceilings.htm
[10] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52013PC0920

Given that the cases addressed in this study refer to the period prior to 2014, the IED, the Directive 2000/76/EC on waste incineration and the Directive 2008/1/EC on integrated pollution prevention and control would be the main pieces of legislation to be considered in order to determine if air breaches have occurred in individual industrial installations. Table 1 to 6 summarise the emissions limit values as expressed in these Directives[11]. As it can be observed, higher values for total dust and NO_x emissions are allowed for cement kilns although it has been pointed out that dust emissions might be effectively higher when fuels made from waste are used[12].

Apart from these limit values, the IED includes the requirements for permits and a core concepts such as "best available techniques" (BAT[13]) inherited from the Directive 2008/1/CE on Integrated Pollution Prevention and Control (IPPC Directive). BAT is defined in article 3(10) as: "the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole: 'techniques' *includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned; 'available techniques' means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator; 'best' means most effective in achieving a high general level of protection of the environment as a whole".*

This concept is relevant because emission limit values are set according to BAT, although no specific technology is prescribed (article 15.2) nor discarded in principle.

Table 1. Air emission limit values for waste incineration plants, daily averages.

Pollutant	mg/Nm^3
Total dust	10
Gaseous and vaporous organic substances, expressed as total organic carbon (TOC)	10
Hydrogen chloride (HCl)	10
Hydrogen fluoride (HF)	1

[11] These values are referred to measurements made under the following conditions: Temperature of 273,15 K; Pressure of 101.3 kPa and after correcting for the water vapour content of the waste gases; Standardised at 11% oxygen in waste gas, Except in case of incineration of mineral waste oil as defined in point 3 of Article 3 of Directive 2008/98/EC, when they are standardised at 3% oxygen, and in the cases referred to in Point 2.7 of Part 6 of the IED.

[12] http://www.aitecambiente.org/Portals/2/docs/pubblici/Documenti/Raccolta%20bibliografica/AITEC_CESISP_Stato%20arte%20-%20letteratura/Mokrzycki%202003_AFR_RE.pdf

[13] http://eippcb.jrc.ec.europa.eu/reference/

Pollutant	mg/Nm^3
Sulphur dioxide (SO_2)	50
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2 for existing waste incineration plants with a nominal capacity exceeding 6 tonnes per hour or new waste incineration plants	200
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2 for existing waste incineration plants with a nominal capacity of 6 tonnes per hour or less	400

Source: Directive 2010/75/EU, Annex VI part 3.

Table 2. Air emission limit values for waste incineration plants, half-hourly averages.

Pollutant	mg/Nm^3
Total dust	30
Gaseous and vaporous organic substances, expressed as total organic carbon (TOC)	20
Hydrogen chloride (HCl)	60
Hydrogen fluoride (HF)	4
Sulphur dioxide (SO_2)	200
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2 for existing waste incineration plants with a nominal capacity exceeding 6 tonnes per hour or new waste incineration plants	400

Source: Directive 2010/75/EU, Annex VI part 3.

Table 3. Air emission limit values for waste incineration plants, over a sampling period of a minimum of 30 minutes and a maximum of 8 hours.

Pollutants	mg/Nm^3
Cadmium and its compounds, expressed as cadmium (Cd)	0.05
Thallium and its compounds, expressed as thallium (Tl)	0.05

Pollutants	mg/Nm^3
Mercury and its compounds, expressed as mercury (Hg)	0.05
Antimony and its compounds, expressed as antimony (Sb)	Total 0.5
Arsenic and its compounds, expressed as arsenic (As)	
Lead and its compounds, expressed as lead (Pb)	
Chromium and its compounds, expressed as chromium (Cr)	
Cobalt and its compounds, expressed as cobalt (Co)	
Copper and its compounds, expressed as copper (Cu)	
Manganese and its compounds, expressed as manganese (Mn)	
Nickel and its compounds, expressed as nickel (Ni)	
Vanadium and its compounds, expressed as vanadium (V)	

Source: Directive 2010/75/EU, Annex VI part 3. Directive 2000/76/EC Annex V. Note: These values are the double for those plants or which the permit to operate has been granted before 31 December 1996, and which incinerate hazardous waste only.

Table 4. Air emission limit values for waste incineration plants, over a sampling period of a minimum of 6 minutes and a maximum of 8 hours.

Pollutants	ng/Nm^3
Dioxins and furans	0.1

Source: Directive 2010/75/EU, Annex VI part 3. Directive 2000/76/EC Annex V.

Table 5. Air emission limit values for waste incineration plants for carbon monoxide (CO) in the waste gases.

Type of measurement	mg/Nm^3
Daily average value	50
Half-hourly average value	100
10-minute average value	150

Source: Directive 2010/75/EU, Annex VI part 3. Directive 2000/76/EC Annex V.

Table 6. Emission limit values for cement kilns co-incinerating waste.

Total emission limit values	**mg/Nm^3**
Total dust (daily average value)	30
HCl (daily average value)	10
HF (daily average value)	1
NOx[14] (daily average value)	500
Cd + Tl (see notes)	0.05
Hg (see notes)	0.05
Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V (see notes)	0.5
SO_2 (daily average value)	50
TOC (daily average value)	10
	ng/Nm^3
Dioxins and furans	0.1

Source: Directive 2010/75/EU, Annex VI part 4. Directive 2000/76/EC, Annex II. Notes: daily average values based on half-hourly averages. Average values over the sampling period of a minimum of 30 minutes and a maximum of 8 hours for heavy metals. Average values over the sampling period of a minimum of 6 hours and a maximum of 8 hours for dioxins and furans. All values are standardised at 10 % oxygen.

