



香港科技大學

THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

Electrification and Onshore Power

Guangdong-Hong Kong-Macao Greater Bay Area Clean Energy Supply Chain Conference

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Hong Kong's vision to become a Green Maritime Fuel Bunkering Hub

- **<Action Plan on Green Maritime Fuel Bunkering>:**

- For 55% of the diesel-fuelled vessels (166 in total) in the **Government fleet** to switch to using green maritime fuels by **2026**

- **<Hong Kong Transport Decarbonization Blueprint>:**

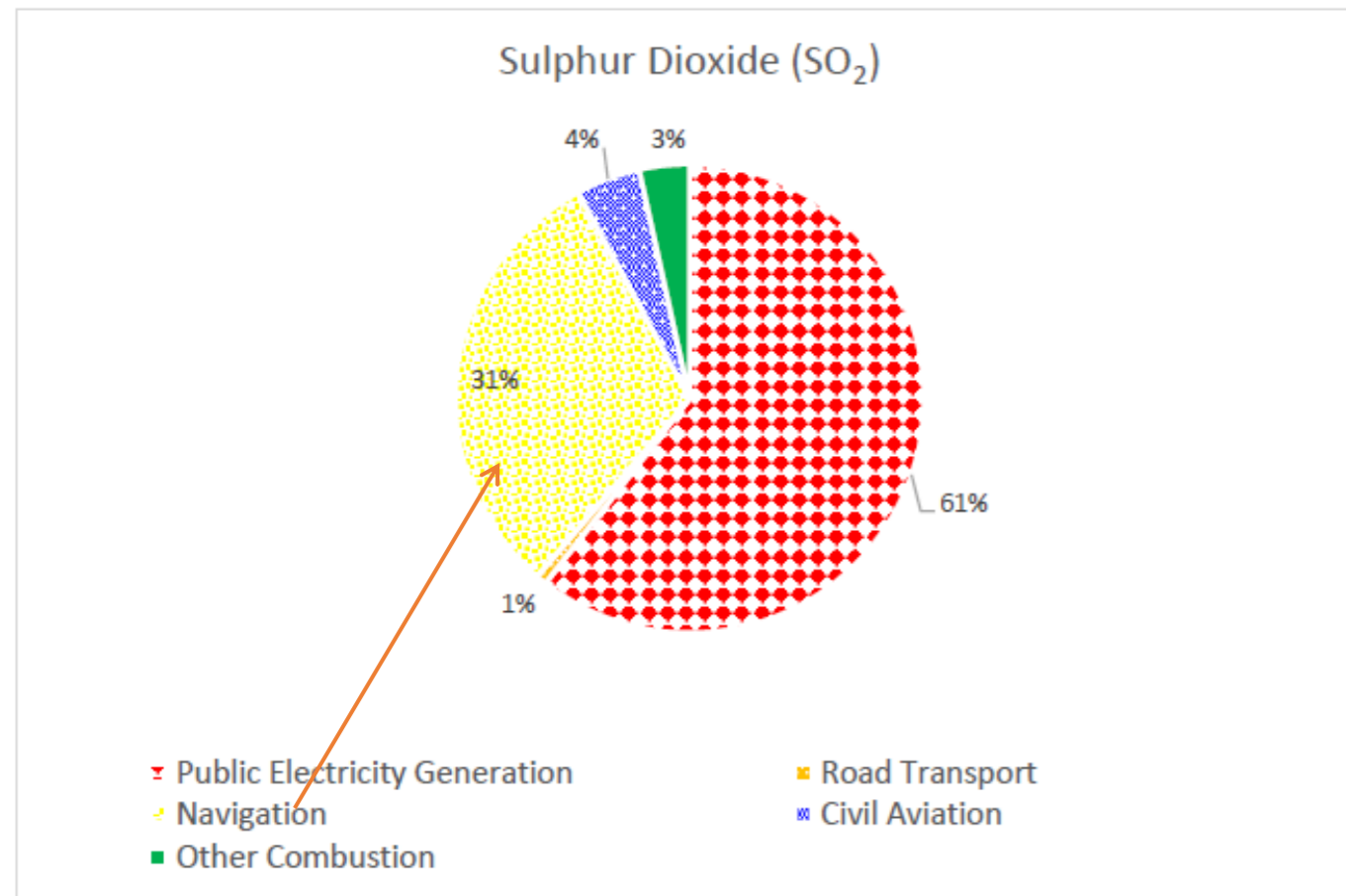
- *Shipping and cruise companies **retrofit vessels to accept OPS***
- *The order book of new ships reflects **a strong trend towards OPS compatibility***
- *The absence of OPS may result in shipping companies **opting to call at regional ports instead of Hong Kong Ports** to meet their sustainability targets and avoid carbon taxes*

