CALIFORNIA
AIR RESOURCES BOARD

# Air Quality Impacts of Port Congestion During the COVID-19 Era and the Influence of Clean Transportation Policies

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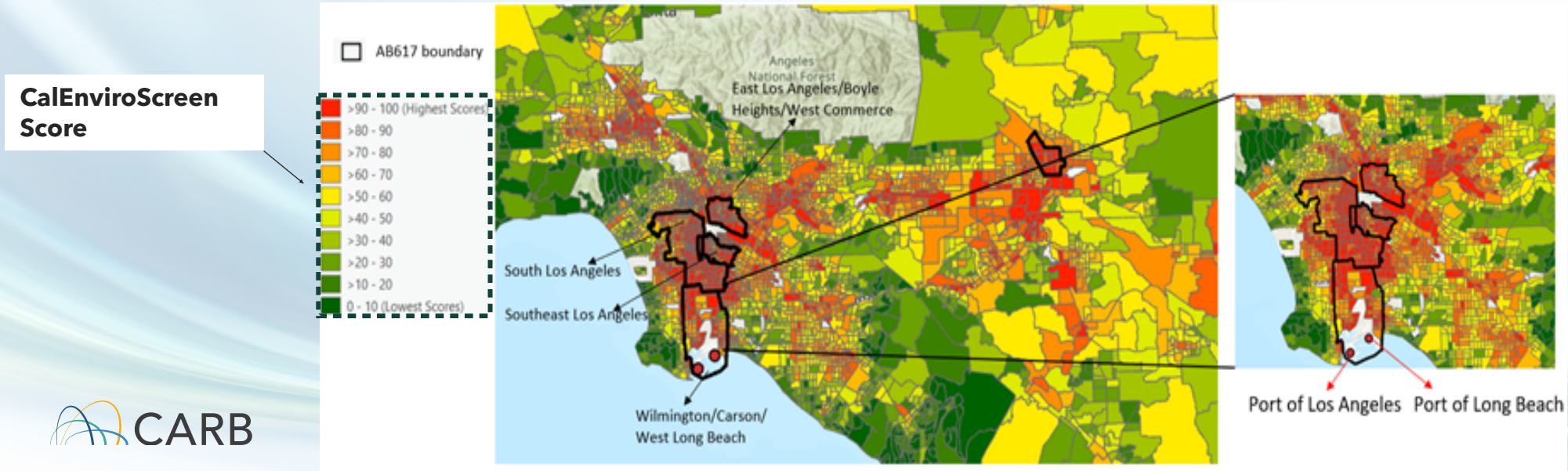
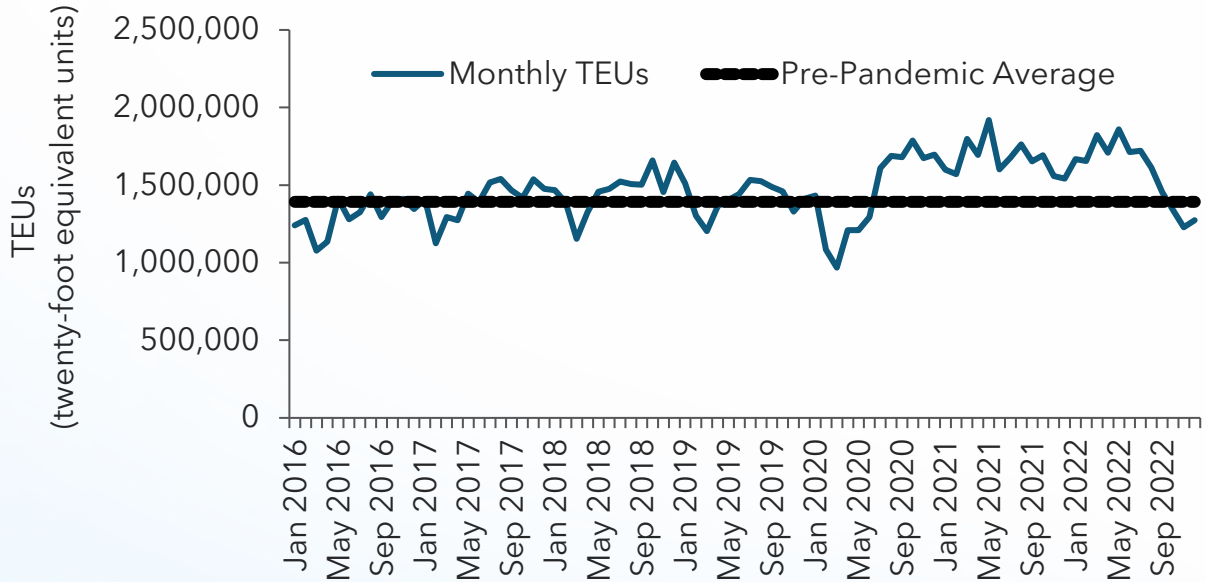
# Background

- The Ports of Los Angeles (LA) and Long Beach (LB) serve as vital gateways for freight movement in the United States
- Operation of vessels, trucks, locomotives, and cargo handling equipment at the ports are a significant source of air pollutants:
  - Nitrogen oxides (NOx) and particulate matter (PM) emissions that lead to adverse health impacts in nearby communities.
  - Carbon dioxide (CO2) emissions contribute to climate change.



# Port Congestion Event

- COVID-19 pandemic led to a shift in consumer behavior, record-breaking import volumes, and labor shortages disrupted the supply chain and normal flow of freight movement.
- Unprecedented vessel congestion and increased activity from landside freight network led to excess pollutant emissions.