2.2. LEGISLATION ON AIR QUALITY

The main piece of legislation regarding ambient air quality is the Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. It integrates the contents of Directives related to air quality as the Air Quality Framework Directive 96/62/EC[15] on ambient air quality assessment and management, Directive 1999/30/EC[16] relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air, Directive 2000/69/EC[17] relating to limit values for benzene and carbon monoxide in ambient air, the Directive 2002/3/EC[18] relating to ozone in ambient air, and includes additional limit values on $PM_{2.5}$.

[14] Until 1 January 2016, the competent authority may authorise exemptions from the limit value for NOx for Lepol kilns and long rotary kilns provided that the permit sets a total emission limit value for NOx of not more than 800 mg/Nm^3.
[15] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31996L0062
[16] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31999L0030
[17] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32002L0003
[18] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32002L0003

The Air Quality Directive (AQD hereafter) sets the limit values as well as the procedures for measurement and validation (e.g. standards and statistical significance requirements) for a number of air pollutants such as ozone, sulphur dioxide, PM_{10}, $PM_{2,5}$, benzene, carbon monoxide and lead. Table 7 shows the most relevant limit values included in this Directive.

Table 7. Most relevant air quality limit values according to the Directive 2008/50/EC (AQD).

Pollutant	Type of measurement	Concentration
Sulphur dioxide	One hour	350 µg/m^3, not to be exceeded more than 24 times a calendar year
	One day	125 µg/m^3, not to be exceeded more than 3 times a calendar year
Nitrogen dioxide and oxides of nitrogen	One hour	200 µg/m^3, not to be exceeded more than 18 times a calendar year
	Calendar year	40 µg/m^3
Particulate matter (PM_{10})	One day	50 µg/m^3, not to be exceeded more than 35 times a calendar year
	Calendar year	40 µg/m^3
Lead	Calendar year	0,5 µg/m^3
Benzene	Calendar year	5 µg/m^3
Carbon monoxide	Maximum daily eight hour mean	10 mg/m^3

Source: Directive 2008/50/EC Annex XI B.

Other relevant legislation on ambient air quality is the Directive 2004/107/EC[19] relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons (PAHs) in ambient air, where target values for all pollutants except mercury are defined for the listed substances although for PAHs the target is defined in terms of concentration of *benzo(a)pyrene* since it is used as a general marker substance for PAHs. Only monitoring requirements are specified for mercury.

[19] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32004L0107

3. Case Studies

Five case studies on waste incineration and co-incineration are addressed in this report: Lafarge cement plant in Montcada i Reixac (Barcelona, Spain), Lafarge cement plant in Trbovlje (Slovenia), Ivry waste incinerator in Paris (France), Dargavel waste incinerator in Scotland (United Kingdom) and Bavaria in Germany.

3.1. LAFARGE MONTCADA I REIXACH (BARCELONA, SPAIN)

Lafarge Cementos (cement plant), owned by Lafarge-Holcim group since 2014 and previously owned by Asland, is located close to the city of Barcelona, in the municipality of Montcada i Reixac. Montcada i Reixac has an area of 23.3 Km^2 and 34,394 inhabitants, and it is settled between the cliffs of the Litoral Mountains of Barcelona, close to the Besós River. The cement plant produces more than 500 tonnes of cement per day and employs close to 70 workers.

The neighbourhood association called *Can Sant Joan*[20], in coordination with other regional and national environmental platforms, has been the organisation through which demonstrations, research and legal actions have been carried out. The first protests asking for filters to be deployed occurred in 1975. In December 2006, after it was made public that the cement plant and the regional government (through the Catalan Water Agency) had plans to start using sludge, bone and meat meal and plastics as fuel,[21] they collected more than 6,000 signatures against this plan[22] and as a result it was delayed.

On April 20th 2008 the company received the environmental permit to use waste as fuel. Table 8 shows the types of waste allowed as fuel according to the original permit (permit number BA20060162[23], of April 29th 2008), and to the extension of that permit in 2011 (permit number BA20100180[24], of April 12th 2011). In July 2013, the Catalan Court of

[20] https://avvmontcadacansantjoan.wordpress.com/
[21] El Punt, November 9th 2006.
[22] Although this report is focused in air breaches, the protests have been also motivated by noise.
[23] http://www.prtr-es.es/informes/download.aspx?Document_id=6878/106
[24] http://bit.ly/1O53qM8

Justice revoked the original permit[25] due to formal defects during the process of public consultation, since the competences of the municipality related to noise, odour, vibrations, etc. had not been taken into account (e.g. they were not consulted in order to report on these issues). Lafarge appealed against the judgement and the Spanish Supreme Court rejected it in 2015[26]. Later in 2015, the Department of Environment repeated the process of public consultation as required by the sentence of the Supreme Court. On November 12th 2015, the plant once again obtained the environmental permit[27]. According to a press release from the neighbourhood association supported by their lawyer, the new issuing is still procedurally incorrect since the original environmental permit was declared null and void and therefore it cannot be amended or rectified. For a new permit to be issued, the whole process of permitting should be repeated[28].

Table 8. Types of waste included in the environmental permits for Lafarge Montcada cement plant.

Quantity	Code (ELW[29])	Description	Date of permit
Up to 40,000 t/year	02 03 01	Coffee grounds	2008
	19 08 05	Common sludge (excluding dredging spoils)	2008
	02 02 03	Animal Meal	2008
Up to 10,000 t/year	13 07 03	Chemical deposits and residues, namely biodiesel (out of standards) and glycerine	2008
Up to 20,000 t/year	17 02 01	Wood wastes	2008
	03 01 01	Wood wastes	2008
	03 01 05	Wood wastes	2008
	02 01 03	Garden waste	2008
Up to 30,000 t/year	19 12 10	Sorting residues rejected from mechanical treatment plants	2011

Source: Department of Environment and Housing, Generalitat de Catalunya.