**ACTION PLAN
ON GREEN
MARITIME FUEL
BUNKERING**

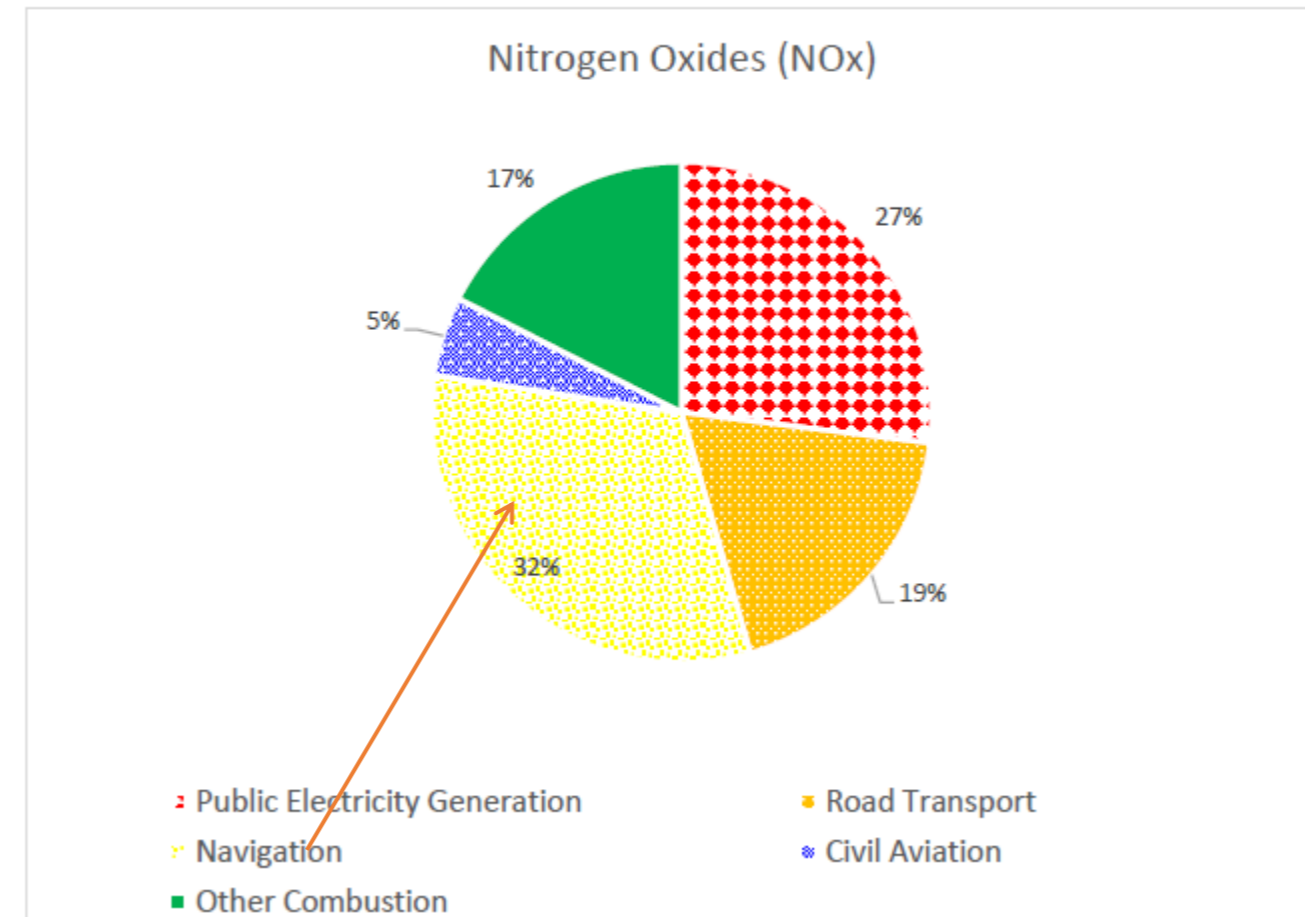


2022 Hong Kong Emission Inventory

