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Air Pollutant: Business Brief

Document providing an overview of the process that Oracle took in publishing its air pollutant inventory

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Purpose

This document provides an overview of the process that Oracle took in publishing its air pollutant inventory for the first time in 2023. It is hoped that this business brief will help other organisations to inspire further air pollutant reporting and the implementation of air pollutant mitigation measures.

Background

"99% of the world's population live in places where air pollution levels exceed World Health Organization (WHO) guideline limits."- World Economic Forum

Announced as a member at COP27, Oracle's air pollution work has been driven principally through membership of the 'Alliance for Clean Air'. Launched in 2021 by the World Economic Forum and the Clean Air Fund, The Alliance for Clean Air is the first global private sector initiative to tackle air pollution. The private sector contributes to air pollutant emissions through activities such as the combustion of fuel, consumption of electricity, disposal of waste and the transportation of goods, materials and passengers.

The reporting of greenhouse gas emissions is common practice for many large organisations. Air pollutant emissions have however until now been largely unquantified. This is partly because there has not been a comprehensive set of methods that would allow emissions from the various key sources along value chains to be identified and quantified, and partly because of a lack of regulatory pressure. The introduction of the Corporate Sustainability Reporting Directive (CSRD) and the EU Commission's adoption of the European Sustainability Reporting Standards (ESRS) will bring air pollutant emission quantification to the attention of reporting organisations. The publicly available guidance referenced and used in this business brief will hopefully help make air pollutant emission reporting more widely adopted within the private sector.

Air Pollutant Quantification

Oracle's air pollutant inventory follows the process suggested in the 'Practical Guide For Business Air Pollutant Emission Assessment', a document developed by the Stockholm Environment Institute (SEI) with support from Climate and Clean Air Coalition (CCAC), and Inter IKEA Group.

The guide was reviewed by the CCAC Scientific Advisory Panel and enables organisations to quantify the air pollutant emissions along their value chains from key sectors, including electricity generation, transport, industrial processes, agriculture and waste.

The guide focuses on quantifying the emissions of directly emitted particulate matter and concentrates on the air pollutants identified as having the largest impact on human health by the World Health Organization:

- Particulate Matter ($PM_{2.5}$, PM_{10})
- Black Carbon (BC)
- Organic Carbon (OC)
- Sulphur Dioxide (SO_2)
- Nitrogen Oxides (NO_x)
- Ammonia (NH_3)
- Non- Methane Volatile Organic Compounds (NMVOCs)
- Carbon Monoxide (CO)

It provides methods for quantifying air pollutant emissions from six key sources: Electricity consumption, Stationary fuel combustion, Transport, Industrial processes, Agriculture and Waste.

The next section provides a step-by-step walkthrough of the calculation process that Oracle followed for quantifying the air pollutant emissions from the consumption of electricity. Excel was used to perform the calculations in the first air pollutant inventory, however the aim is to move to a systems based approach.

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Air Pollutant Emissions from Electricity Consumption: Worked Example

The Guide uses three 'Tiers' to estimate air pollutants, each tier representing a level of methodological complexity. This three-tier approach follows the Intergovernmental Panel on Climate Change (IPCC) emission inventory guidelines. Oracle used the Tier 1 method for quantifying electricity consumption air pollutant emissions, and the Tier 1 method is the approach outlined below.

The consumption of electricity from the national grid does not release air pollutant emissions at the point where the electricity is consumed, however the generation of electricity in fossil fuel or biomass power plants can be a large source of air pollutant emissions.

Step 1:

Oracle gathered the activity data for the reporting period. In the example here, it was the amount of electricity consumed globally across operations for the reporting period of calendar year 2022. The same activity data is used in the Oracle greenhouse gas inventory.

Step 2:

Once Oracle had gathered the activity data, the starting point for quantifying emissions is to quantify the electricity generated from different types of power stations. This is calculated using the formula below:

$$EG_n = ECT * P_n$$

- EG_n is the electricity generation using fuel and technology n (units: kWh): Examples of different fuels are hard coal, brown coal, gaseous fuels (e.g. natural gas), heavy fuel oil, light oil (e.g. diesel) and biomass.
- ECT is the total electricity consumed at a particular part of the company's value chain: Oracle used the electricity consumption from our offices and data centres.
- P_n is the proportion of the consumed electricity that is generated using fuel and technology n: This can be substantially different country-to-country.

To estimate the consumed electricity by fuel and technology (P_n), Oracle used the IEA energy dataset to gather data on the electricity generation by source (e.g. oil, coal, natural gas etc) of the countries that it operates in. As the IEA dataset does not provide a detailed list of the type of coal and oil used, Oracle had to make assumptions that it was likely to be hard coal and heavy oil, as these are the majority used globally at this time.

Step 3:

Having determined the amount of electricity generated using a particular fuel and technology in a specific country (EG_n), the next step is to determine the amount of fuel that is consumed to generate this. This is calculated following the formula below:

$$FC_n = EG_n * Eff_n * 0.0036$$

- FC_n: the fuel consumption for fuel and technology n (units: GJ)
- EG_n: is the electricity generation using fuel and technology n (units: kWh) – calculated in Steps 1 and 2
- Eff_n is the efficiency of technology n in generating electricity (fraction), and 0.0036 is the conversion from kWh to GJ.

The efficiency of different power stations (Eff_n) is used to estimate the quantity of fuel consumed to generate electricity consumed. Specific values for Eff_n were not known, so Oracle used default values within the Guide to estimate the average efficiency of different types of power station.

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Step 4:

Having estimated the fuel consumption associated with electricity use within the Oracle offices and data centres, Oracle then calculated the associated air pollutant emissions by multiplying the fuel consumption by fuel specific emission factors:

$$Em_k = FC_n * EF_{n,k}$$

- Em_k: the air pollutant emissions of the specific pollutant k
- FC_n: the fuel consumption for fuel and technology n (units: GJ)- calculated in Step 3
- Where $EF_{n,k}$ is the emission factor for pollutant k for fuel n

The emission factors used are those listed in the Guide (table 4.4.).

Step 5:

The air pollutant emissions were then sorted and published in the Oracle data sheet (below):

AIR POLLUTANT EMISSIONS CY2022					
	Particulate Matter ($PM_{2.5}$) [metric tons]	Particulate Matter (PM_{10}) [metric tons]	Nitrogen Oxides (NOx) [metric tons]	Sulphur dioxide (SO_2) [metric tons]	Carbon monoxide (CO) [metric tons]
Stationary combustion	0.2	0.2	14	0.2	5
Electricity use	28	36	285	555	79
Electricity transmission & distribution losses	2	2	17	36	4
Waste generated in operations	0.2	0.04	0.3	0.03	0.3
Upstream logistics	Not calculated	.09	98	5	Not calculated

Summary:

The Guide is freely available to enable organisations to create air pollution emission inventories. Quantifying air pollutant emissions and creating a baseline analysis of a company's global air pollution emissions is a crucial first step to set the stage for mitigating action. Oracle will continue to work on refining its air pollutant emission inventory and look to set targets and objectives with a clear mitigation action plan.

Oracle is also working to embed air pollutant and greenhouse gas quantification into its software. More information about Fusion Cloud Sustainability can be found here: Oracle Fusion Cloud Sustainability

References:

- A Practical Guide For Business: Air Pollutant Emissions Assessment: Free to download here
- IEA data available here
- More information about Oracle's sustainability program and the inventory above in our data sheet can be found here
- World Economic Forum quote- article available here
- CSRD ESRS standards are available here
- Alliance for Clean Air: information here