

A Comparative Air Quality Modelling Analysis of Options for Management of Waste After Recycling

GVS&DD Board
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metro
vancouver

Air Quality in Metro Vancouver and the FVRD

- Air quality in the Lower Fraser Valley airshed is generally good, and compares favourably to other North American cities
 - network of 27 monitoring stations from Horseshoe Bay to Hope measures outdoor air quality against objectives and standards
 - there can be short term episodes of degraded air quality



Emissions ↔ Air Quality

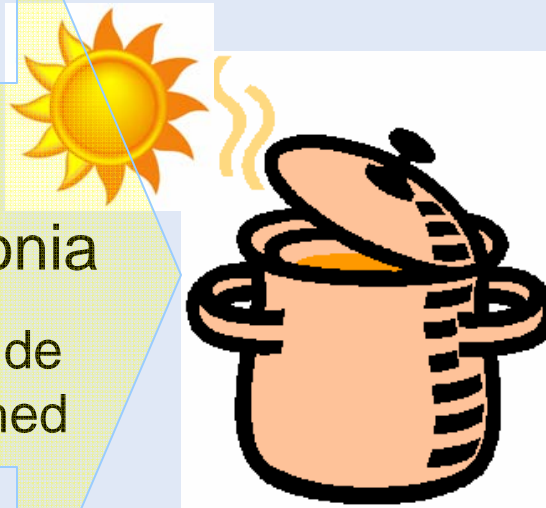
- Air quality is a function of the interaction between emissions, meteorology, topography and other influences

NO_x, VOC

PM, SO_x, ammonia

Emissions from inside and outside of airshed

“precursors”



Ozone

Secondary particulate

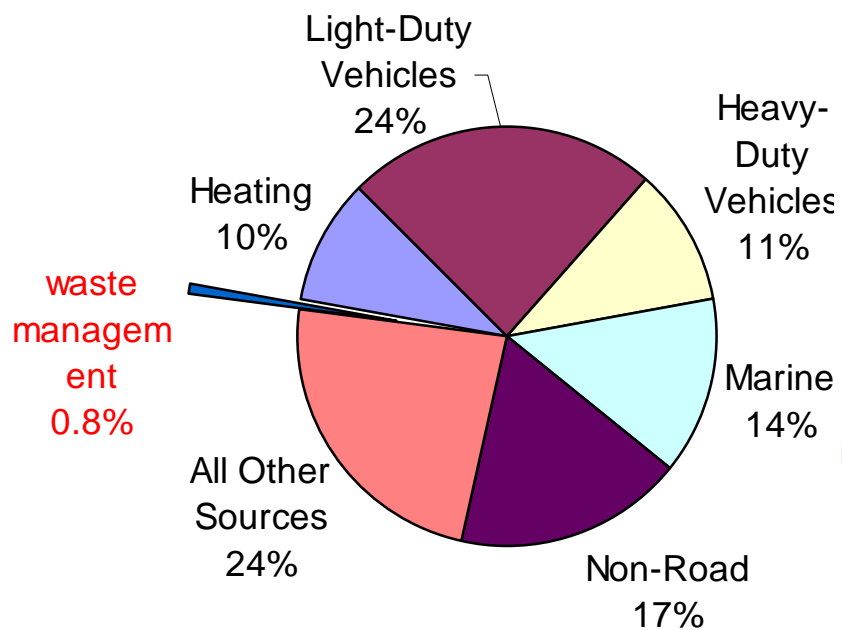
Smog / haze

potential health effects

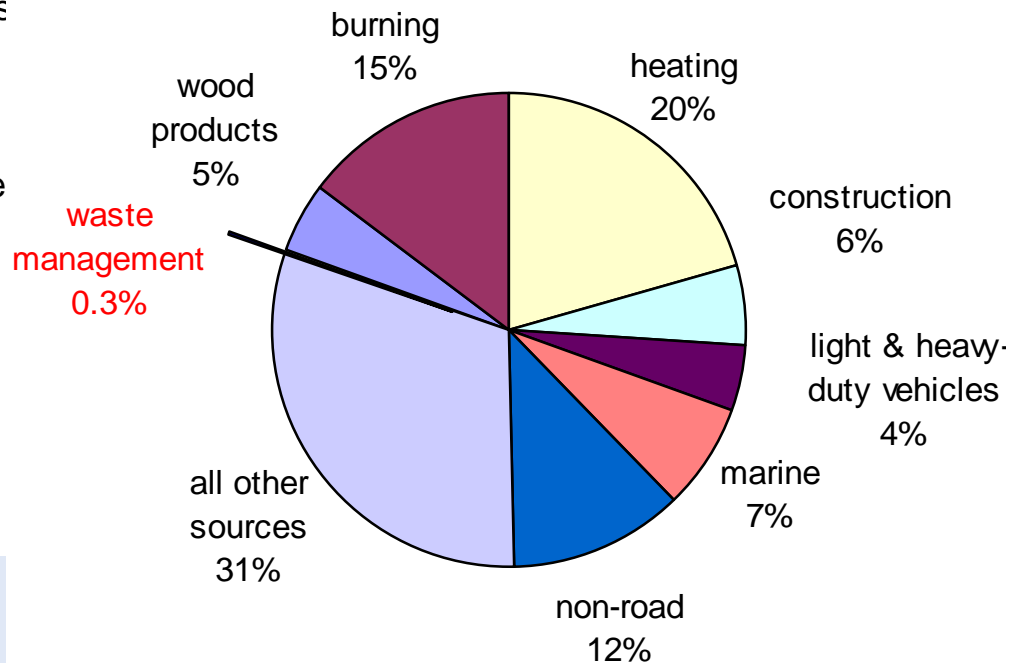
- Air quality (or airshed) models are used to predict outdoor air quality based on the emissions discharged to the atmosphere