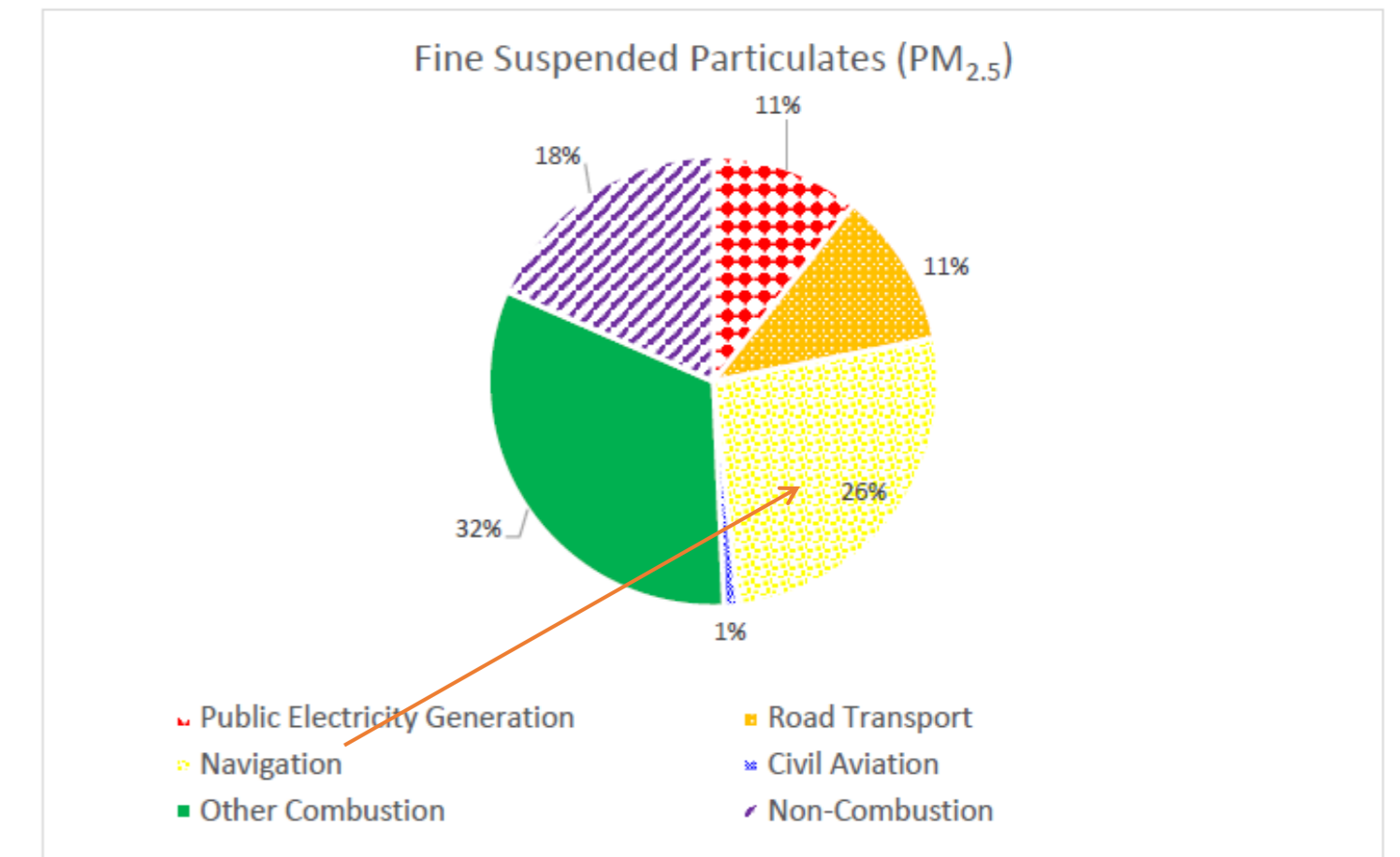
Total SO₂ emissions = 4,390 tonnes



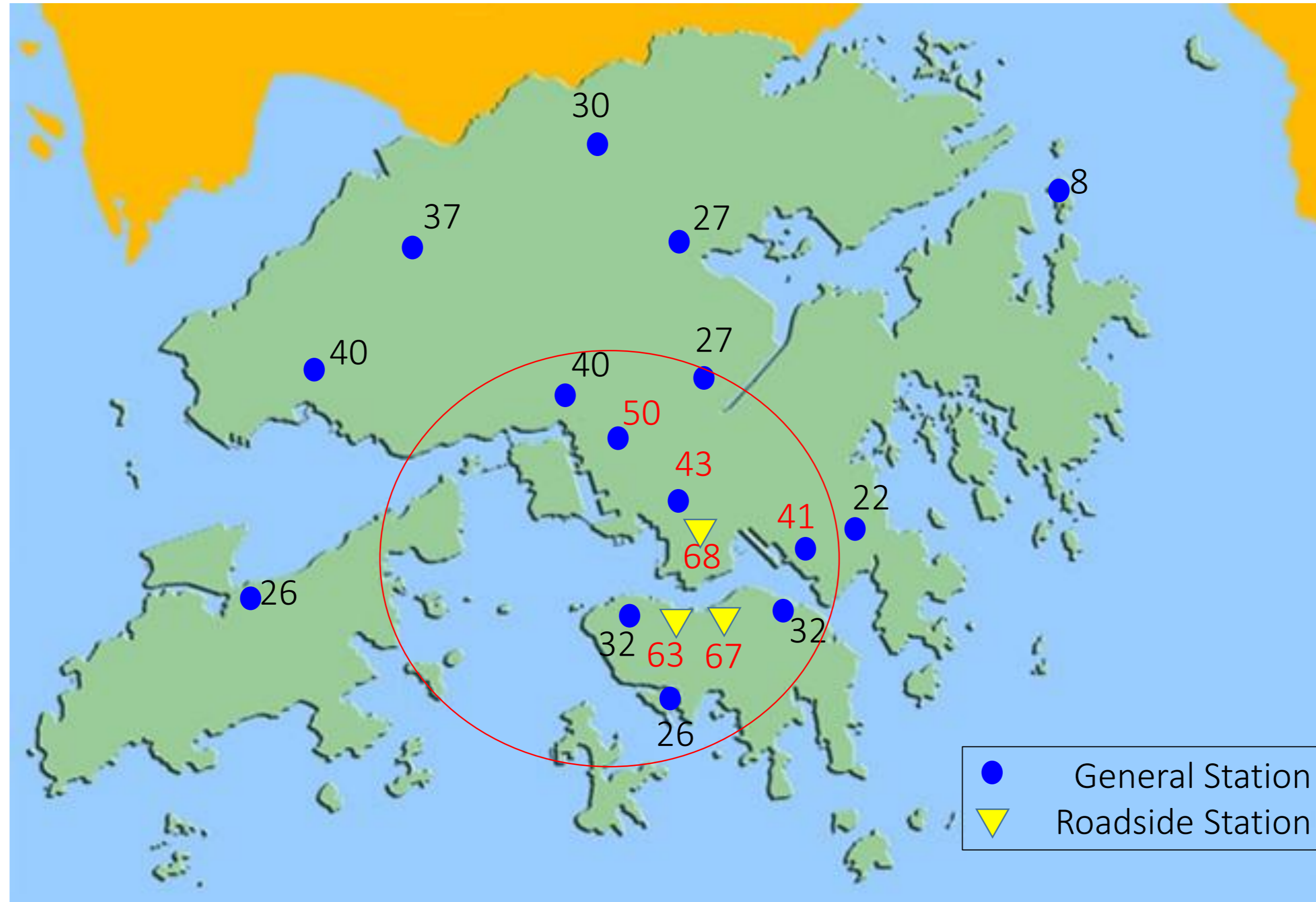
Total NO_x emissions = 50,010 tonnes



