



## Monitoring of cruise ship particulate matter emissions



Cruise ship emissions include:

- Sulphur Dioxide (SO<sub>2</sub>)
- Nitrous Oxides (NO<sub>x</sub>)
- Volatile Organic and other burn residual compounds
- Green House Gases (CO<sub>2</sub> equivalent)
- Fine Particulate Matter (PM<sub>2.5</sub>)

Before moving on to Particulate Matter emissions we will first show how changes to SO<sub>2</sub> regulations have affected particulate Matter emissions.

## Scrubbers remove SO<sub>2</sub> but what about Particulate Matter?

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Due entirely to government regulations SO<sub>2</sub> emissions are no longer a significant component of cruise ship emissions. Starting in 2012 cruise companies were progressively forced to use a fuel containing reducing amounts of sulphur.

However, in 2015 when legislation was due to limit the fuel sulphur content to 0.1% the cruise companies successfully lobbied the US government to permit the use of stack scrubbers to remove SO<sub>2</sub> and revert to the use of high sulphur content fuel. The use of these heavier fuels results in higher levels of particulate matter.

**No standards were set for particulate matter scrubber emissions**

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## Why we are concerned about particulate matter emissions

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This undercover 2019 report by the Johns Hopkins University measured PM concentrations on the decks of 4 cruise ships; 3 of these ships are Victoria visitors.

<https://bit.ly/3n8Yr4c>

The report notes *“Concentrations of PM on the decks of these ships are comparable to concentrations measured in polluted cities, including Beijing and Santiago”*

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## PM2.5 – The health risks

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**From BC Government website:**

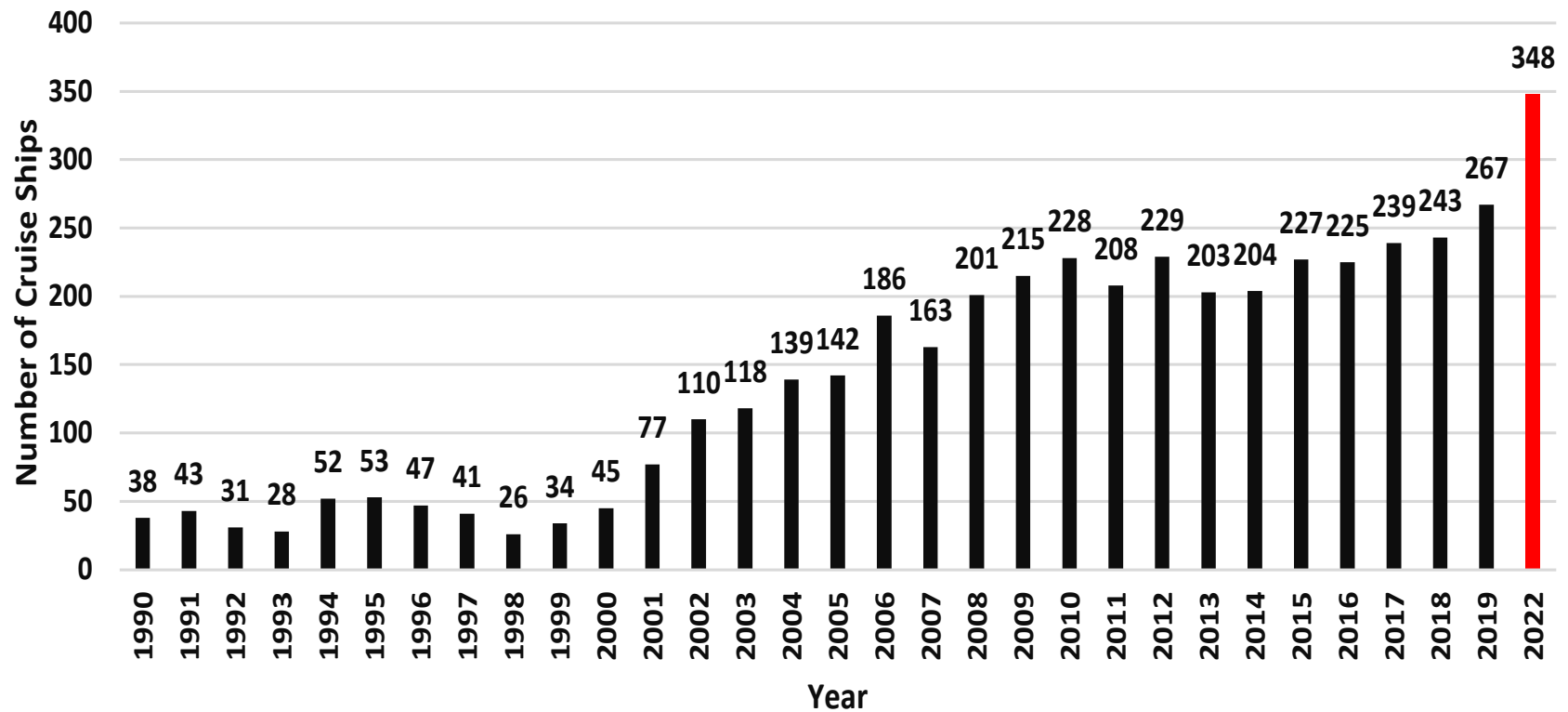
**Fine particulate matter can be harmful to humans.** Exposure to fine particulate matter has been associated with several serious health effects including heart and lung disease. Both short-term (24-hour) and longer-term (a year or more) exposure to fine particulate matter can have negative effects on human health.

