# Port Authority of New York and New Jersey Criteria Pollutant and Greenhouse Gas Emission Inventory – Calendar Years 2006-2008

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# Presentation Organization

1. Project Goals
2. Organizational Boundaries
3. Inventory Methods by Department/Source
4. Results
5. Findings

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# PANYNJ GHG Inventory Goals

1. Develop GHG Inventory to set baseline for PANYNJ GHG reduction goals of 80% by 2050
2. Baseline Inventory Calendar year 2006
3. Six IPCC GHGs ($CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$)
4. Include direct and indirect emissions
   a. Direct GHGs (Source 1)
   b. Indirect Electricity (Source 2)
   c. Other Indirect (Source 3)
5. Maximize flexibility

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# Inventory Goals (cont'd.)

6. Ensure transparency
7. Estimate emissions rather than rely on direct measurements
8. Establish an annual reporting system
9. Adhere to IPCC and WRI/WBCSD Guidelines
10. Bottom-up Registry quality estimates, where possible
11. Express emissions as $CO_2e$

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# Inventory Boundary

| Department | Boundary |
|---|---|
| Aviation | • Civil and commercial use of airplanes, including civil and general aviation, up to 3,000 feet.<br>• Airport ground support equipment.<br>• Vehicle trips attracted by the airport, including those of private vehicles, taxis, and buses. |
| Port Commerce | • Emissions within the three-mile demarcation line off the eastern coast of the United States from all vessels that call on Port Authority facilities.<br>• Cargo handling equipment.<br>• Drayage trucks to the first point of rest. |
| Tunnels, Bridges, & Terminals | • Emissions based on vehicle volume, the roadway length of each facility, and the average length of toll lane queues.<br>• Terminals include all vehicle travel within the terminal property. |

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# Inventory Boundary (cont'd)

| Department | Boundary |
|---|---|
| PATH | • Traction power.<br>• Commuters' vehicle trips to PATH stations.<br>• Fuel consumption of Utility Track Vehicles and other equipment. |
| Real Estate & Development | • Office space leased by the Port Authority.<br>• Buildings leased to tenants (operating and capital leases).<br>• Exclude real estate projects that the Port Authority owned or invested in, but that it no longer manages or operates (e.g., Queens West).<br>• Includes energy consumption (electricity, natural gas, fuel oil) |

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# Inventory Boundary (cont'd)

| Department | Boundary |
|---|---|
| Construction | • Construction equipment used in Port Authority capital projects. |
| Vehicle Fleet | • Fuel consumption |
| Employee Commuting | • Vehicle trips to and from work by Port Authority employees. |

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# Port Authority Departments

- Aviation
- Real Estate & Development
- Tunnels Bridges & Terminals
- Port Commerce
- PATH

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# Aviation

- Aircraft
  - Activity data as arrivals and departures by airport/aircraft type. Emission factors from 2006 IPCC Guidelines by aircraft type.
  - Downtown Heliport – Number of trips and typical trip profile (fuel use)
- Ground Support Equipment
  - Fuel use surveyed
  - Used when complete sample
  - Otherwise EPA NONROAD model

# Aviation

| Attracted Travel | |
|---|---|
| Group 1 | Group 2 |
| Limos | Buses |
| Taxis | Shuttle Buses |
| Rental Cars | Cargo |
| Private Cars | |
| Other | |
| Van | |

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# Aviation Attracted Travel
# Group 1 Example

Total number of passengers (JFK) = 42,604,975

Percentage traveling by mode (private car) = 42%

Percentage of private cars with trip origin (Brooklyn) = 19.1%

One-way distance = 18.3 miles

Average travel party size = 2.42 (average of LGA and EWR values)

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# Aviation Attracted Travel
# Group 2 Overview

- Buses
  - Number, Number of trips, Trip lengths by route
- Shuttle Buses
  - Numbers, Fuel Consumption, or typical day profiles
- Cargo Vehicles
  - Based on JFK airport study
  - Applied to other airports using cargo tons

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# Tunnels, Bridges, and Terminals

- Bridges
  - GW Bridge
  - Bayonne Bridge
  - Goethals Bridge
  - Outerbridge Crossing
- Tunnels
  - Lincoln Tunnel
  - Holland Tunnel

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# Attracted Travel

- Bridges or tunnel length
- Annual traffic volume
- Vehicle type distributions
  - auto, buses, small trucks, large trucks
- Vehicle age distributions – I/M program annual report
- GHG Emission Factors from DOE-EIA and EPA GHG Inventory reports

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# Tunnels, Bridges, and Terminals Queuing Analysis

- Queue lengths from aerial photos
- Spring and Fall day samples
- Estimate daily vehicle hours of delay
- Allocate to vehicle types
- Apply idling emission factors by vehicle type to estimate GHGs