Emissions Context

2005 NOx Emissions = 61,000 tonnes

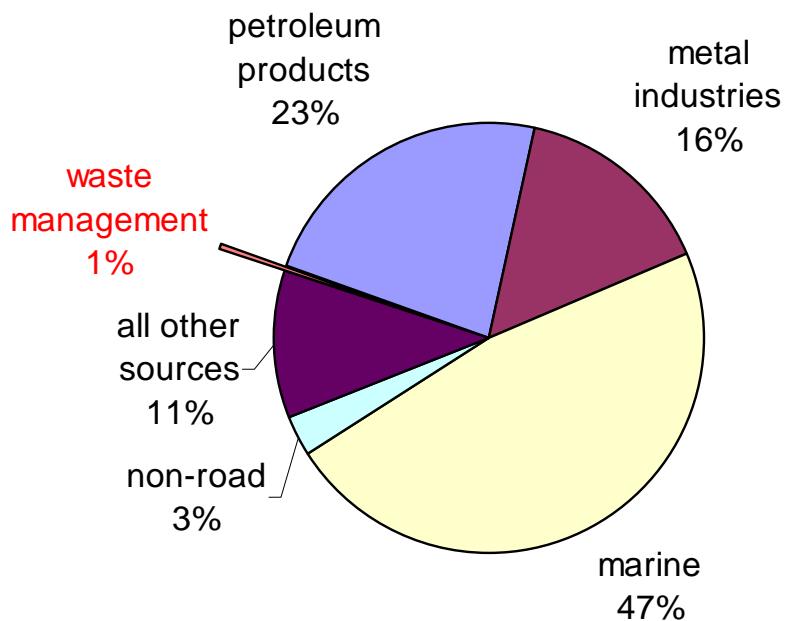


2005 PM2.5 Emissions = 7,000 tonnes

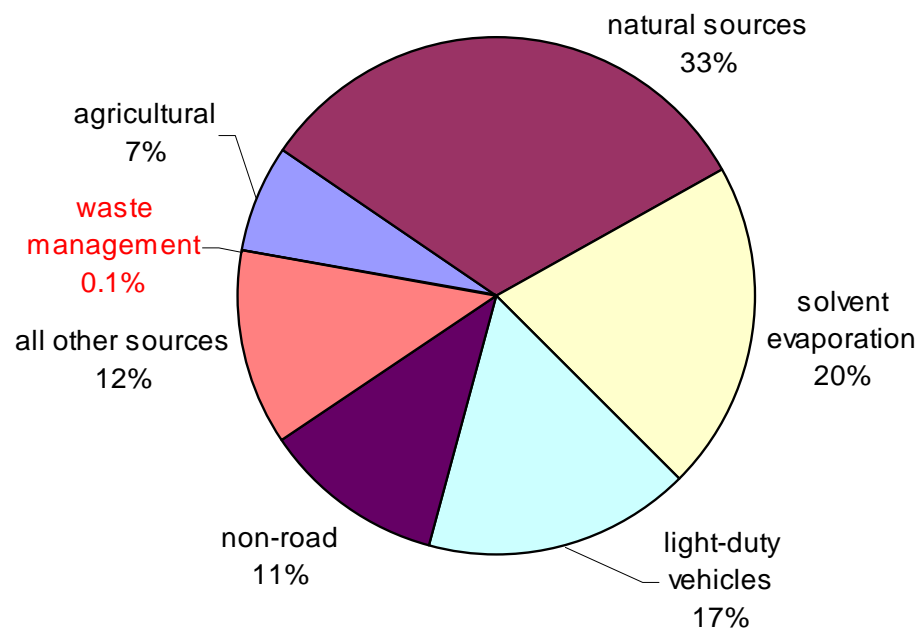


Emissions Context

2005 SO_x Emissions = 10,300 tonnes