# Objectives

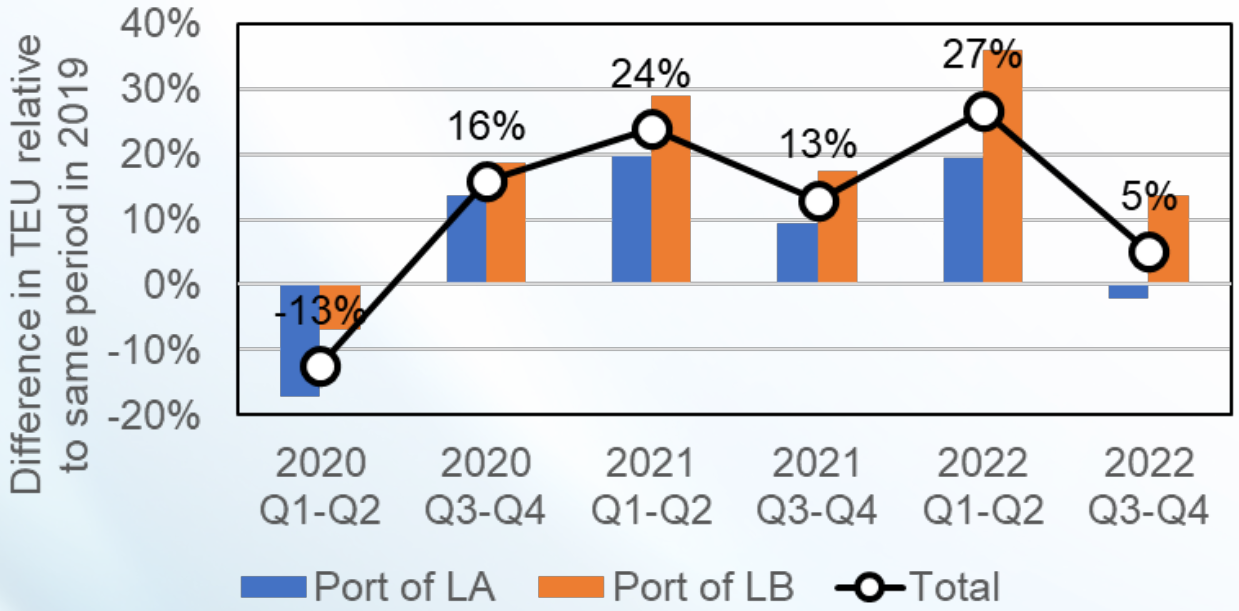
- Provide the first comprehensive monthly assessment of PM, NOx, and $CO_2$ emissions during the Port Congestion Period
- Estimate excess emissions in the South Coast Air Basin by comparing two scenarios:
  (1) Business as usual (BAU) scenario: a counterfactual scenario assuming the port congestion had not occurred
  (2) ACTUAL scenario, based on observed activity data that reflects the port congestion
- Investigate the impact of strategies to mitigate emissions associated with increased port activities

# Data Sources for Estimating Excess Emissions

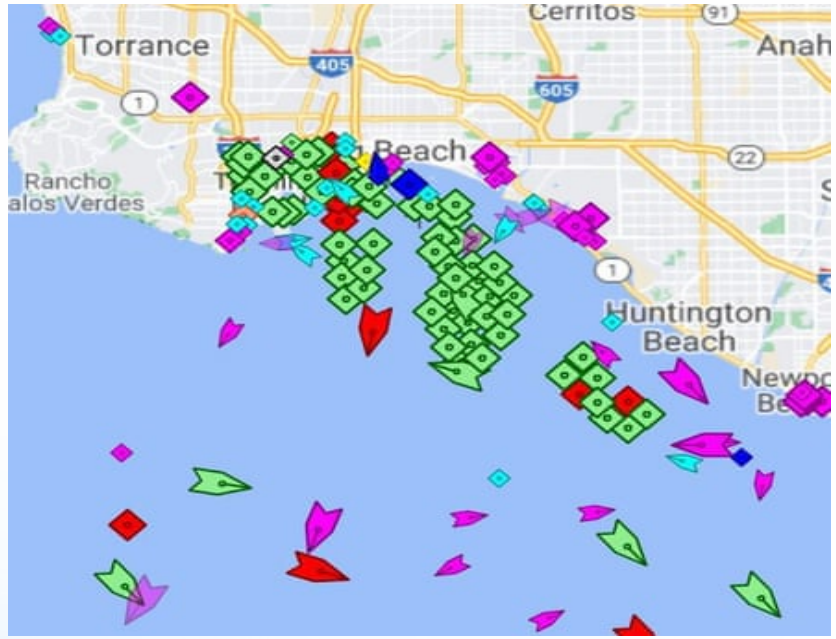
| Source Category | Data Source for Activity | Data Source for Emission Factors |
|---|---|---|
| Ocean-Going Vessels (OGV) | Automatic Identification System (AIS) from National Oceanic and Atmospheric Administration (NOAA) | U.S. Environmental Protection Agency's 2020 Updates to OGV Emission Factors |
| Cargo Handling Equipment | Twenty-foot Equivalent Unit (TEU) of containers data from Ports of LA/LB | CARB's OFFROAD model |
| Locomotives | TEU data from Ports of LA/LB | Air emissions inventories from Ports of LA/LB |
| Trucks | Truck trips data from Ports of LA/LB | CARB's EMFAC model |