Total PM_{2.5} emissions = 2,220 tonnes

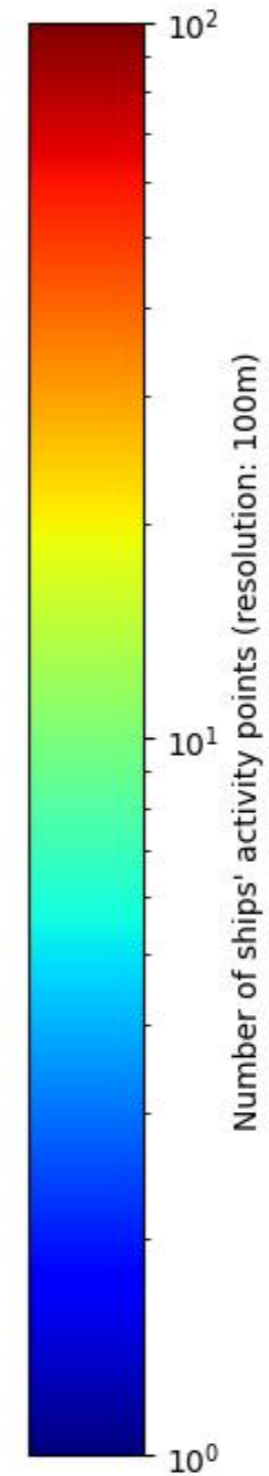
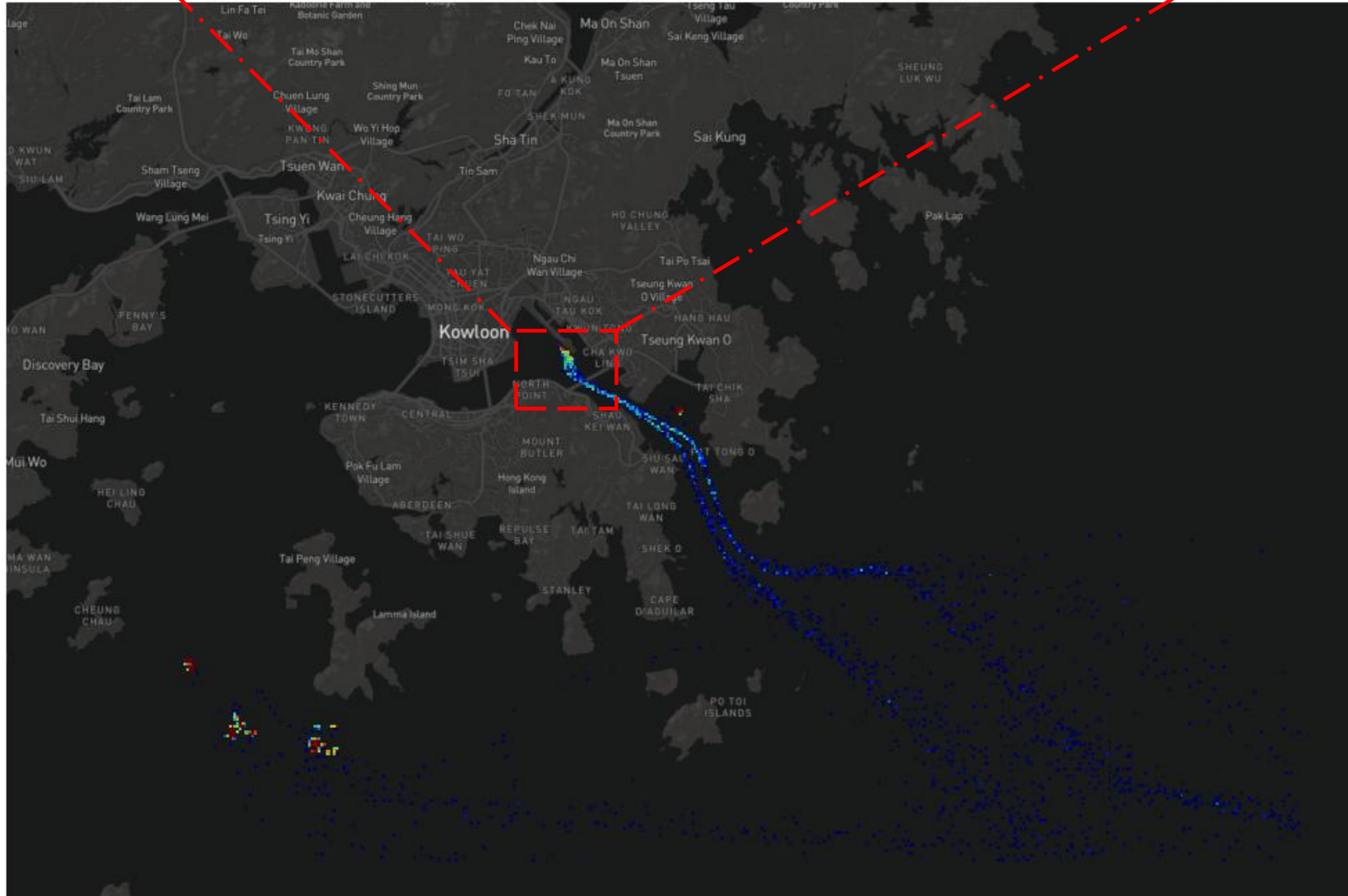