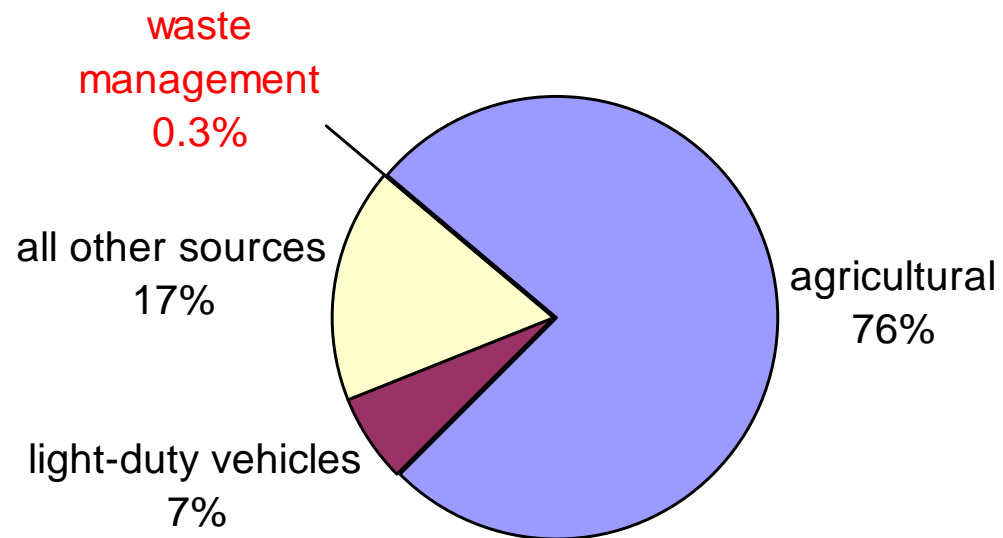


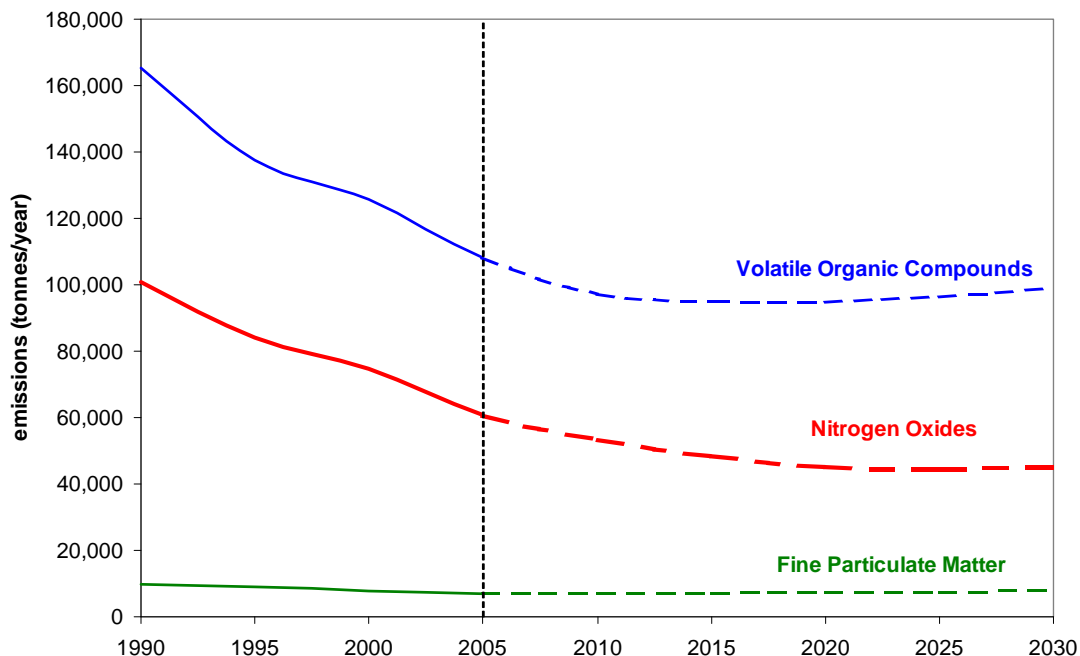
2005 VOC Emissions = 108,000 tonnes



Emissions Context

2005 NH₃ Emissions = 18,500 tonnes



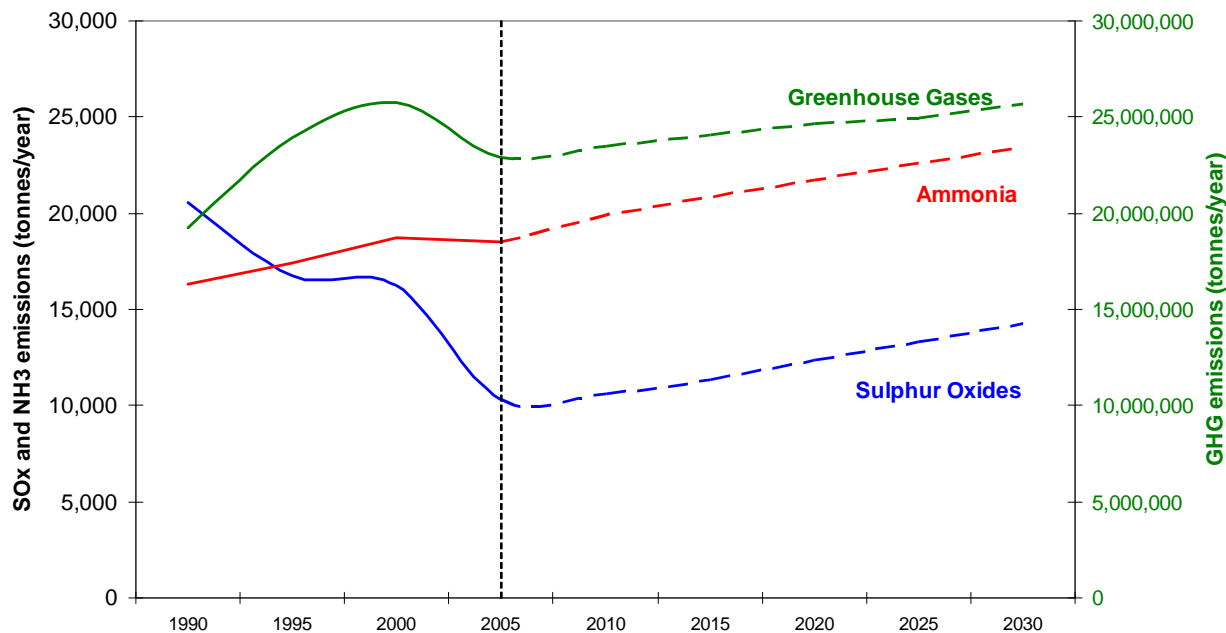
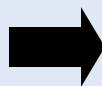