**Landside Freight Network**

# Changes to Port Throughput of Containers



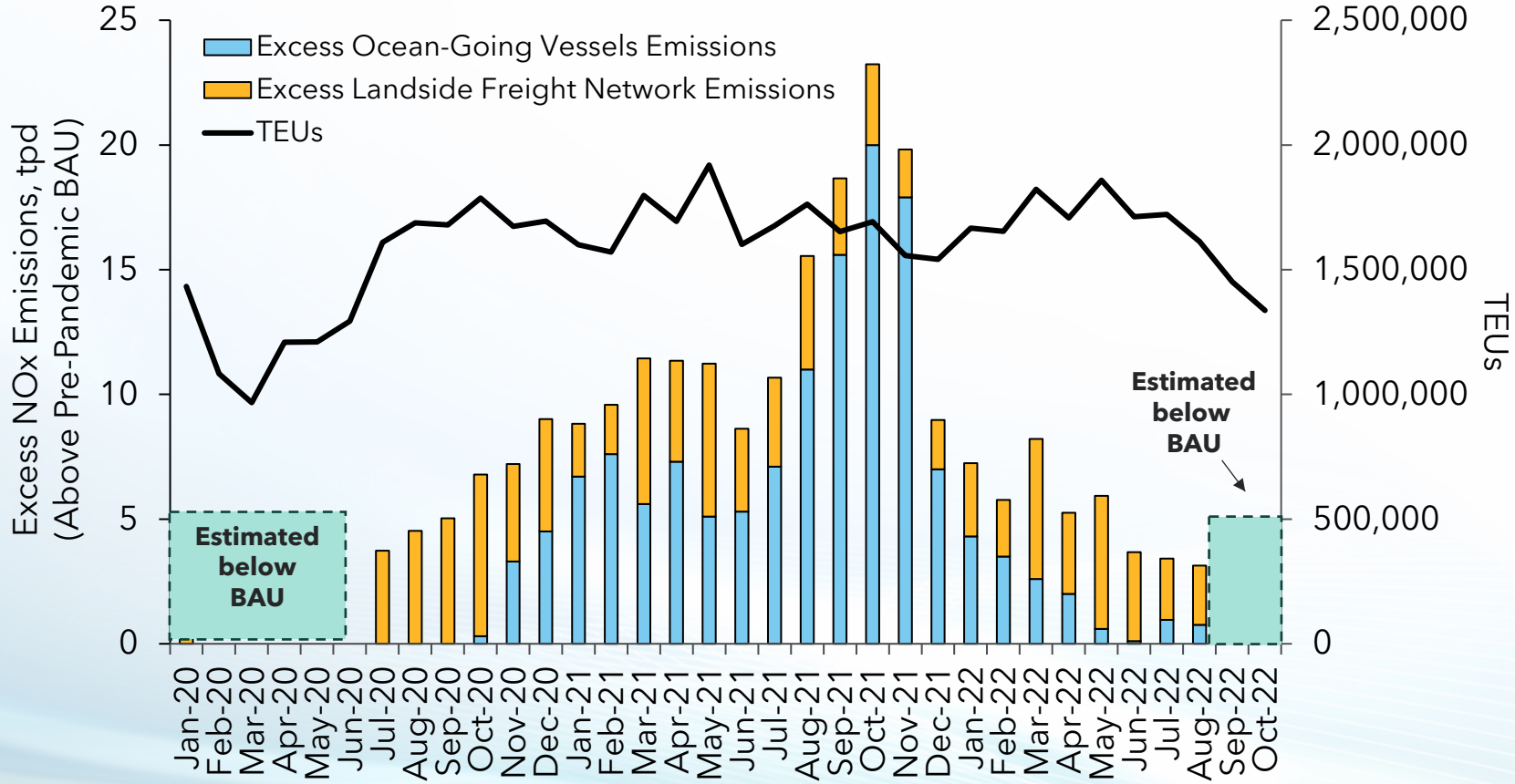

- Increased level of goods movement resulted in higher emissions from landside freight network.
- Surge in freight movement and resulting congestion led to an increased number of vessels waiting for berths at Ports of LA/LB.




A record number of cargo ships are stuck outside LA. What's happening? https://www.theguardian.com/us-news/2021/sep/22/cargo-ships-traffic-jam-los-angeles-california

# Overall Emissions Impact in South Coast Air Basin (All Sources)

- Excess NOx emissions occurred between July 2020 – August 2022.
- Peak excess NOx emissions of **23.2 tpd** occurred in October 2021.