<https://www.env.gov.bc.ca/soe/indicators/air/fine-pm.html>

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## More ships = More emissions

Cruise Ships 1990 to 2022



## PM2.5 – a summary

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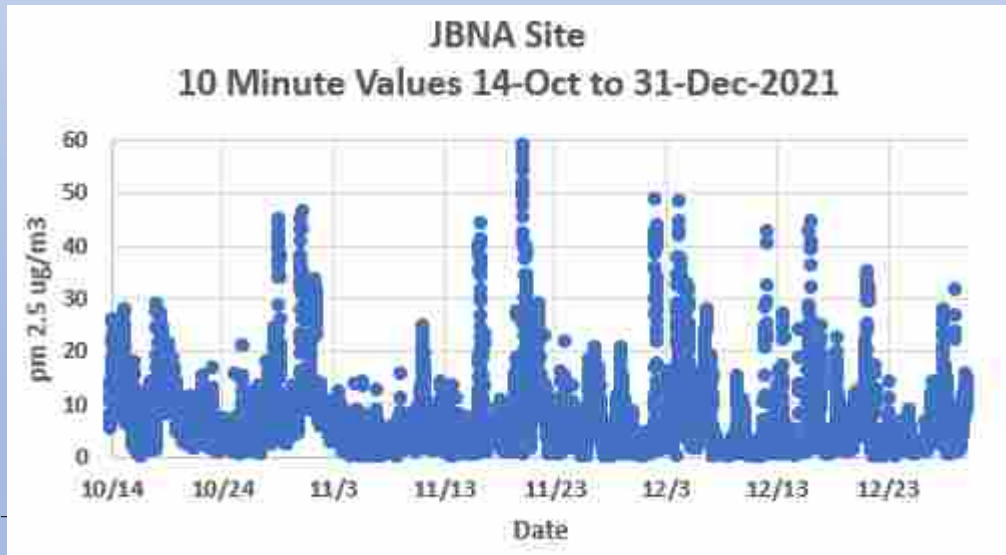
- We have evidence of substantial particulate matter emissions from cruise ships stacks
- The BC government has published the health risks associated with airborne particulate matter
- Each year there is an increasing number of cruise ship visits to James Bay, and therefore increasing pollution

Now, thanks to the BC Ministry of Environment, we have the means to discover whether the PM emissions from cruise ships pose a health risk to James Bay residents .....

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## JBNA, working with the Ministry of the Environment, will locate three Particulate Matter monitors in James Bay

JBNA has purchased one PurpleAir monitor and the Ministry of Environment has provided JBNA with an additional two. These will be placed in locations in line with prevalent summer WSW/SW/SSW winds.



Measurements will be downloaded and, by linking them to ship arrival times and wind direction, an accurate record of PM<sub>2.5</sub> levels will be determined.



## Concluding thoughts ....

- Actual, as distinct from theoretical, determination of cruise ship emissions affecting James Bay residents is long overdue.
- Although PM<sub>2.5</sub> is a danger to health we do not yet know whether cruise ship emissions, when dispersed by the wind, pose a danger to James Bay residents.
- It is quite possible that, even if high levels of PM<sub>2.5</sub> emissions occur during the average 6-1/2 hours that ships are in port, the levels when averaged over 24 hours, will be below the 24 hour average levels listed as BC Air Quality objectives
- We thank the Ministry of Environment for providing the means to measure the emissions and reach an evidence-based conclusion.