Emission Trends

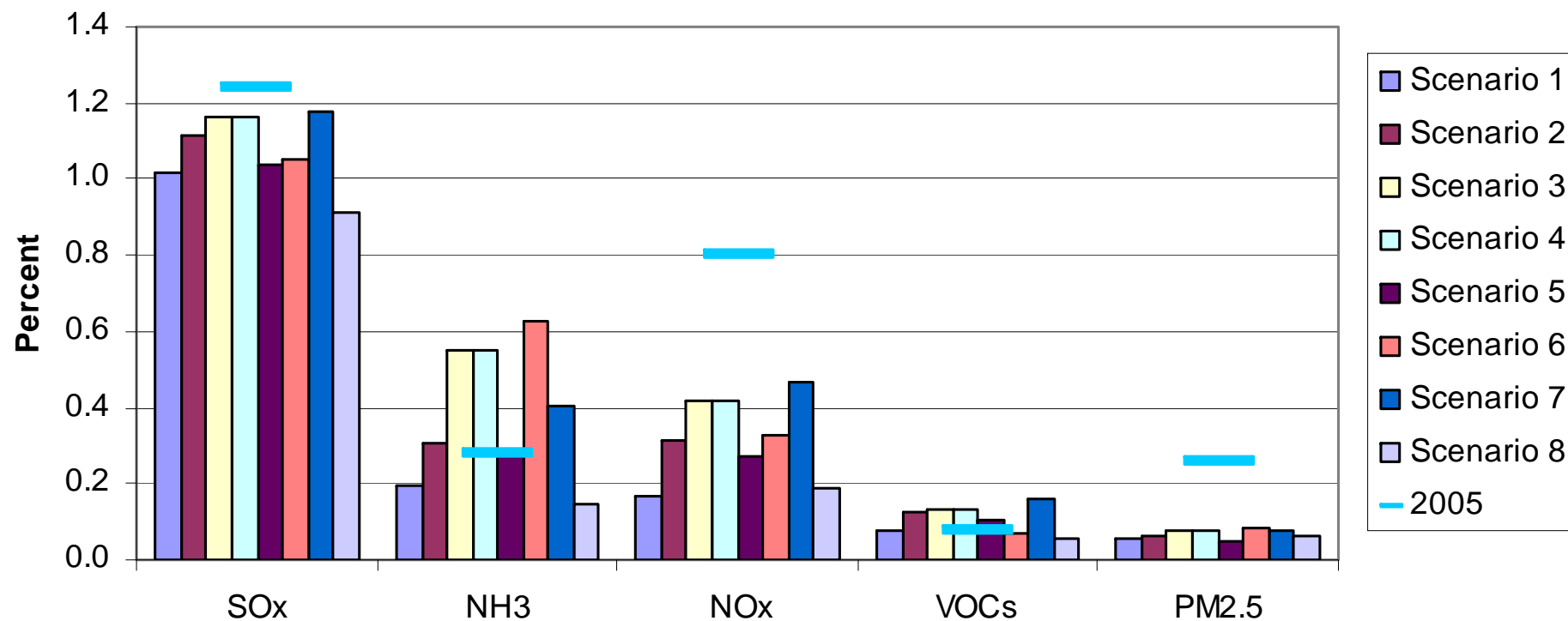
Emissions of some contaminants have decreased or levelled off