Spatial Distribution of Annual NO₂ Concentrations in 2023



Ship Name	Gross Tonnage	Voyage Counts	Mooring Time (h)	Fuel (ton)	CO ₂ (ton)	SO _x (ton)	NO _x (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)
Ditto	150,695	68	1,162	3,041	9,749	30	152	10	10
Ditto	169,379	33	489	1,280	4,103	13	64	4	4
Ditto	138,194	1	7	20	63	0.2	0.9	<0.1	<0.1

Activity Heatmap of Identified Cruise Ships in/near Hong Kong Waters (as of 2021)



OPS Potentials at Kai Tak Cruise Terminal

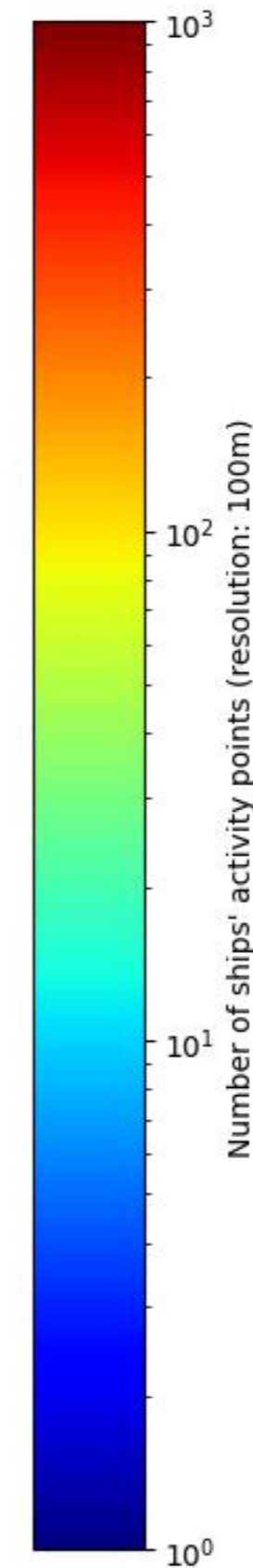
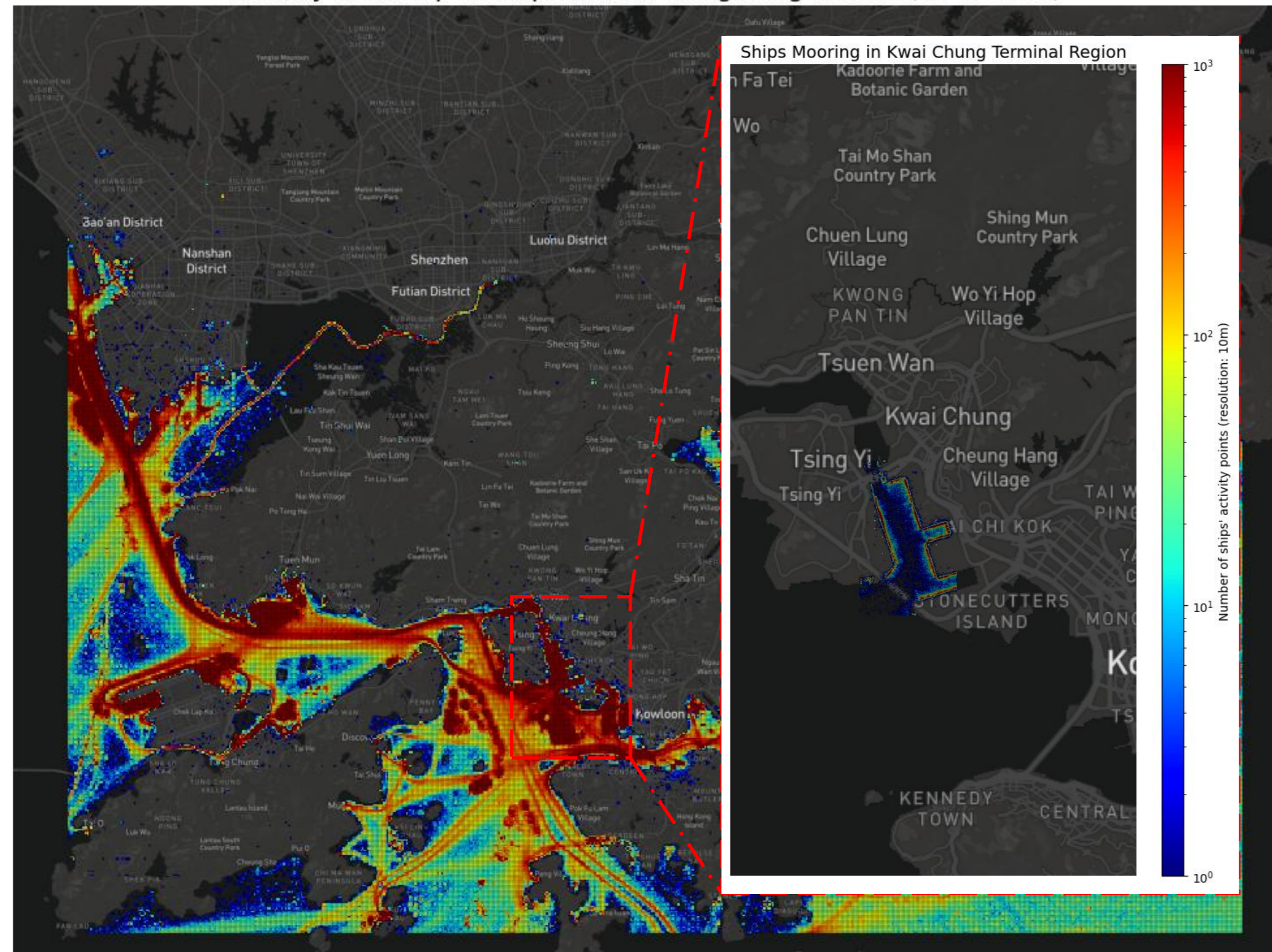
- During **102** voyages, **three** cruises accumulated **1,658 hours** of mooring time
- With **87** registered voyages translating to **582+** berthing hours in 2025, the deployment of OPS could save around **1,520** tons fuel, and eliminate **15.2** tons of SO_x emissions, **76.1** tons of NO_x emissions, and **4.9** ton of each PM₁₀ and PM_{2.5}