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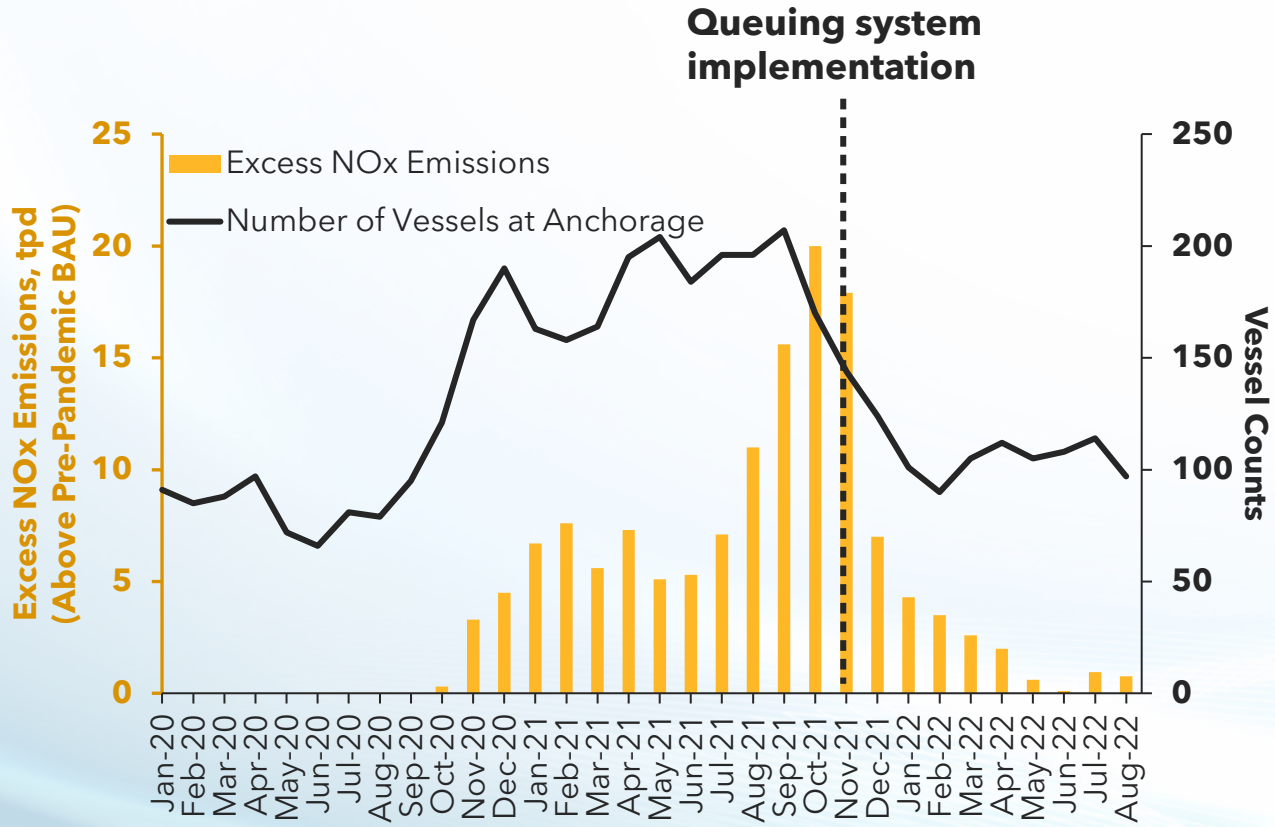
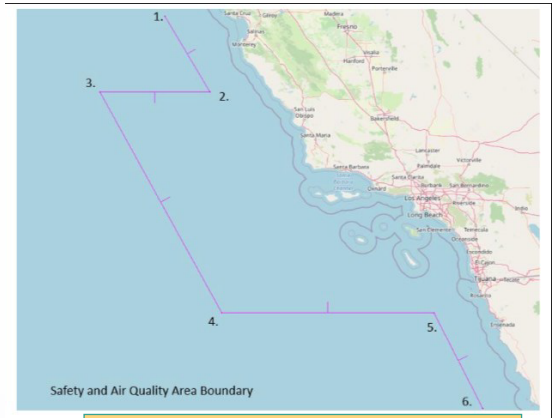
# Impact of Queuing System on Ocean-Going Vessels at Anchorage

- Pacific Maritime Management Services (PacMMS) implemented queuing system in November 2021 encouraging vessels to wait outside of the "Safety and Air Quality Area"
- Number of vessels at anchorage returned to pre-pandemic levels, despite high volume of TEUs.




Vessels waiting for berth move 50-150 nm from the shore.

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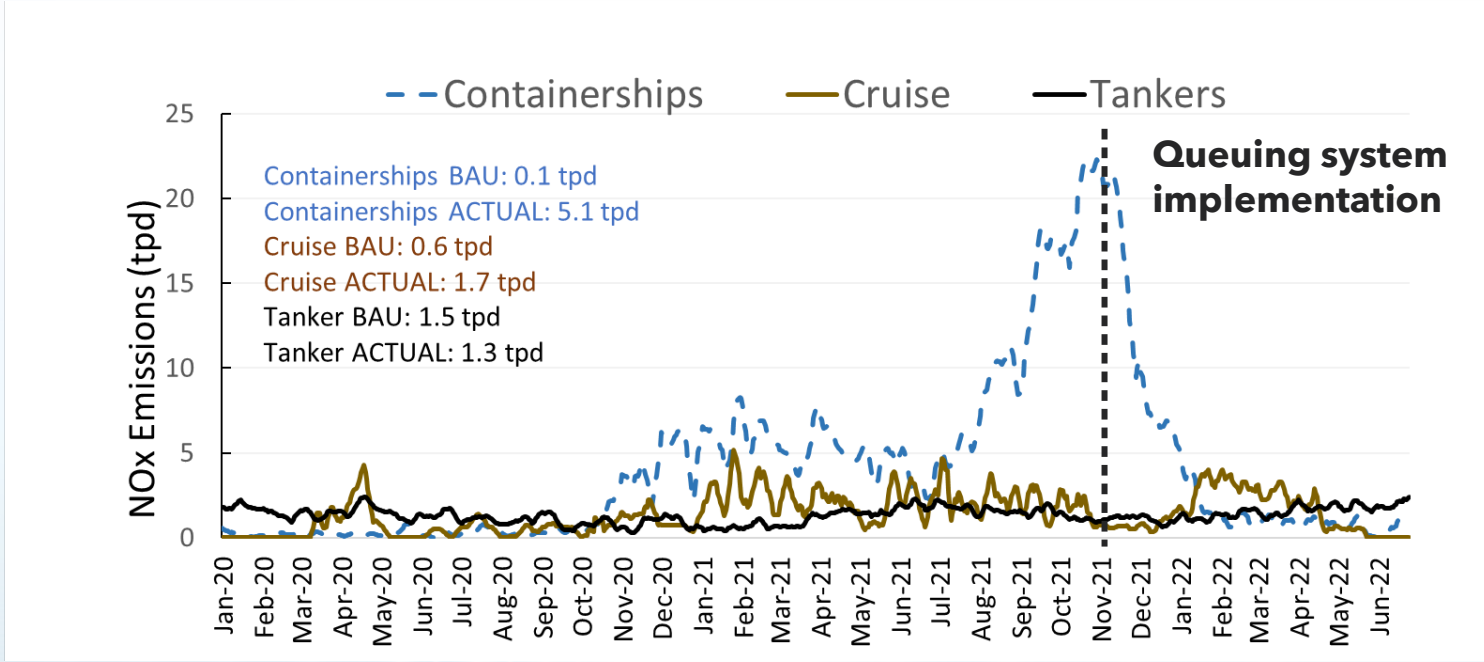
# NOx Emissions from Ocean-Going Vessels at the Port of LA/LB

