

## **WRITTEN REPRESENTATION (10<sup>th</sup> March 2023)**

Professor Clive Ballard

Interested party reference number: 20033376

I am providing a written representation as a local resident, but I hope that my expertise as Professor of Age Related Diseases (Kings College London and University of Exeter) can provide some insights, in particular for health related issues.

### **Responses relating to:**

- 1) Impact of the mega-incinerator on Health
- 2) Modelling the Environmental Impact of the Proposed Mega-Incinerator
- 3) Emerging technologies
- 4) Need and Transport

### **1) Impact of the Mega-Incinerator on Health**

#### **a) Air pollution is a risk to health**

A Lancet commission (a major paper including the majority of UK and international in this area) focussing on pollution and health, using robust meta-analysis to combine the results of all of the major research studies, estimated that there were 4 million excess deaths worldwide every year as a result of air pollution. Air pollution was a major contributory factor in 25% deaths due to cardiovascular disease and 50% of deaths due to lung disease, as well as significantly increasing the risk of diabetes, dementia, autism and attention deficit disorder.

#### **Reference**

*Landrigan PJ, Fuller R, Acosta NJR, Adeyi O, Arnold R, Basu NN, Baldé AB, Bertollini R, Bose-O'Reilly S, Boufford JI, Breyse PN, Chiles T, Mahidol C, Coll-Seck AM, Cropper ML, Fobil J, Fuster V, Greenstone M, Haines A, Hanrahan D, Hunter D, Khare M, Krupnick A, Lanphear B, Lohani B, Martin K, Mathiasen KV, McTeer MA, Murray CJL, Ndahimananjara JD, Perera F, Potočnik J, Preker AS, Ramesh J, Rockström J, Salinas C, Samson LD, Sandilya K, Sly PD, Smith KR, Steiner A, Stewart RB, Suk WA, van Schayck OCP, Yadama GN, Yumkella K, Zhong M. The Lancet Commission on pollution and health. Lancet. 2018 Feb 3;391(10119):462-512. doi: 10.1016/S0140-6736(17)32345-0. Epub 2017 Oct 19. Erratum in: Lancet. 2018 Feb 3;391(10119):430. PMID: 29056410.*

#### **b) Particulate matter is a risk to stroke and respiratory health**

Two recent and very comprehensive reports in the British Medical Journal provide clear evidence of the impact of particulate matter in the air on health. Firstly, a meta-analysis of more than 2000 studies showed a clear and significant risk of stroke associated with particulate matter. This risk was seen with as little as 7 days exposure, and also had a

significant impact on related hospitalizations. Secondly, a report combining the findings of studies across more than 200 countries demonstrated a link between exposure to particulate matter and an increased risk of asthma and Chronic Obstructive Pulmonary disease – explaining a substantial 20% of the risk.

In addition to the impact on the health of individuals, the added health burden and increased rate of hospitalization also has significant implications for health resources and cost.

### *References*

*Shah AS, Lee KK, McAllister DA, Hunter A, Nair H, Whiteley W, Langrish JP, Newby DE, Mills NL. Short term exposure to air pollution and stroke: systematic review and meta-analysis. BMJ. 2015 Mar 24;350:h1295. doi: 10.1136/bmj.h1295. Erratum in: BMJ. 2016 Sep 06;354:i4851. PMID: 25810496; PMCID: PMC4373601.*

*Safiri S, Carson-Chahhoud K, Noori M, Nejadghaderi SA, Sullman MJM, Ahmadian Heris J, Ansarin K, Mansournia MA, Collins GS, Kolahi AA, Kaufman JS. Burden of chronic obstructive pulmonary disease and its attributable risk factors in 204 countries and territories, 1990-2019: results from the Global Burden of Disease Study 2019. BMJ. 2022 Jul 27;378:e069679. doi: 10.1136/bmj-2021-069679. PMID: 35896191; PMCID: PMC9326843.*

- c) Heavy metals and polycyclic aromatic hydrocarbons accumulate in the environment and are a significant risk to health.

It is well established and not disputed that heavy metals including lead, mercury, cadmium, silver nickel, vanadium, chromium and manganese are all harmful to human health, resulting in problems in most of the bodies organs including the lungs (asthma, breathlessness, respiratory function, lung cancer), heart (increased blood pressure), blood (anaemia), kidney (kidney failure) and nervous system (memory disturbances, sleep disorders, anger, fatigue, hand tremors, blurred vision, slurred speech). There are also particular risks during pregnancy (spontaneous abortion, reduced foetal growth, pre-term delivery, low birth weight, congenital malformations).