[25] http://www.elconfidencial.com/ultima-hora-en-vivo/2013-09-20/una-sentencia-tsjc-anula-licencia-de-impacto-ambiental-de-cementera-lafarge_47670/
[26] http://www.elconfidencial.com/ultima-hora-en-vivo/2015-07-30/supremo-ratifica-sentencia-que-prohibe-a-lafarge-fabricar-cemento-en-la-c-17_649946/ http://www.elconfidencial.com/ultima-hora-en-vivo/2015-07-30/supremo-ratifica-sentencia-que-prohibe-a-lafarge-fabricar-cemento-en-la-c-17_649946/
[27] http://www.elpuntavui.cat/territori/article/11-mediambient/914245-la-cimentera-de-montcada-obte-el-permis-ambiental.html
[28] Can Sant Joan neighbourshood association, personal communication on November 20th 2015.
[29] European List of Wastes: http://ec.europa.eu/environment/waste/framework/list.htm

These permits also establish the monitoring requirements in line with the Directive in place at that moment (2000/76/EC). These requirements (e.g. standards of measurement) are the continuous measuring, daily average values of:

- Particles: according to method UNE–EN 13284–1:2002
- HCl: according to method UNE-EN 1911
- HF: according to method ISO 15713
- NOx: according to method UNE-EN 14792
- Total organic carbon: according to method UNE-EN 12619
- SO_2: according to method UNE-EN 14791.

It also includes the manual measurement of:

- Heavy metals (Cd, Tl, Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V): according to method UNE-EN 14385
- Dioxins and furans: according to method UNE-EN 1948
- Hg: according to method UNE-EN 13211.

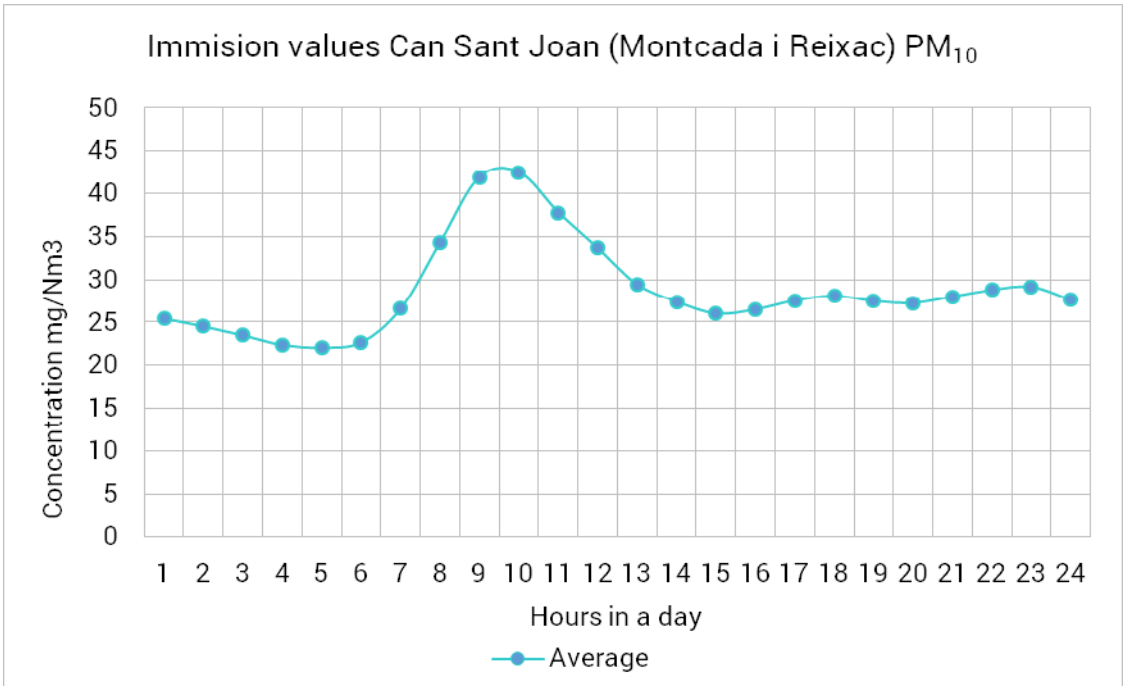
The neighbourhood association has carried out studies on immission values based on the measurement of the Catalan monitoring system (as required by the 2008 permit). High average (e.g. over 20 mg/Nm^3) and maximum (e.g. over 500 mg/Nm^3) concentrations of PM_{10} were detected. According to the World Health Organization (WHO)[30] the guidelines for the annual concentration on PM_{10} as related to health risk are 20 µg/m^3, and 50 µg/m^3 as daily average. In tune, the AQD sets the limit values in surpassing 50 µg/m^3 during 35 days for daily averages, and 40 µg/m^3 for calendar year average (Table 7).

Figure 2 shows the hourly average values between June 2010 and October 2012. The distribution follows a pattern similar to traffic density (mostly condensed between 7am and 11am) although there was not any hour at which average values during the period had been below 20µg/m^3. The potential contribution of the cement plant can be easily identified during the night when traffic is not so relevant and the effect of the cement plan can be clearly observed.

Table 9 displays the annual average values in Montcada for three periods of one year, including one calendar year. All of them are well above (approximately 50%) the recommended values by the WHO although they do not reach the annual average limit value set in the AQD. During the whole period, average daily values over 50µg/m^3 were recorded 18 times, therefore surpassing the values pointed by the WHO but not the limit values set by the AQD.