While others are forecast to increase

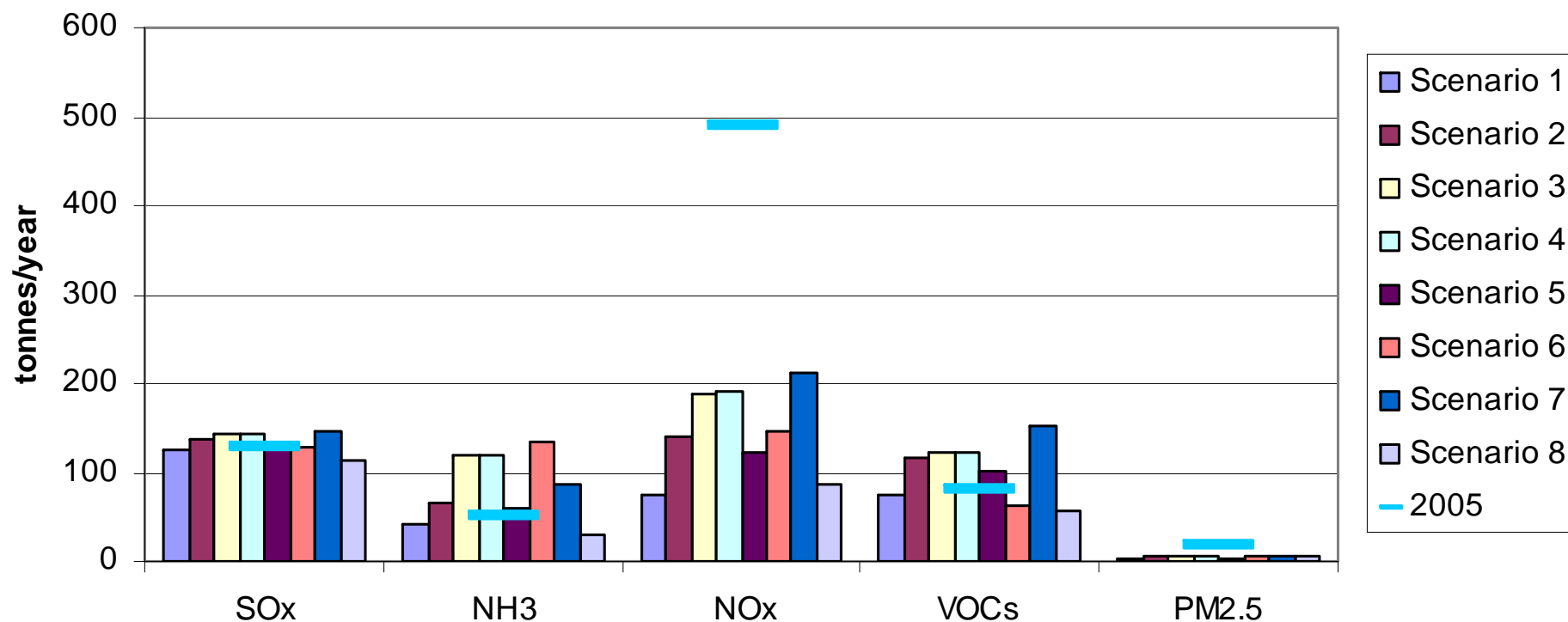


Emissions from solid waste management scenarios



Emissions from waste management are a small contributor to airshed totals in 2020, and will be less than or comparable to present day

Emissions from solid waste management scenarios

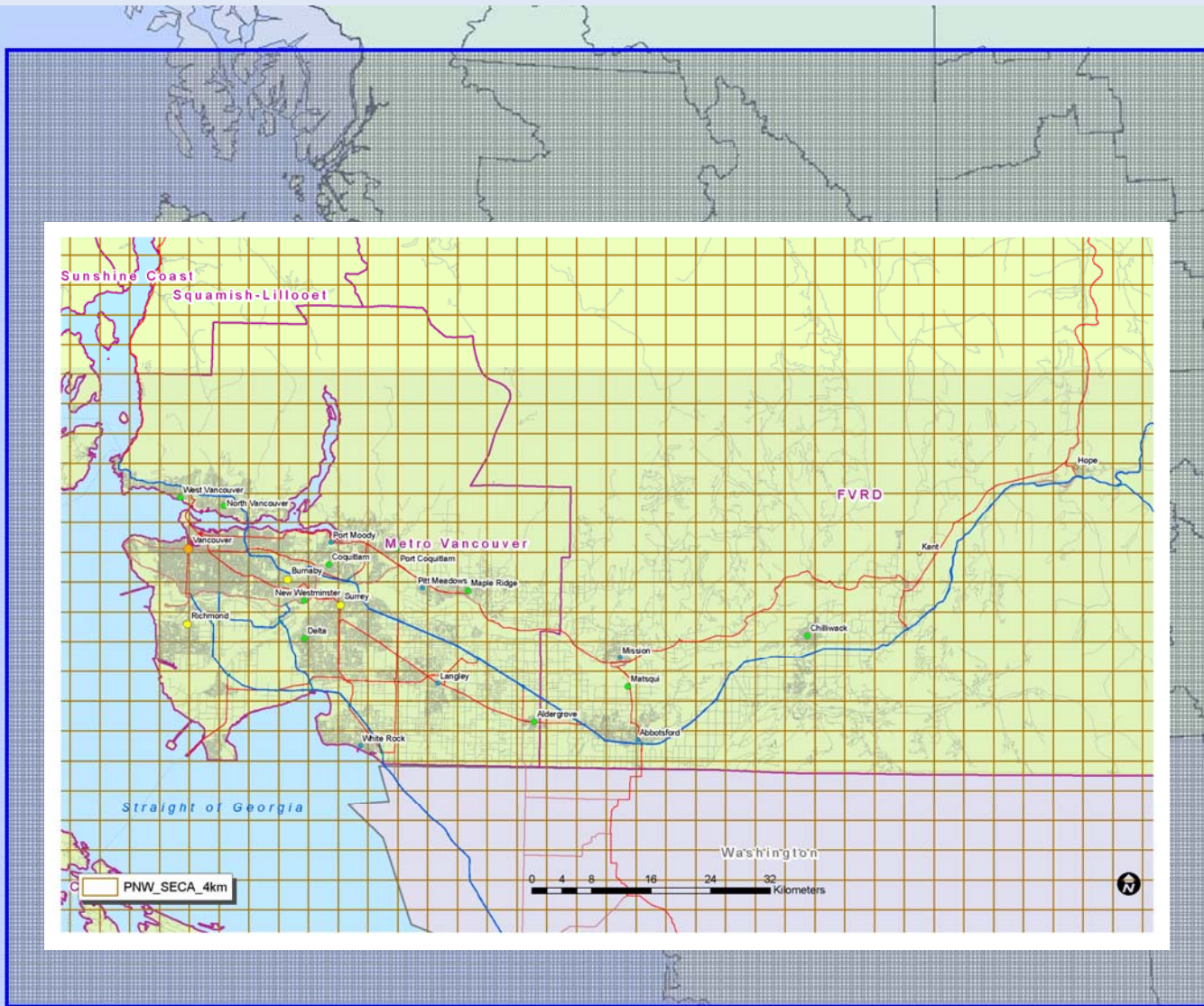


In absolute terms, emissions (tonnes) from waste management in 2020 will be less than or comparable to present day