There are 2 major problems that intensify the impact of heavy metals on health

- They are not broken down or excreted by the human body and therefore continue to accumulate over time; and
- Heavy metals in the air also get into the soil and water, impacting on wildlife but also getting into the food chain and further exacerbating accumulation in the body.

It is therefore extremely difficult to set safe levels for heavy metals as these materials continue to accumulate in the body over time, and any failure in safety measures leading to

increased heavy metal air pollution (even very temporary), would have a significant and permanent impact on human health.

The impact of Polycyclic Aromatic Hydrocarbons should also be given serious consideration with respect to the impact on health. They are found in coal and in tar sediments and are generated through incomplete combustion of organic matter as **part of the incineration process**. Polycyclic aromatic hydrocarbons compounds, such as benzopyrene, acenaphthylene, anthracene, and fluoranthene are universally recognized as toxic, mutagenic, and carcinogenic substances, including an established risk of lung cancer.

Given what we know about air pollution, particulate matter and heavy metals, **it is almost certain that the facility would have a significant negative impact on human health**. This is particularly important in the context of the current proposed facility given the **size of the facility** and the proximity to local **schools**.

## References

*Manisalidis I, Stavropoulou E, Stavropoulos A, Bezirtzoglou E. Environmental and Health Impacts of Air Pollution: A Review. Front Public Health. 2020 Feb 20;8:14. doi: 10.3389/fpubh.2020.00014. PMID: 32154200; PMCID: PMC7044178.*

*Kampa M, Castanas E. Human health effects of air pollution. Environ Pollut. 2008 Jan;151(2):362-7. doi: 10.1016/j.envpol.2007.06.012. Epub 2007 Jul 23. PMID: 17646040.*

## 2) The Environmental Impact of the Proposed Mega-Incinerator

The modelling from the applicant suggests that the proposed facility has less of an impact on CO2 emissions than traditional landfill. Although it sounds highly technical, understanding the details of the model is critical to understanding whether the assumptions the applicant makes are reasonable, balanced, and lead to a fair interpretation. Although the documentation from the applicant describes the factors included in the model at a top-line level, it does not give sufficient information to understand how exactly the key elements were defined and weighted- therefore the results of the model cannot be independently replicated. **This is vital as minor tweaks to the way factors are included can have a major impact on what the model shows – ie it is easy to manipulate the results of models and make them look more favourable. To enable independent transparent replication, experts and stakeholders need access to the executable model.**

I have experience of modelling approaches in the Health sector, and I have been involved in the appraisals of anti-dementia drugs by the National Institute for Clinical Excellence. In this situation there were disputes regarding the model used to evaluate outcomes, and as part

of a legal dispute the **Court of Appeal ruled that the executable model should be made available to all stakeholders for transparency and to ensure robust consideration of the model.** Surely, the same principle of transparency should apply in the current situation.

It should also be noted that the **favourability of the model relies to a very large degree on the assumptions made about offsetting the CO2 emission impact through factors such as the generation of energy and heat (bearing in mind that this is the second worst method of energy production for the generation of CO2 after coal).** When considering just the CO2 emissions alone, the results of studies are highly variable for both landfill and energy from waste incinerators; and even within studies emissions vary substantially between and within facilities.

Manfredi et al (2009) for example explains that the CO2 emissions per tonne of waste vary from 1000 kg CO2 per tonne for open landfill, to 300kg per tonne for traditional closed landfill to 30kg per tonne to low carbon landfill facilities. Modelling based upon these values suggests that landfill sites become better than carbon neutral if energy derived from gas production is factored into the model.

**The energy saving trust estimate that the CO2 production from Waste to Energy Incinerators is 250-600kg CO2 per tonne of waste, which without modelling “offset benefits” does not seem to compare favourably with landfill. In addition, when modelling is applied to landfill emissions to offset benefits from gas capture, then landfill too appears to be environmentally friendly.**

**Other modelling studies in the literature have concluded that there is uncertainty regarding whether Energy from Waste Incinerators compare favourably to other approaches. For example,** Pfadt-Trilling et al (2021) concluded that “Using the minimum and maximum LCCCI, the conversion range is  $-0.202$  to  $+0.429$  kg CO<sub>2eq</sub>/kg MSW; using the first and third quartile results, this equates to  $-0.00795$  kg CO<sub>2eq</sub>/kg MSW and  $+0.223$  kg CO<sub>2eq</sub>/kg MSW, respectively. This range includes negative and positive LCCCI values for the Coproduct Scenario and does not agree with claims of published reports as to the magnitude of GHG emissions avoided by WTE.”