- Anchorage and loitering activities significantly increased emissions from containerships due to port congestion.
- Cruise and tanker vessels were not significantly impacted.
- Implementation of the new queuing system reduced these vessel emissions near the coast.



# PM Emissions from Ocean-Going Vessels at the Port of LA/LB

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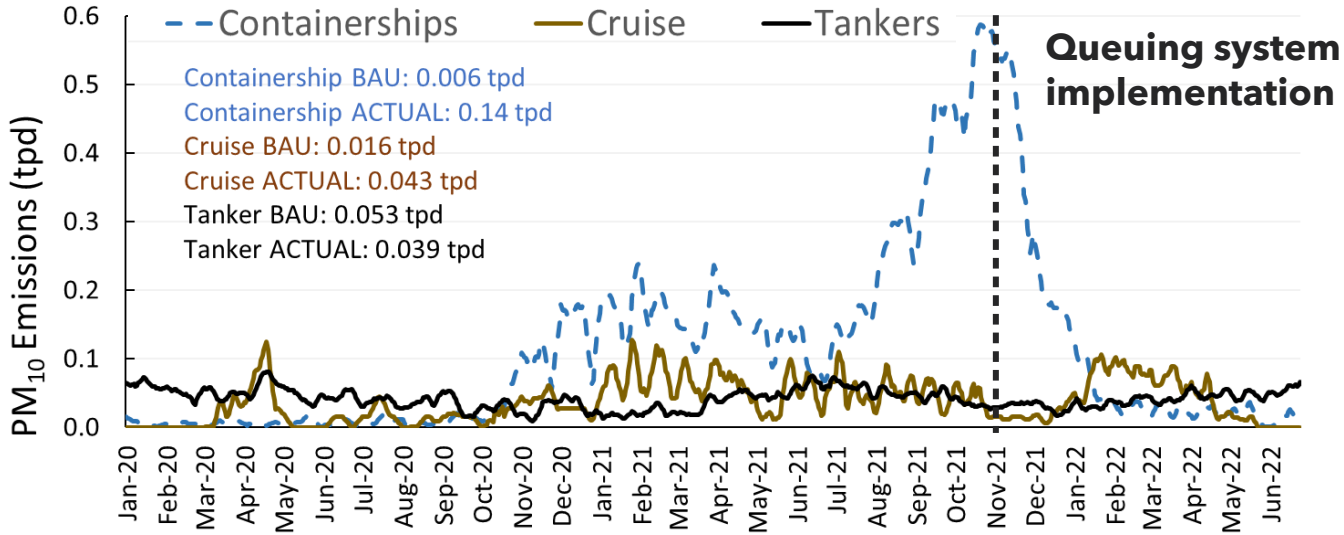


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# CO2 Emissions from Ocean-Going Vessels at the Port of LA/LB

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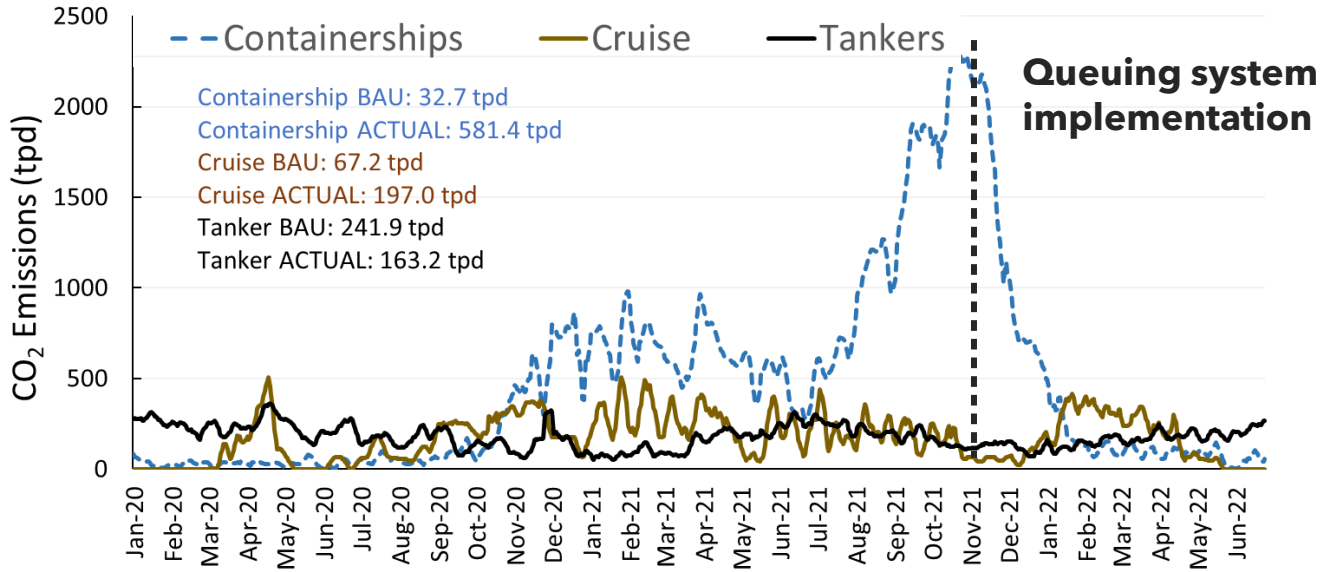