[30]http://apps.who.int/iris/bitstream/10665/189524/1/9789241565080_eng.pdf?ua=1

Figure 2. PM_{10} hourly average values from June 2010 to October 2012.



Source: Department of Environment and Housing, Generalitat de Catalunya.

Table 9. Annual averages of PM_{10} concentration in Can Sant Joan, Montcada.

Period	PM_{10} annual averages (mg/Nm^3)
14 June 2010 - 14 June 2011	29.16
1 January 2011 - 1 January 2012	28.99
8 October 2011 - 8 October 2012	28.02

Source: Department of Environment and Housing, Generalitat de Catalunya. Note: three periods of one year have been calculated according to the availability of data, taking the first and the last day as reference for the beginning and the end of the first and the last period respectively, plus one calendar day in between.

All in all, the case of Montcada highlights the relevance of the AQD limit values as compared to those recommended by the WHO for several pollutants. The limits in the case of the EU are set according to the so-called "best available techniques" whereas the WHO guidelines are based on epidemiological studies on health and environmental risk.

3.2. LAFARGE TRBOVLJE (SLOVENIA)

Lafarge's cement plant in Trbovlje (Slovenia) was established in 1876 close to abundant coal deposits, which provided the plant with a cheap source of energy. The factory is also connected to a 40 hectares of quarry of marly rock that supplies the plant with raw materials. In 1947, under the Yugoslavian government, it was nationalized. In 1972 a new kiln was put in production with a capacity of 1,000 tons of clinker per day. The company was sold in 2002 to the Lafarge group, which introduced automation for some of the production processes. They also added filters to the chimney after direct pressure from the government according to the reorganisation program.

The current nominal capacity of the plant is 1,400 tonnes of clinker per day. It employs 76 people although the number of workers has decreased since 2002.

After buying the plant in 2002, Lafarge started to use petroleum coke instead of fuel oil, which increased the emissions of benzene by 256% and Total Organic Carbon by 77%[31]. In 2004, the first petition for stopping the use of coke was signed by 11,794 people, resulting into the establishment of the non-governmental organization *Eko krog* (Eco-cycle) in 2005, in order to provide a formal structure to the protests.

According to Eko krog, legal action started in 2006 after Lafarge initiated the process for legalizing the use of coke and obtaining the Integrated Pollution Prevention and Control (IPPC) permit for using waste as fuel. Although it is mandatory according to the Slovenian law, there was no public consultation during the IPPC issuing procedure. Therefore, those municipalities affected by the activity of Lafarge (e.g. Zagorje ob Savi) were not allowed to participate in the procedure. Only Uroš Macerl, farmer and president of Eko krog, was included in the IPPC issuing procedure due to the fact that he owned some land inside the 500 metres radius, which was recognised by authorities as official area of influence (the study was performed by EIMV institute and paid by Lafarge).

The government issued the first IPPC permit in 2009 for waste incineration (permit number 35407-104/2006-195 of July 23rd) and the second in 2014 for petroleum coke (permit number 35407-104/2006-391). Eko Krog took these permits to the court. Table 10 shows the list of wastes allowed for burning according to the first permit.

In February 2015, the European Commission took Slovenia to court "*for its failure to license industrial installations that are operating without permits. Such permits should only be issued if a number of environmental criteria are met. In 2010 the Court ruled that Slovenia was failing in its obligation to ensure that all installations operate in line with EU rules on pollution prevention and control. Four years after that judgement, a major cement factory is still operating without the necessary permit, and potentially endangering citizens' health. The Commission is asking for a daily penalty payment of EUR 9,009 from today until the obligations are fulfilled and a lump sum of EUR 1,604,603*". [32]

According to Eko Krog the plant was shut down in March 2015[33]. In July 2015, Lafarge appealed the shutdown but the appeal was rejected in July by the Ministry of the Environment.

[31] Eko krog, personal communication.
[32] http://europa.eu/rapid/press-release_IP-15-4492_en.htm
[33] http://www.ekokrog.org/2015/07/15/mop-zavrnilo-lafargevo-pritozbo/#more-4222

In this case, although Eko krog was mainly concerned about heavy metals, benzene, total organic compounds (TOC), NO_x, and dust, it was the odour that mobilized the most people. Particularly after several filters were removed, which intensified these problems. In legal terms, formal defects in the issuing of the permit (e.g. public consultation) were the grounds for legal action.

Table 10. Types of waste allowed for burning in permit 35407-104/2006-195 of July 23rd for Lafarge cement Trbovlje.

ELW code	Description	Annual Quantity (t)
19 12 10	Combustible waste – waste plastics	15,000
16 01 03	End-of-life tyres	6,000
13 01 10	Mineral-based non-chlorinated hydraulic oils	3,000
13 01 11	Synthetic hydraulic oils	300
13 01 13	Other hydraulic oils	300
13 02 05	Mineral-based non-chlorinated engine, gear and lubricating oils	5,000
13 02 06	Synthetic engine, gear and lubricating oils	300
13 03 07	Mineral-based non-chlorinated insulating and heat transmission oils	400
13 03 08	Synthetic insulating and heat transmission oils	300
13 03 10	Other insulating and heat transmission oils	100
13 04 01	Bilge oils from inland navigation	100
13 04 02	Bilge oils from jetty sewers	100
13 04 03	Bilge oils from other navigation	500
13 05 06	Oil from oil/water separators	1,000
13 08 02	Other emulsions	300

Source: Zero Waste Italy.

3.3. BAVARIAN INCINERATORS AND CEMENT PLANTS (GERMANY)

The region of Bavaria is a federal state of Germany located in the south-eastern part of the country. It is 70,549 km^2 and has a population of 12.6 million inhabitants, which makes it the largest and the second most populated region of Germany.