To highlight some specific concerns regarding the modelling approach by the applicant: ,

- There is evidence of substantial variability in the emissions from energy to waste incinerators – even for the same incinerator over time, mediated by a number factors including the exact composition of the waste and the season of the year. This variability does not seem to have been factored appropriately into the model.
- As well as the proposed “off-sets”, the added CO2 burden of conveying waste to the facility requires fuller consideration in the model, particularly to allow for longer transport distances
- The model assumes what seems to be a worse-case scenario for the comparator – landfill. This is extremely important given the 40 year lifespan of the proposed facility, as there are a number of policy measures already due to be introduced

which will reduce landfill emissions. In addition, various improvements in technology and the development of more gas capture technologies for landfill will also make them more efficient. The improving efficiency of landfill sites over time needs to be factored into the model.

- The modelling assumes that landfill is the comparator, but ignores other increasingly available alternatives such as composting, which appear to compare favourably to landfill. The model should assume a balance of alternative approaches.
- Given the likely emergence and further development of other novel technologies, including exciting microbiology based technologies being increasingly used to improve the efficiency of landfill sites. Over a 40 year period, this should also be considered extensively in the sensitivity analyses.
- There is also evidence from a large European study that the easy availability of incinerators reduces recycling and that 50% of the rubbish sent for incineration could have been recycled. This is obviously a concern with respect to government policy, but also should be included as a sensitivity analysis in the model.

The applicant stated that the components of their model had been approved by Cambridgeshire County Council. This feels highly inappropriate, as these models are complex and the results can easily be manipulated by minor changes. It would be much more appropriate to have a full independent evaluation and replication of the model by an appropriate expert or group of experts.

Finally, it is also important to note that **heavy metal emissions are significantly higher from incinerator facilities than from traditional landfill, and that the ash from incinerators also contains a significant concentration of heavy metals.** The impact of heavy metal emissions also needs to be considered and modelled in comparison to landfill and other methods of waste management.

#### References

*Manfredi S, Tonini D, Christensen TH, Scharff H. Landfilling of waste: accounting of greenhouse gases and global warming contributions. Waste Management & Research. 2009;27(8):825-836. doi:10.1177/0734242X09348529*

<https://energysavingtrust.org.uk/generating-energy-waste-how-it-works/>

*Pfadt-Trilling AR, Volk TA, Fortier MP. Climate Change Impacts of Electricity Generated at a Waste-to-Energy Facility. Environ Sci Technol. 2021 Feb 2;55(3):1436-1445. doi: 10.1021/acs.est.0c03477. Epub 2021 Jan 8. PMID: 33417433.*

*Second National Infrastructure Assessment: Baseline Report - NIC*

*A decade of industrial pollution data — European Environment Agency (europa.eu)*

### **3) Need and transport**

With respect to need, the discussion at the Issue specific meeting held on 22<sup>nd</sup> February 2023 highlighted that there was already an incinerator in Peterborough and that most of Cambridgeshire already had arrangements in place for disposing of waste. The need is therefore clearly not a need for our own town or County, but was proposing to take waste from a wide geographical area.

During the meeting, Mrs Brown on behalf of the applicant, explained that although it was not a hard and fast rule, that a travel time of up to 2 hours had been proposed as the usual distance for transporting waste based upon financial viability. This was very confusing as more than 50% of the proposed areas from which waste would be collected were more than 2 hours away from Wisbech. Even more concerning, this financial viability was determined before the recent increases in fuel and transport costs. Therefore there would seem to be a substantial risk that the facility would not be financially viable and would only be able to collect waste from a more restricted geographical area where there are already solutions in place and hence limited need.

There was much discussion in the Issue specific meeting held on 22<sup>nd</sup> February 2023 regarding the limited road infra-structure to service the facility around Wisbech – which is a serious concern. It should however also be noted that because of the silt soil composition in the area, the local roads deteriorate quickly and there is a high burden on road maintenance. This would clearly be significantly exacerbated by a substantial increase in heavy vehicle transport, and I presume that if the current proposal goes ahead that the applicant would be expected to make a significant contribution to any increased road maintenance costs.

Closures to the A47 already happen on a very regular basis resulting in traffic shortcuts ‘rat runs’ being created through the local drove roads, which are highly unsuitable to HGV traffic due to their often single lane nature and the composition.