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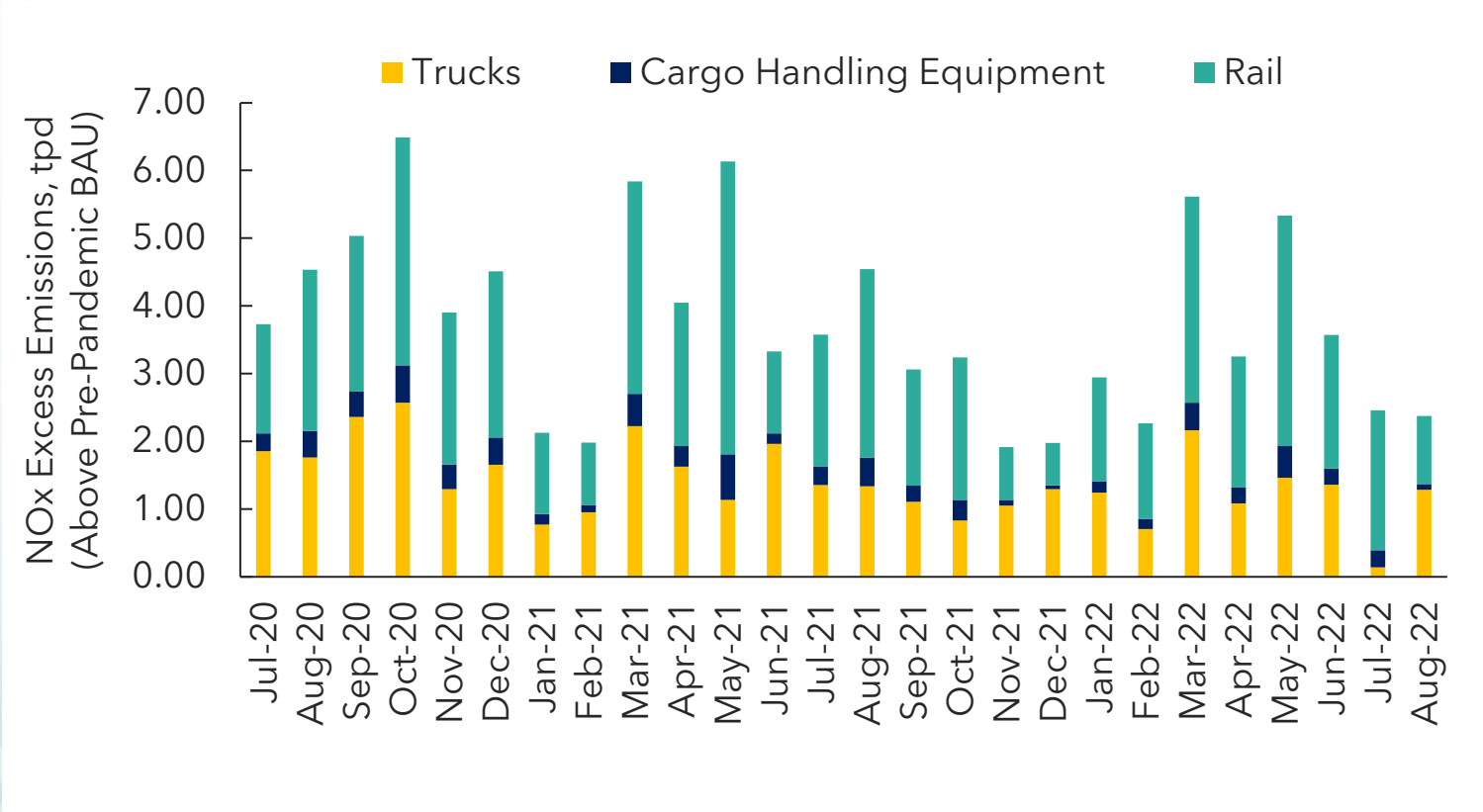
# Excess NOx Emissions from Landside Freight Network due to Increased Freight Movement

- Increased freight movement required additional activity by port trucks, locomotives, and cargo handling equipment.
- Increased activity led to excess emissions.