¹ "Mooring" state defined as berthing or anchoring

OPS Potentials at Kwai Chung Container Terminal

Activity Heatmap of Ships in/near Hong Kong Waters (as of 2021)



3,167 vessels accumulated approximately **580,000** mooring-hours, consuming **68,685** tons of fuel and releasing the following pollutants:

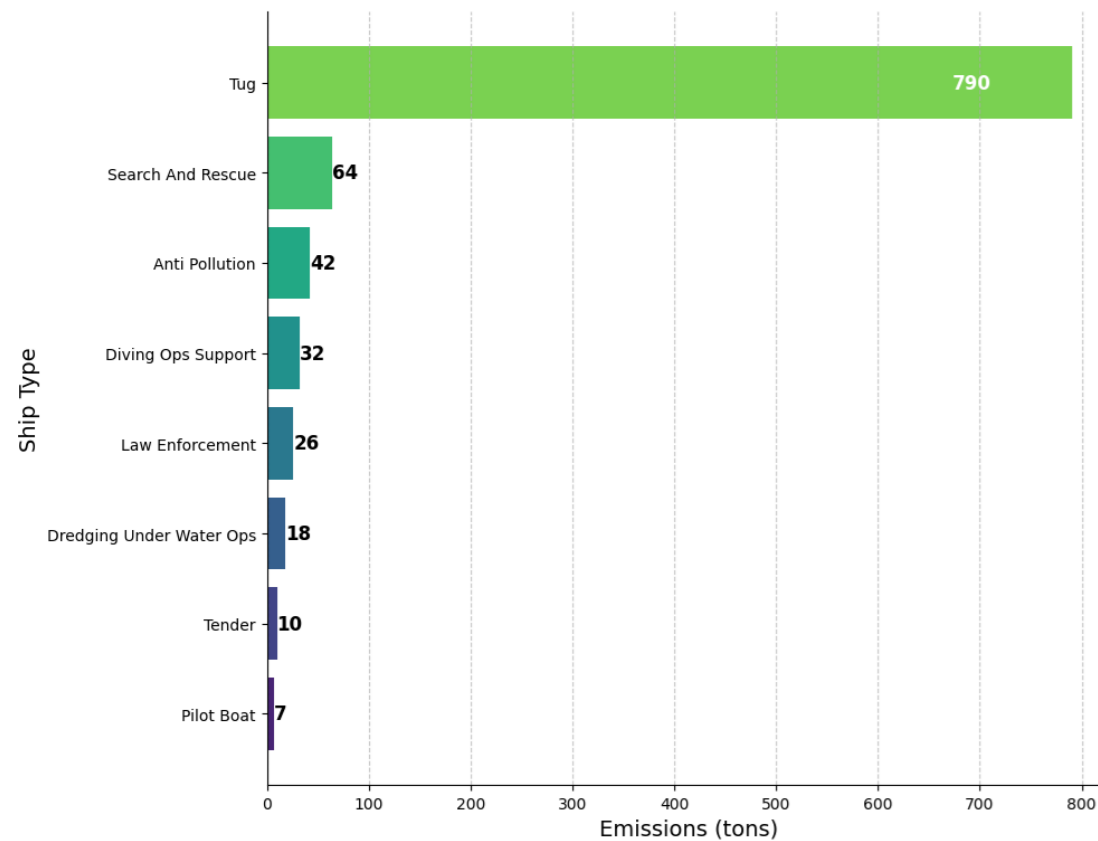
- Carbon dioxide (CO₂): 220,206 tons
- Sulfur oxides (SO_x): 671 tons
- Nitrogen oxides (NO_x): 2,128 tons
- Particulate matter:
 - PM₁₀ :159 tons
 - PM_{2.5} : 146 tons