Within the region, six cement plants operate and all six of them have an authorisation permit for the co-incineration of waste. These cement plants are Burglengenfeld, Harburg, Karlstadt, Rohrdorf, Solnhofen and Triefenstein Lengfurt.

According to the State Ministry of Environment and Consumer Protection, the following quantities of waste were co-incinerated during 2012 and 2013 in cement plants:

Table 11. Types and quantities of waste co-incinerated in 2012 and 2013 in Bavarian in cement plants.

Type of waste	2012 (t)	2013 (t)
Sewage sludge	41,700	42,900
Hazardous waste (solvents, oils, roofing cardboard)	50,500	46,300
Non-hazardous waste (tyres, industrial waste, paper, animal meal)	589,600	583,700

Source: State Ministry of Environment and Consumer Protection.

The emission limit values are set in the Seventeenth Ordinance for the Implementation of the Federal Pollution Control Act (Order on the incineration and co-incineration of waste - 17. BImSchV[34]) of 2 of May of 2013 (Table 12). As it can be noted, emission limit values are higher for cement plants. These differences on limit values are justified, according to the State Ministry, since different technologies for the burning processes require different limits.

According to the State ministry of Environment and Consumer Protection, in response to Malka Freie Wähler on 19th May 2014, since 2005 air breaches regarding dust, NO_x, SO_x, Hg, HCl and benzene have been reported (Table 13).

[34] http://www.gesetze-im-internet.de/bundesrecht/bimschv_17_2013/gesamt.pdf

Table 12. Emissions limit values in Bavaria for waste incineration plants and co-incineration cement plants.

	Waste incineration plants (mg/m³)			Equipment for the production of cement clinker or cement (mg/m³)		
Pollutant	**Daily average values**	**Half-hourly average values**	**Annual Mean**	**Daily average values**	**Half-hourly average values**	**Annual Mean**
Dust	5	20	-	10	30	-
Nitrogen oxides	150	400	100 *	200 *	400 *	200 *
Ammonia	10	15	-	30	60	-

*Source: State Ministry of Environment and Consumer Protection. Note: * apply from 01.01.2019; so-called mixed limits for cement plants up to the 31.12.2018 (max. daily average values 500 mg/m³) according to the 17th BImSchV i. d. F. of the 14.08.2013, as last amended by regulation from January 27th, 2009.*

Moreover, 15 incinerators[35] for non-hazardous waste and 6 for hazardous waste are sited within the State. They are Augsburg, Bamberg, Burgau[36], Burgkirchen, Coburg, Geiselbullach, Ingolstadt, Kempten, München-Nord, Nürnberg, Rosenheim, Schwandorf, Schweinfurt, Weissenhorn and Würzburg for non-hazardous waste and Burghausen, Ebenhausen, Gendorf, Gersthofen, Kelheim and Trostberg for hazardous waste. Data for 2011 show that for some of these plants, exceedances have occurred:

Table 13. List of incinerators burning non-hazardous waste and exceedances in emissions limit values in 2011

Incinerator	Exceedances in limit values in 2011
Augsburg	SO_2, CO
Bamberg	CO, Dust
Burgau	SO_2, HCl, NOx, Dust, CO, Hg
Coburg	TOC, CO
Geiselbullach	SO_2, HCl, CO, Hg, TOC

[35] Up to 2011, there were 16 operative incinerators. Landshut incinerator was shut-down in 2011.
[36] This is a pyrolysis plant.

Incinerator	Exceedances in limit values in 2011
Ingolstadt	SO_2, NOx, Dust, TOC, CO
Kempten	SO_2, NOx, Dust, TOC CO
München-Nord	SO_2, NOx, CO
Nürnberg	Dust, CO
Rosenheim	CO, NH_3
Schwandorf	SO_2, HCl, Dust, CO
Schweinfurt	SO_2, NOx, TOC, CO
Weissenhorn	SO_2, Dust, CO
Würzburg	SO_2, HCl, CO, Hg

Source: dr Hartmut Hoffmann

Although no legal breaches were found, the exceedances in TOC and CO values might entail emissions of dioxins and furans[37], which are not measured by continuous monitoring. In this case, the issue of emission limit values set in the permits as compared to the guidelines published by the WHO arises again. Furthermore, the allowance for cement plant to release higher concentrations of pollutants than incinerators is also acknowledged and justified by the authorities based on technological arguments.

3.4. DARGAVEL WASTE INCINERATOR, DUMFRIES (SCOTLAND, UK)

Scotgen (Dumfries) Ltd is a continuous batch incinerator with energy recovery located in Dumfries (Scotland), for three years considered Scotland's worst polluter according to the Scotland Environmental Protection Agency (SEPA)[38].

The plant was permitted in May 2009. By the end of that year, clean wood and municipal waste were commissioned although incineration stopped between January and March 2010 due to technical problems with combustion which lead to several modifications in the plant. Despite these changes, the problems remained so that the plant was closed again in April 2011 for approximately one year in order to redesign and install new boiler systems. In February 2013 the permit was varied to require the proper functioning of the plant by June 2013.

[37] https://www.energinet.dk/SiteCollectionDocuments/Danske%20dokumenter/Forskning%20-%20PSO-projekter/FU5731%20-%20Final%20report.pdf
[38]http://www.heraldscotland.com/news/13123975.Revealed__Scotland_s_worst_polluters/

The incinerator had its license revoked by SEPA on 23 August 2013 after hundreds of toxic pollution breaches and a major fire in July 18th 2013, which left up to 800-tonnes of waste not being properly burnt. The reasons, as publicised in the notice issued by SEPA[39], are:

- Persistent non-compliance with the requirements of the permit
- Failure to comply with an enforcement notice
- Failure to maintain financial provision and resources to comply with the requirements of the permit
- Failure to recover energy with a high level of efficiency[40].