# Excess PM* Emissions from Landside Freight Network due to Increased Freight Movement

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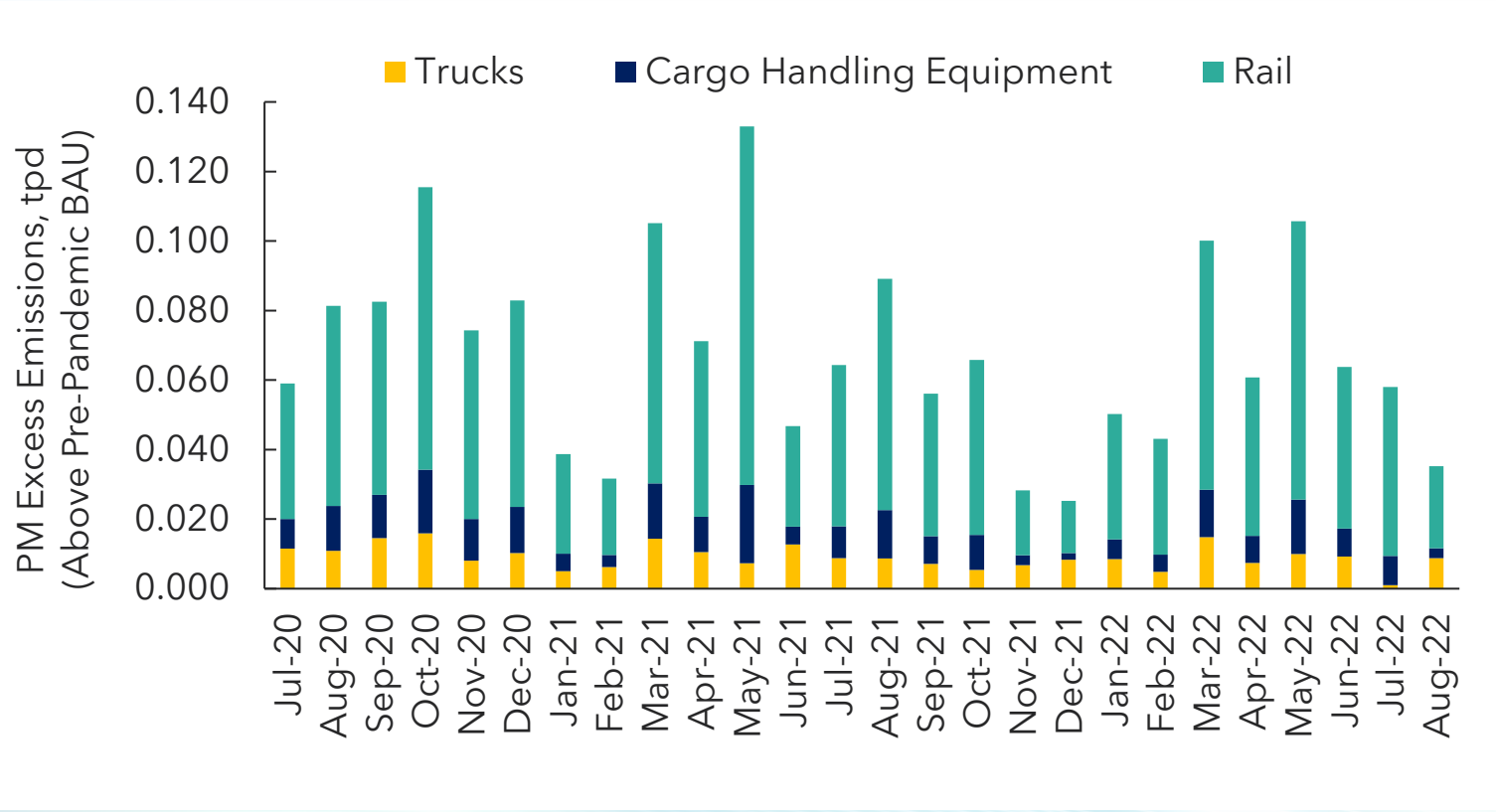