¹ "Mooring" state defined as berthing or anchoring

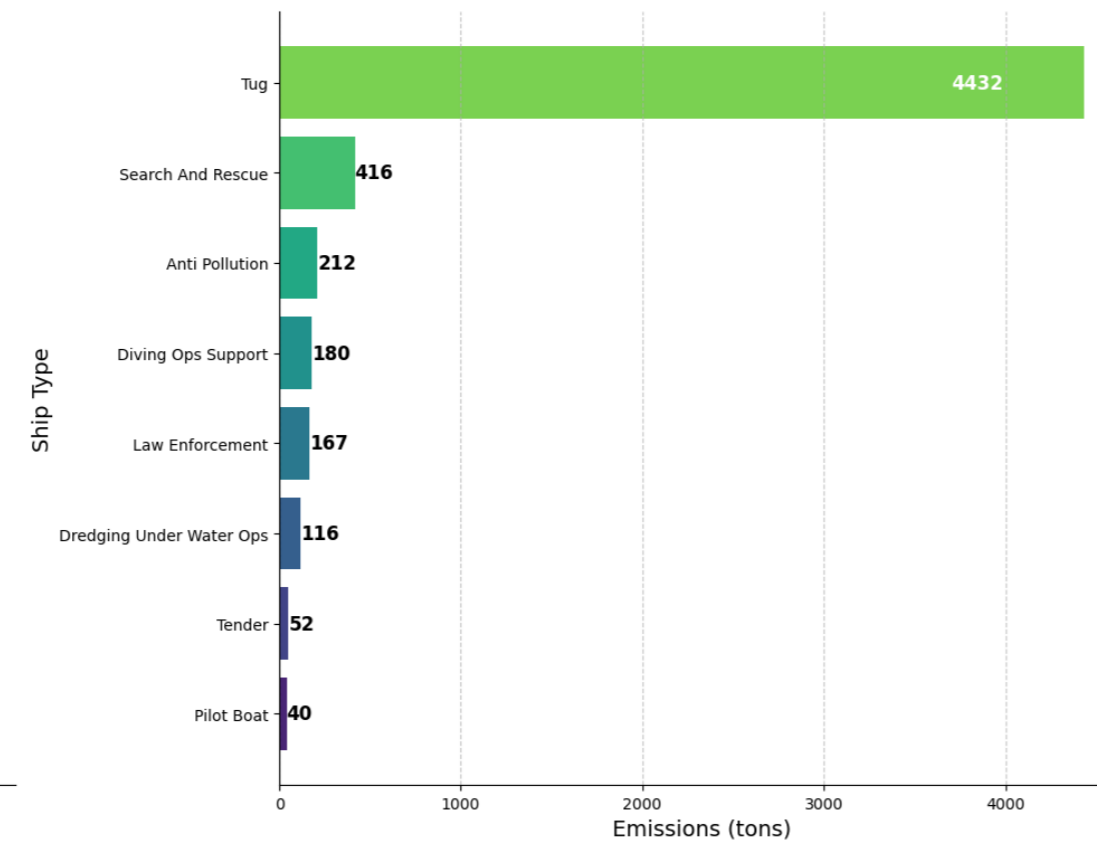
² Vessels with continuous mooring >30 days were flagged as idle and excluded

Air Emissions Inventory from Working Vessels in Hong Kong Waters (as per 2021)