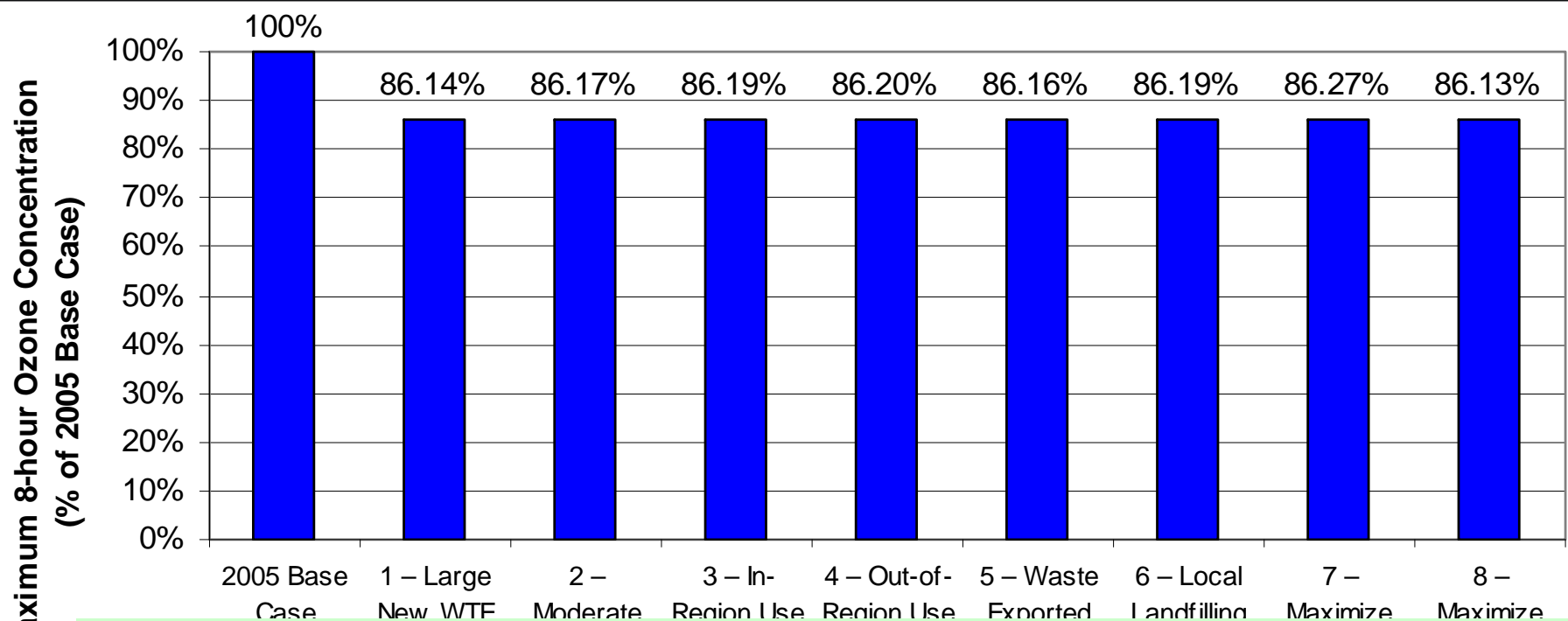
Airshed Modelling Methodology

- Modelling analysis conducted by RWDI AIR Inc.
- Community Multi-Scale Air Quality Model (CMAQ)
 - Applied previously in the Pacific Northwest by Environment Canada; more recently for marine vessel emissions control
 - Best used to compare alternative scenarios
- Considers meteorology, atmospheric chemistry, and emissions
- Model runs conducted under worst case summer ozone episode conditions for:
 - 2005 base case – basis of comparison to present day
 - All eight 2020 scenarios – compare the impacts of the scenarios