* Tailpipe (exhaust) emissions

# Excess CO2 Emissions from Landside Freight Network due to Increased Freight Movement

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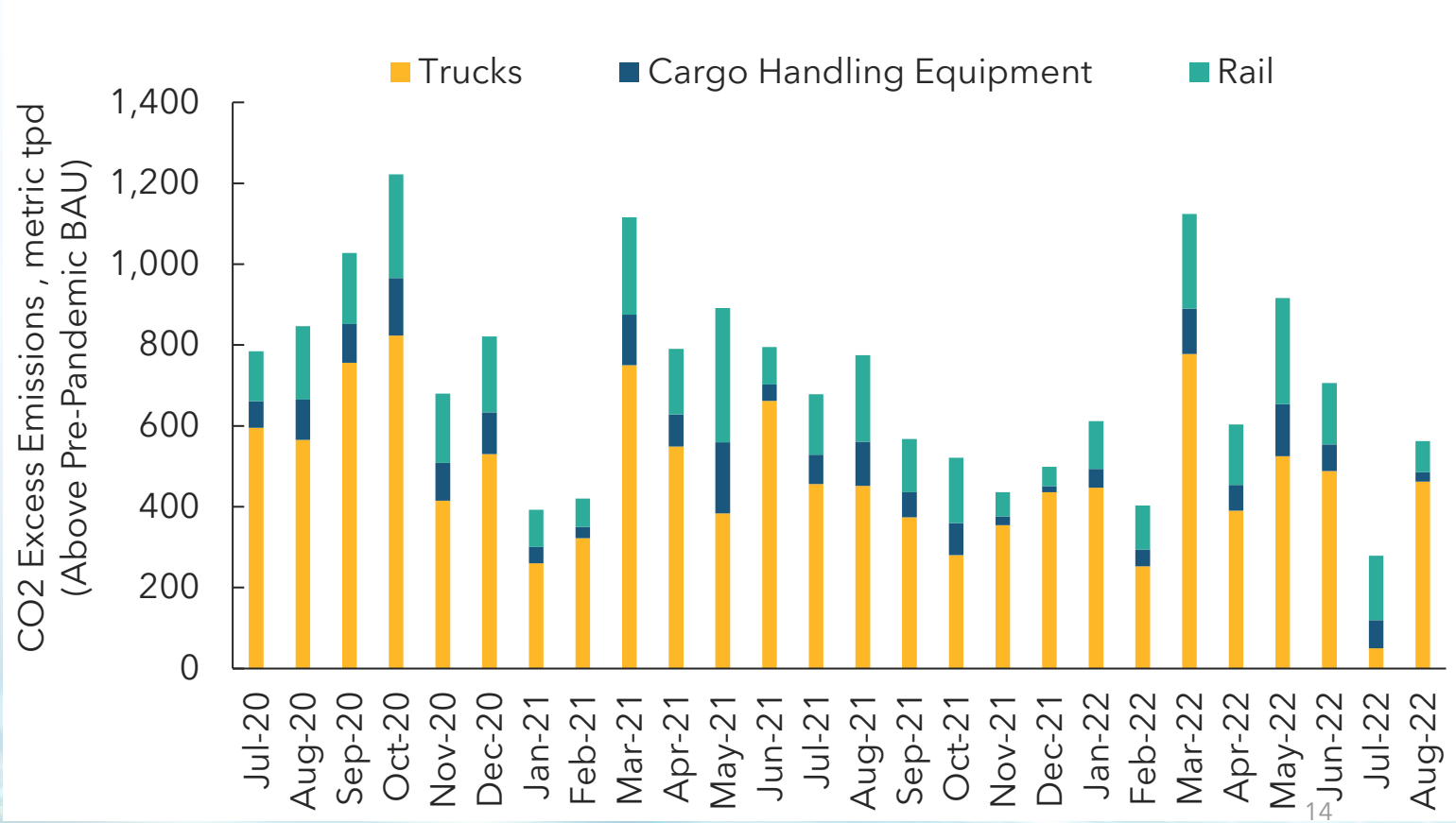
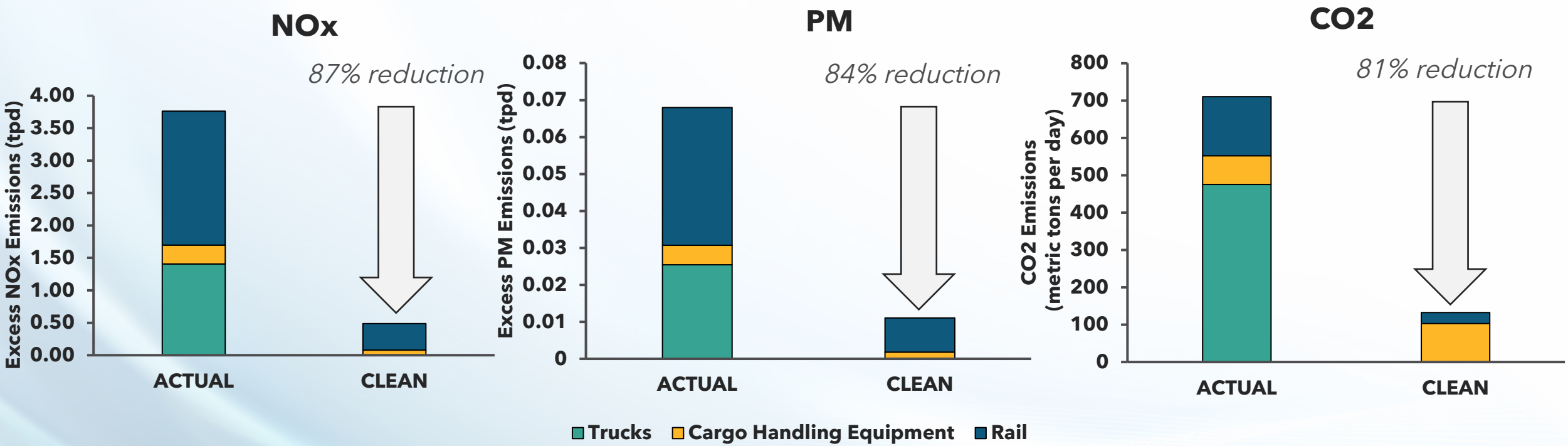


# Port Congestion Scenario for Freight Transport Network

- The **CLEAN** scenario, a hypothetical scenario in 2035, assuming similar level of port congestion as the **ACTUAL** scenario, but with the implementation of clean transportation policies.
  - **Trucks:** Heavy-Duty Inspection and Maintenance, Heavy-Duty Omnibus, Advanced Clean Trucks, and Advanced Clean Fleets
  - **Rail:** In-Use Locomotive Regulation
- Reflected activity growth rate between COVID-19 calendar years 2020, 2021, and 2022 (ACTUAL) and 2035 (CLEAN)

# Benefits of CARB Control Strategies



# Conclusions

- Surge in freight movement and port congestion resulted in excess emissions from ocean-going vessels and the freight transport network.
- Implementation of the queuing system for vessels reduced excess emissions from ships operation near the Ports of LA/LB.
- Clean transportation policies can limit the excess emissions from congestion events.

# Thank you!

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