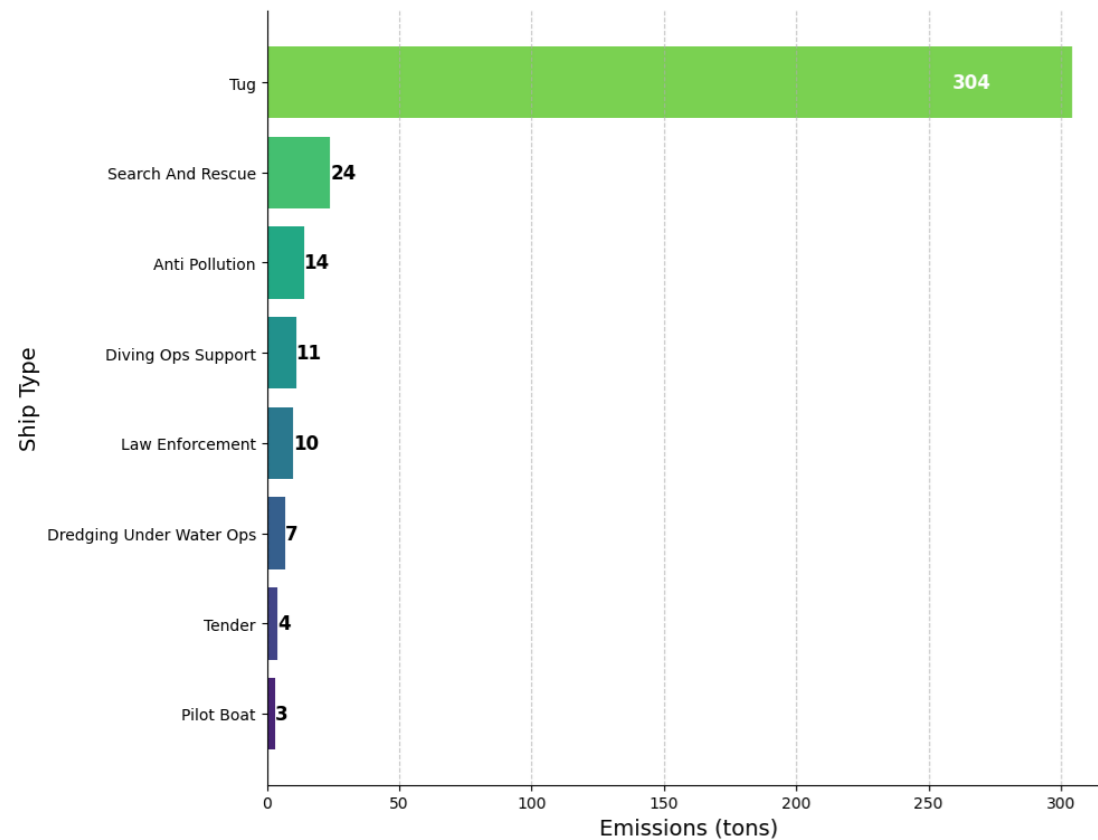
SOx Emissions by Ship Type



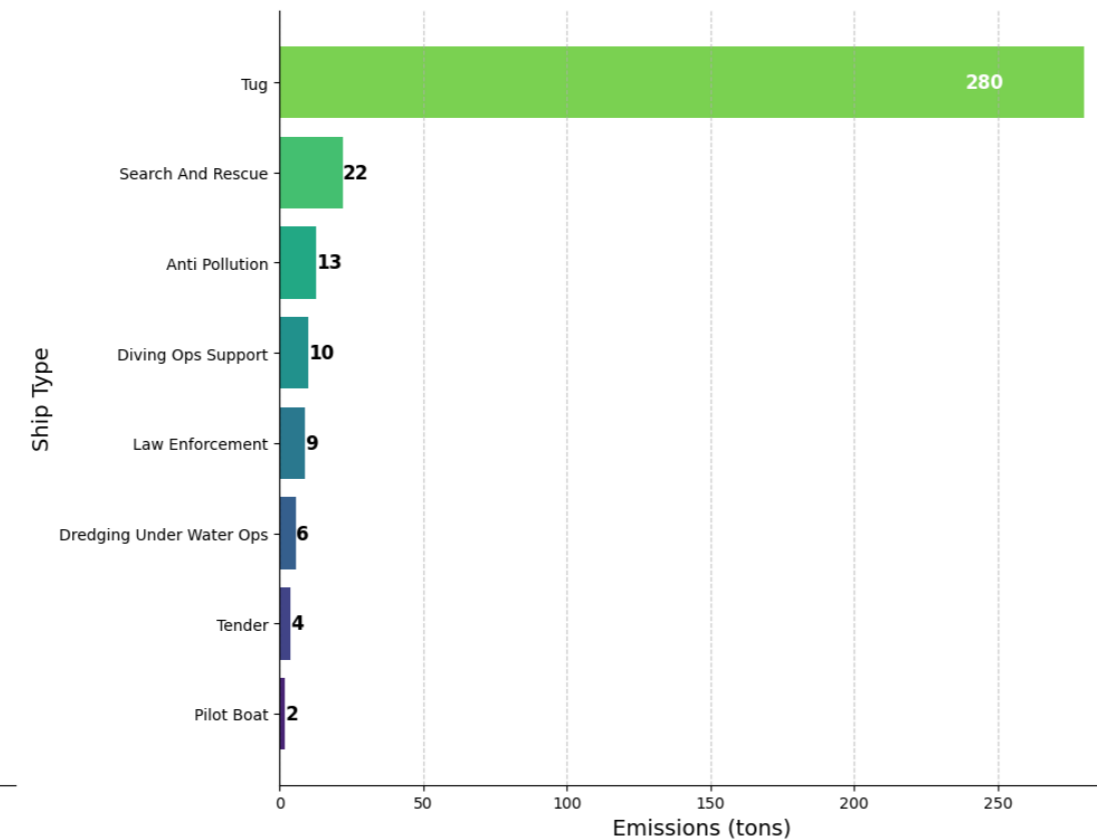
NOx Emissions by Ship Type



PM10 Emissions by Ship Type



PM2.5 Emissions by Ship Type



- **The aggregate emissions** amount to 989 tons of SO_x, 5,615 tons of NO_x, 377 tons of PM₁₀, and 346 tons of PM_{2.5}
- **Tugs** are the largest pollution contributor among selected vessels
- **Tugs, Search And Rescue vessels, and Anti Pollution vessels** collectively account for 90.6% of all maritime emissions

¹ Estimated based on AIS data, vessels with continuous mooring >30 days were flagged as idle and excluded

Issues to be Addressed for Electrification of the Port

- Do we have sufficient electricity supply to support the charging need of electric vessels?
- Is the carbon intensity of HK's electricity lower than diesel and other green fuels?
- What are the hurdles to be overcome for installing power supply facilities for vessels?
- Is the technology of electric vessel mature enough for large scale deployment in Hong Kong?
- What types of vessels are most suitable for electrification in Hong Kong?
- What is the cost comparison (CAPEX and OPEX) between electric vessels and conventional combustion engine powered vessels?
- What are the latest developments in charging technology at terminals?
- What kind of charging facilities are suitable for cruise and cargo terminals in Hong Kong?
- What are the business models suitable for electrification of vessels in Hong Kong?