Model Domain

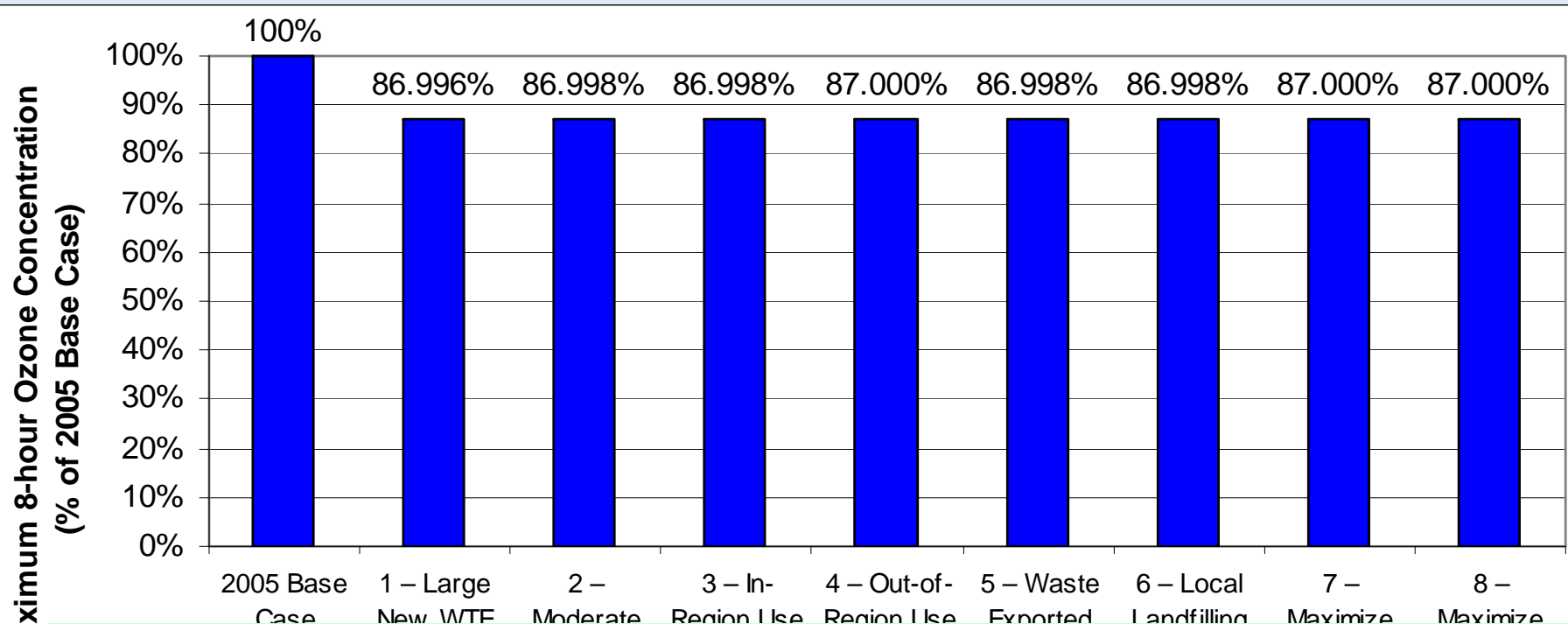


Regional Ozone Levels for 2020 Scenarios Compared to 2005



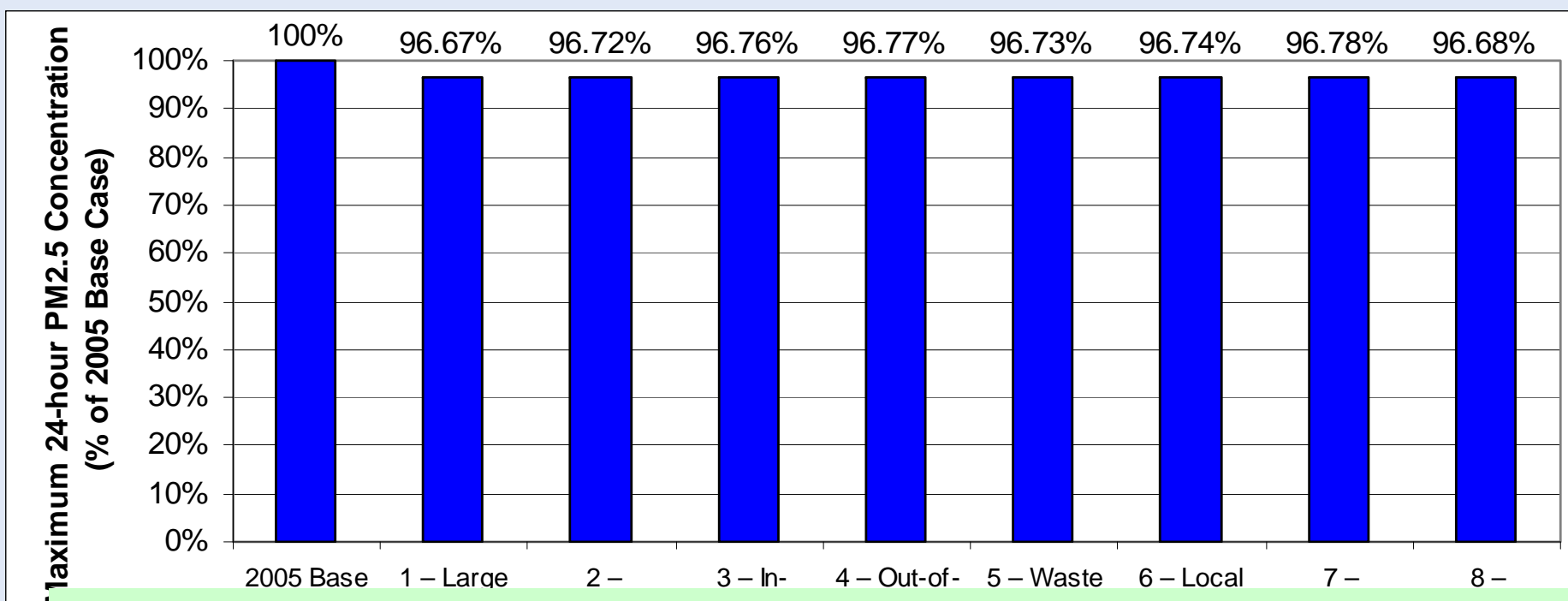
- Ozone precursors going down, modelling predicts improvements to 2020;
- No discernible difference between scenarios
- Maximum predicted 8 hour ozone, entire study area