Besides, the revocation notice also requires several steps to be taken in order to restore a satisfactory state of the site.

During the first operational period of the incinerator (December 2009 – April 2011), SEPA[41] reported the following incidents:

- 45 noise complaints
- 38 by-pass stack activations
- 200 reported emission limit breaches (mainly short-term temperature and O_2 levels)
- 2 dioxin emission breaches
- 100 notifications of short-term exceedances.

Once the activity was restarted (June 2013), more incidents occurred:

- 19 noise complaints
- 50 by-pass stack activations
- 3 low temperature alerts
- 23 low O_2 alerts
- 6 dioxin emission breaches
- 1 plant communications failure
- 2 failures of the daily HCl limit
- 1 failure of daily NO_x limit
- 2 failure of the heavy metals limit
- 1 complaint of flies
- 1 incident of accepting waste outside operational hours
- 2 incidents of process building doors being left open for prolonged periods
- 2 incidents of dark smoke emissions from the bypass stacks.

[39] http://media.sepa.org.uk/media-releases/2013/sepa-revokes-scotgen-dumfries-limiteds-permit/
[40] According to Shlomo Dowen (UK Without Incineration Network), "*the Dargavel facility was shut down without ever having exported any electricity to the grid* : http://www.hucknalldispatch.co.uk/news/waste-incineration-debunking-the-myths-1-6451958#ixzz3r4wHYAfF
[41] http://www.ukwin.org.uk/files/pdf/sepa_dargavel_june_2013.pdf

In addition, SEPA reported emission limit values breaches, which did not result in permit breaches. However, it was the following incidents that led to plant closure:

- 6 dioxin limit values breaches in 2012
- Faulty temperature controllers caused a burst.

In March 2014, the company Rank Recycling Scotland bid to restart the plant and applied for a new pollution prevention and control permit, after the transfer of the previous permit, as held by Scotgen, was denied. In May 2014, SEPA confirmed no application for PPC permits had been sent although "*Rank Recycling Scotland Ltd has indicated it is their intention to modify the plant design and submit an application*"[42].

In this case, air breaches have been repeatedly reported and acknowledged by the authorities. The malfunctioning of this plant is mostly related to its initial design.

3.5 IVRY INCINERATOR (PARIS, FRANCE)

The Ivry-Paris XIII incinerator, located at the southeast of the city of Paris, is the largest incineration plant in France. It was originally commissioned in 1969 and currently covers 38% of the processing capacity of the municipal association for waste management (Syndicat Intercommunal de Traitement des Ordures Ménagères de l'Agglomération Parisienne) carrying out the incineration of waste from 12 neighbourhoods and 14 "communes" of Paris. It serves more than one million inhabitants, processing up to 730,000 tonnes of waste in ten parallel process lines and delivering power equivalent to 100,000 households heating.

According to the last annual report published by SYCTOM[43] (the owners of the plant), no emissions breaches were registered during 2013. However, according to 3R[44], immission measurements taken in a nearby school in 2013 showed high values of dioxins and furans (up to eleven times those reported by the plant). The local authorities (Airparif), based on measurements carried out during six weeks, have reported estimated annual concentrations of $PM_{2.5}$ and PM_{10} of 18 and 25 mg/Nm^3 respectively in 2014[45]. These values are compliant with EU limit values although they surpass the AQG of the WHO.

The plant is planned to be reconstructed between 2017 and 2023 through a €1,575 million project signed in February 2015 (to be paid through waste charges) to be carried out by Suez Environment. The project includes a reduction of the incineration capacity by half, plus the deployment of a mechanical biological (plus biomethanisation) plant.

Protests have arisen led by 3R, which has sent a formal appeal to the Paris Administrative Court based on the following points:

- Contract duration is 23 years (including construction and exploitation). It is considered too long for a public contract.

[42] https://www.whatdotheyknow.com/request/212361/response/522343/attach/3/attachment.pdf
[43] http://www.sita.fr/wp-content/uploads/2015/01/20141118_DIP_20131.pdf
[44] https://drive.google.com/file/d/0B_bgBW25wNeiX1JhWXZNRFFCRFU/view
[45] http://www.airparif.asso.fr/_pdf/publications/rapport-uiom-ivry-sur-seine-140606.pdf

- The costs do not correspond with the technology to be implemented. The technical score achieved in the evaluation process (64%) can be considered poor as compared to other options.

According to 3R, should low performance of separate collection in the region be improved (only 3% of households have access to separate collection of bio-waste, being these 40% of total waste produced), the plant update would be unnecessary and so the associated risks (e.g. precedent fires in mechanical biological treatment plants in France) and foreseeable inconveniences (e.g. odour).

Two associations, namely 3R[46] and Zero Waste France[47], have presented an alternative, B'OM project[48], where significant increases of separate collection and reductions in the rejects of packaging waste are expected. This plan foresees total waste generation to decrease from 2 million tonnes in 2014 to 1.25 million tonnes. The cost of this plan is estimated to be €200 million (one order magnitude less than the plant update project).

This case illustrates the existence of the alternatives to incineration in the broader context of waste management policies and public investment.

[46] http://collectif3r.blogspot.com.es
[47] http://www.zerowasteeurope.eu
[48] http://www.planbom.org

4. Discussion of EU Directives shortages

The IED and the AQD show a number of issues that, in the context of waste incineration and co-incineration might be controversial. In fact, the capacity of the EU Directives for protecting human life and the environment is often challenged by local groups through protest and legal actions, as exposed in the previous section. In the light of the cases addressed, several aspects of these Directives are highlighted and discussed in the next sections.