Ozone Levels for 2020 Scenarios Compared to 2005 - Chilliwack



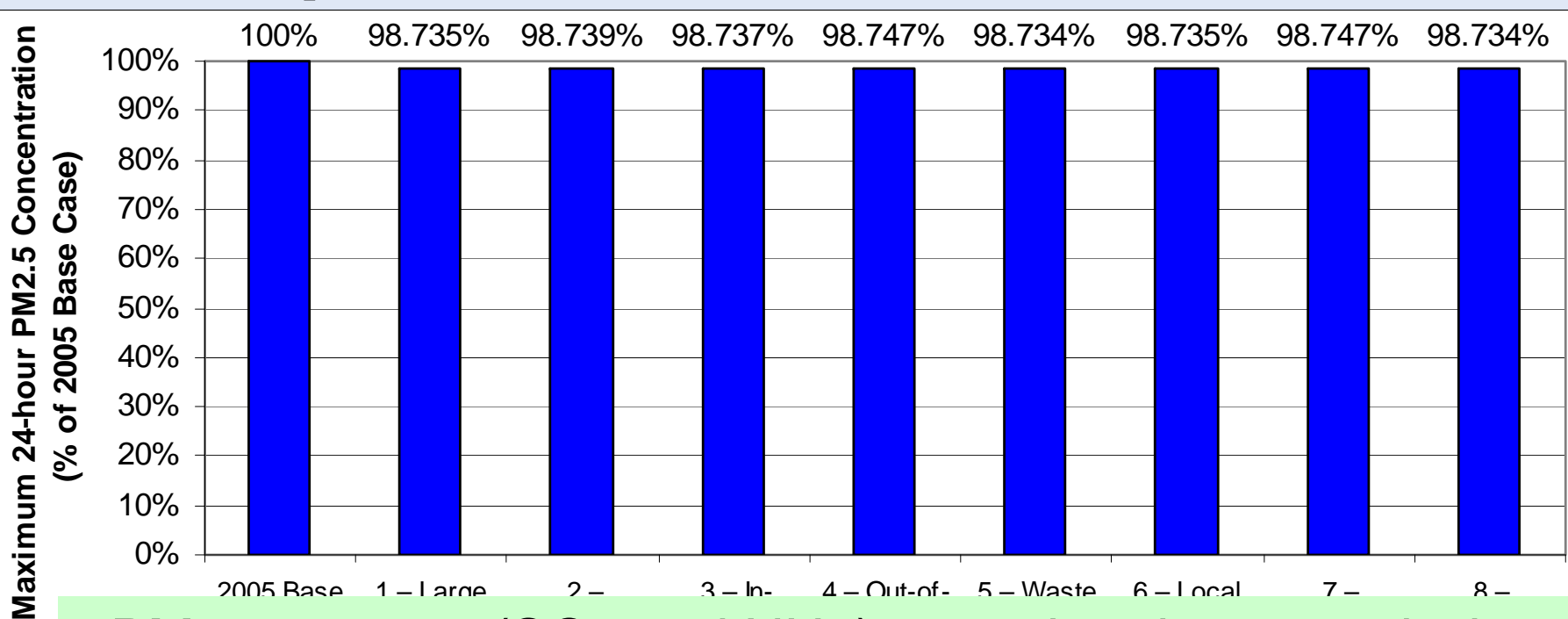
- Ozone precursors going down, modelling predicts improvements to 2020;
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 - Maximum predicted 8 hour ozone, Chilliwack

Regional PM_{2.5} Levels for 2020 Scenarios Compared to 2005



- PM precursors (SO_x and NH₃) not going down, modelling predicts about the same levels to 2020; but changes are not due to waste management emissions
- No discernible difference between scenarios
 - Maximum Predicted 24-Hour PM_{2.5} – entire study area

PM_{2.5} Levels for 2020 Scenarios Compared to 2005 - Chilliwack



- PM precursors (SO_x and NH₃) not going down, modelling predicts about the same to 2020; but changes are not due to waste management emissions
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Health aspects

- RWDI report provides context on health benefits from ambient ozone and PM improvement, across scenarios
 - Health and air quality study, BC Lung Association, 2005
 - 1% improvement in annual ozone and PM_{2.5} concentrations between 2000 and 2010 can produce health-related benefits on the order of \$17 million / year
 - Reduced mortality, fewer emergency room visits, decrease in restricted activity days, fewer asthma symptom days
 - Scenario modelling shows 14% and 3% improvement in ozone and PM_{2.5} levels during an 8 day summer period
 - It is expected that summer improvements would lead to overall annual improvements and therefore health-related benefits

Summary of Observations

- There *will* be emissions associated with waste management for the foreseeable future
- Future waste management emissions under any scenario are comparable to present day and are very low relative to airshed totals (from <0.1% to 1.2%)
- Airshed wide improvements in ambient levels of ozone and PM_{2.5} are predicted due to declining emission levels of several precursors
- CMAQ modelling shows no discernible difference between scenarios