4.1. ISSUES ON AMBIENT AIR QUALITY

The main source of concern is on the quantitative limit values set by the AQD (see Table 7) as compared to the air quality guidelines (AQG) of the World Health Organization on air quality[49], since these guidelines point to lower values than those required by the AQD for several pollutants (see table 14 for a comparison). More specifically:

- The AQG for the annual average concentration of PM_{10} (20 $\mu g/m^3$) is a half of the concentration required by the AQD (40 $\mu g/m^3$). The current EU level corresponds to the medium point between the so-called Interim target-2 and target-3 of the WHO. This concentration is associated to a risk of increasing cardiopulmonary and lung cancer mortality.

- In the case of $PM_{2.5}$ the EU annual average limit (25 $\mu g/m^3$) more than doubles the AQG. At the AQD limit value, the WHO states a risk of premature mortality of between 4 and 13%.

- For SO_2, the WHO states "a prudent precautionary approach to a value of 20 ng/m^3" for the daily average whereas the EU limit values is set in 125 $\mu g/m^3$ not to be surpassed more than 3 times in a calendar year. No further indications are given regarding daily averages. Furthermore the WHO stressed the relevance of shorter exposures (10 minutes) for which no limits are set by the EU.

[49] http://apps.who.int/iris/bitstream/10665/69477/1/WHO_SDE_PHE_OEH_06.02_eng.pdf

- Ozone concentrations (measured as 8-hour mean concentration) as stated by the AQG should be below 100 µg/m^3. The EU standards sets a limit value of 120 µg/m^3 during 25 days averaged over three years.

Regarding other relevant pollutants such as arsenic, nickel and polycyclic aromatic hydrocarbons, the limit value set by the EU Directives cannot be compared to the AQG value provided by the WHO. In these cases, the risk of exposure to these pollutants is measured as probability of diminished life expectancy (see table 14).

Apart from differences between the AQG and the EU standards, and the lack of reference values in the Directive for some pollutants, the AQD, Annex I, sets the data quality standards for air quality measurements. These quality standards assume an additional range of acceptable uncertainty in the measurements, which in practice might allow higher actual concentrations to occur.

Taking these issues into account, a question on how these values should be set arises. The AQD assumes several deviations from the AQG, which in turn implies assuming a certain degree of health risk (e.g. measured as probability of premature death). Being public health at stake, it would be advisable that the grounds on which these limit values are set would be publicly debated whenever they surpass the values recommended by international accredited organizations such as the WHO. Moreover, they should be regularly reviewed and put in the context of the current local air quality status and available alternatives, in a proper application of the Precautionary Principle[50]. There are examples of a proper application of the Precautionary Principle*, inter alia* for asbestos[51].

This kind of issues have been also addressed by the "Post-Normal science" approach[52].: *"[t]he insight leading to Post-Normal Science is that in the sorts of issue-driven science relating to environmental debates, typically facts are uncertain, values in dispute, stakes high, and decisions urgent"*. The most relevant conclusion from this approach is a procedural point, according to which *"[t]he contribution of all the stakeholders in cases of Post-Normal Science is not merely a matter of broader democratic participation. For these new problems are in many ways different from those of research science, professional practice, or industrial development. Each of those has its means for quality assurance of the products of the work, be they peer review, professional associations, or the market. For these new problems, quality depends on open dialogue between all those affected. This we call an "extended peer community", consisting not merely of persons with some form or other of institutional accreditation, but rather of all those with a desire to participate in the resolution of the issue"*.

Overall, the current limit values operate between risk and uncertainty for human health and the environment (e.g. immission levels and health risk). In this context, public consultation and participation would be referred to the evaluation of alternatives for waste management.

[50] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=URISERV:l32042&from=EN
[51] http://unesdoc.unesco.org/images/0013/001395/139578e.pdf
[52] http://www.nusap.net/sections.php?op=viewarticle&artid=13

Table 14. Limit values at the EU level as compared to guidelines from the World Health Organization.

Pollutant	Period	Limit value Directive 2008/50/CE	Permitted exceedances (per year)	Guidelines WHO
$PM_{2.5}$	1 year	25 µg/m^3	n/a	10 µg/m^3
	24 h	-	-	25 µg/m^3
SO_2	10 min	-	24	500 µg/m^3
	1 h	350 µg/m^3	-	-
	24 h	125 µg/m^3	3	20 µg/m^3
NO_2	1 h	200 µg/m^3	18	200 µg/m^3
	1 year	40 µg/m^3	n/a	40 µg/m^3
PM_{10}	24 h	50 µg/m^3	35	50 µg/m^3
	1 year	40 µg/m^3	n/a	20 µg/m^3
Ozone	Max daily 8 h mean	120 µg/m^3	25 days averaged over 3 years	100 µg/m^3
As	1 year	6 ng/m^3	n/a	At an air concentration of 1 µg/m^3 an estimate of lifetime risk is 1.5 × 10E^{-3}
Cd	1 year	5 ng/m^3	n/a	5 ng/m^3
Ni	1 year	20 ng/m^3	n/a	Incremental risk of 3.8 × 10E^{-4} can be given for a concentration of nickel in air of 1 µg/m^3.
PAHs	1 year	1 ng/m^3	n/a	A unit risk for benzene(a)pyrene as indicator air constituent for PAHs is estimated to be 8.7 × 10^{-5} per ng/m^3

Sources: http://apps.who.int/iris/bitstream/10665/69477/1/WHO_SDE_PHE_OEH_06.02_eng.pdf and http://www.euro.who.int/__data/assets/pdf_file/0005/74732/E71922.pdf?ua=1.

4.2. ISSUES ON INDUSTRIAL EMISSIONS

A first relevant point regarding the IED is the core concept of "best available technique" (BAT).

The introduction of the Directive, point 16, reads: "*In order to take into account certain specific circumstances where the application of emission levels associated with the best available techniques would lead to* ***disproportionately high costs compared to the environmental benefits,*** *competent authorities should be able to set emission limit values deviating from those levels. Such deviations should be based on an assessment taking into account well-defined criteria. The emission limit values set out in this Directive* ***should*** *not be exceeded. In any event, no significant pollution should be caused and a high level of protection of the environment taken as a whole should be achieved*." This implies that best available technique relies upon qualitative economic criteria.

Article 15.4 reads: "[…] *the competent authority may, in specific cases, set less strict emission limit values. Such a derogation may apply only where an assessment shows that the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits due to: (a) the geographical location or the local environmental conditions of the installation concerned; or (b) the technical characteristics of the installation concerned*".

Therefore, if limit values depend on BAT and those are defined according to economic criteria, the latest play a central role in setting limit values. This has several implications. First, that in the event of a dispute about BAT, both financial cost and environmental benefits should be measured and compared. Environmental valuation for decision-making has proven controversial and with plenty of epistemological and procedural shortages since it implies the choice of a language of valuation and an allocation of resources to future generations[53]. Secondly, the meaning of "disproportionately" remains qualitative. Third, it states that the decision on specific derogations corresponds to the national authorities.

Article 59.2 also foresee a situation where the limit values can be exceeded: "*[…] where the operator demonstrates to the competent authority that for an individual installation the emission limit value for fugitive emissions is not technically and economically feasible, the competent authority may allow emissions to exceed that emission limit value provided that significant risks to human health or the environment are not to be expected and that the operator demonstrates to the competent authority that the best available techniques are being used*". Again, qualitative criteria (e.g. significant risk) are employed in order to evaluate whether limit values could be exceeded, in the event it is not economically feasible to achieve them.

Furthermore, emission breaches are evaluated based on continuous monitoring data carried out and reported by the companies, plus a number of annual inspections. Filters and their continuous monitoring systems are currently paid for and managed by the cement plants and incinerators, which makes it more difficult to find air breaches.

The process of public consultation for permit issuing has resulted into a source of conflict in itself and current regulation allow for situations such as the process in Slovenia, where the nearby municipalities were not included. In Montcada, the municipal government took Lafarge to the court because their competences were ignored during the issuing of the permit. After winning the case, the cement plant continued operating.

[53] http://www.redibec.org/archivos/revista/articulo7.pdf

4.3. FURTHER CONSIDERATIONS

Besides issues related to air pollution, there are at least two additional relevant points to be mentioned regarding incineration activities.

First, in the context of waste management options, there is a large margin to further develop and prioritise the higher tiers of the waste hierarchy, namely prevention, re-use and recycling. It has been demonstrated[54] that high levels of separate collection and recycling (around 75%) are achievable in Europe. Therefore incineration would not be required to comply with Directive 1999/31/EC on the landfill of waste, which set reduction targets for total waste landfilled. Moreover, by fostering incineration, the potential contribution of waste management to a transition towards a low carbon economy might be missed[55].

Second in economic terms, cement plants receive a triple dividend from waste incineration activities[56]. First, they get paid as waste managers by the competent authorities (e.g. 10 euros per tonne of waste in the case of Lafarge Montcada). Second, they save the corresponding quantity of fossil fuels substituted by waste, and therefore their costs. Third, they can trade emissions permits corresponding to those fossil fuel savings, some of which have been assigned to these facilities at no cost. In practice, this implies that taxpayers are effectively supporting waste incineration and the associated allocation of health and environmental risks.

[54] http://zerowasteeurope.eu/zerowastecities.eu/
[55] http://www.zerowasteeurope.eu/downloads/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/
[56]http://www.greenpeace.org/espana/Global/espana/report/contaminacion/cdr290512.pdf

5. General conclusions

This report presents a general review of EU Directives on air quality and emissions and five case studies on conflicts between citizen and installations devoted to the incineration or co-incineration of waste (e.g. cement plants).

Incineration activities release pollutants to ambient air. These pollutants, at certain concentrations, lead to health and environmental issues, as the World Health Organization has acknowledged. Several European Directives have addressed the abatement and control of these pollutants both from the point of view of the polluters through the IED, and from of the point of view of citizens through the AQD. In addition, the Waste Framework Directive has set the order of priorities for waste management options, amongst which incineration (either dedicated plants or cement kilns) with energy recovery is only preferred to landfill disposal.

The cases of cement plants in Spain, Slovenia and Germany and incinerators in the UK, Germany and France have been addressed. Although the protests in each case are based on different grounds and motivations, the issues of air pollution, health risk, procedural defects and conflict on legitimacy are common to all these cases.

The current design of the EU legal framework allows for immission limit values that face an unavoidable allocation of health and environmental risks to those citizens living nearby incineration and co-incineration activities. This entails an environmental justice issue since very often, nearby municipalities are populated by low income families and immigrants[57].

Although emissions limit values are regulated, significant legal space exists for more stringent emission and immission values (e.g. WHO guidelines). More specifically, the core concept of “best available technique” links emissions limit values directly to the economic costs of technologies. Therefore, emission limit values are conditioned by the affordability of cleaner technologies so that innovation in the field of health and environmental protection is constrained.

[57] http://www.tandfonline.com/doi/abs/10.1080/09640568.2012.749395

As a common trait, the organizational skills of civil society have shown key for monitoring and limiting the impact of incineration activities, based on a variety of legal, health and environmental arguments.

http://www.zerowasteeurope.eu