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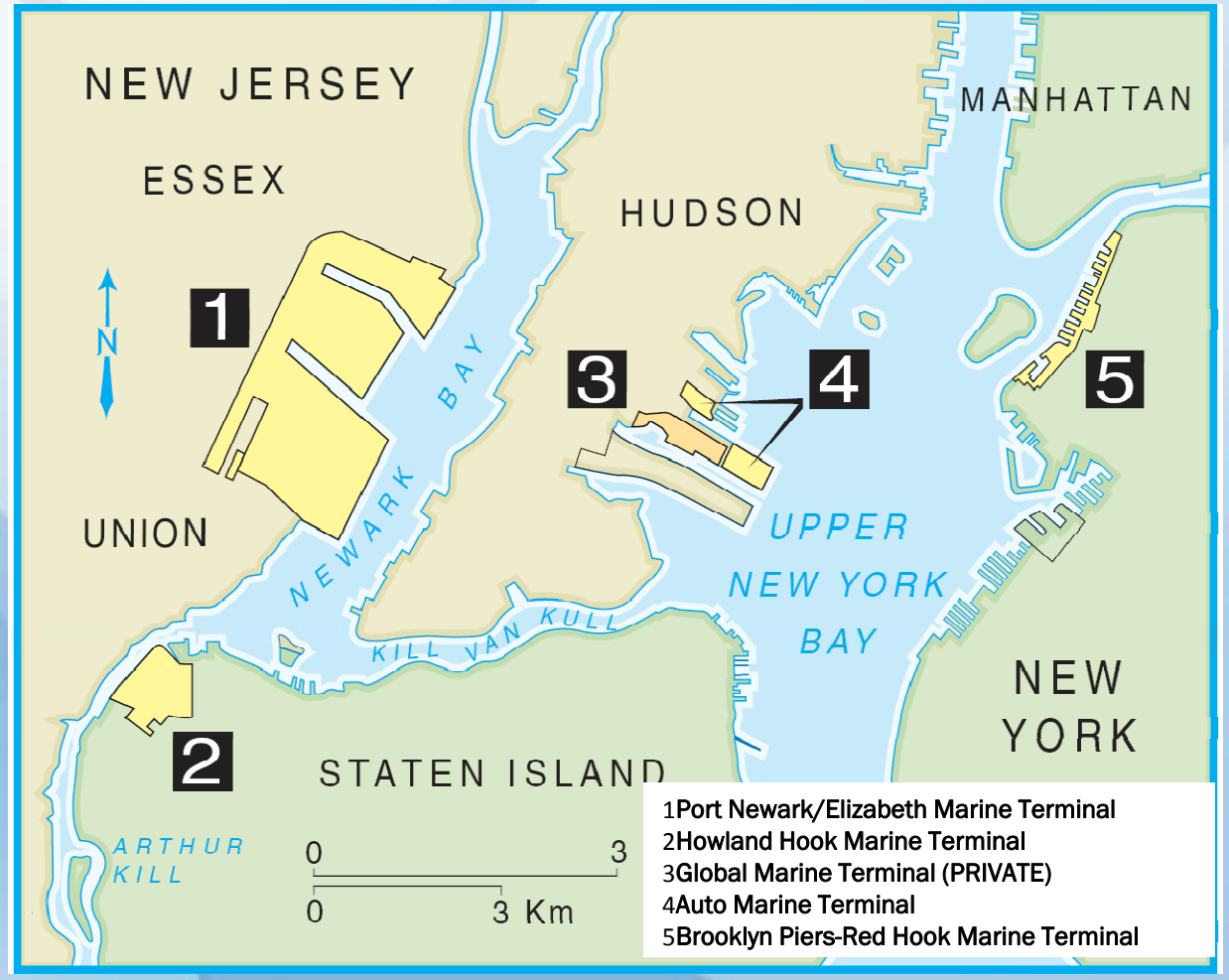
# Port Commerce Facilities

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# Port Commerce

- Commercial Marine Vessels
  - Ocean Going Vessels
  - Towboats
  - Harbor Vessels
- Activity data for 2000 – Starcrest study
- Consistent With State Implementation Plan inventory
- Removed activity outside PANYNJ management control
- Extrapolated from 2000 to 2006 using ship calls
- Apply GHG emission factors

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# Construction Equipment

- Activity estimates based on 2006 construction spending
- EPA NONROAD model for county-level 2006 construction equipment emissions
- Use Port Authority construction dollars vs. county-wide dollars to allocate emissions to PANYNJ

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# Buildings

- Key Sources:
  - Natural gas usage
  - Indirect electricity consumption
- Data sources:
  - Electricity bills
  - Gas bills
  - Peak electricity demand (Port Newark)
  - Office space type and square footage

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# 2008 Results

| Department | $CO_2$ Equivalent Emissions (thousand metric tons) |
|---|---|
| Aviation | 3,723 |
| Port Commerce | 867 |
| Real Estate & Development | 726 |
| Tunnels, Bridges & Terminals | 387 |
| Mobile Sources | 92 |
| PATH | 88 |
| **Totals** | **5,883** |

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# PANYNJ $CO_2e$ Emissions in 2006, 2007, and 2008

| | | Thousand Metric Tons | | |
|---|---|---|---|---|
| | | **2006 CY** | **2007 CY** | **2008 CY** |
| Direct GHG | Scope 1 | 87 | 87 | 97 |
| Indirect Electricity | Scope 2 | 274 | 243 | 245 |
| Other Indirect | Scope 3 | 5,407 | 5,565 | 5,541 |
| **Totals** | | **5,768** | **5,894** | **5,883** |

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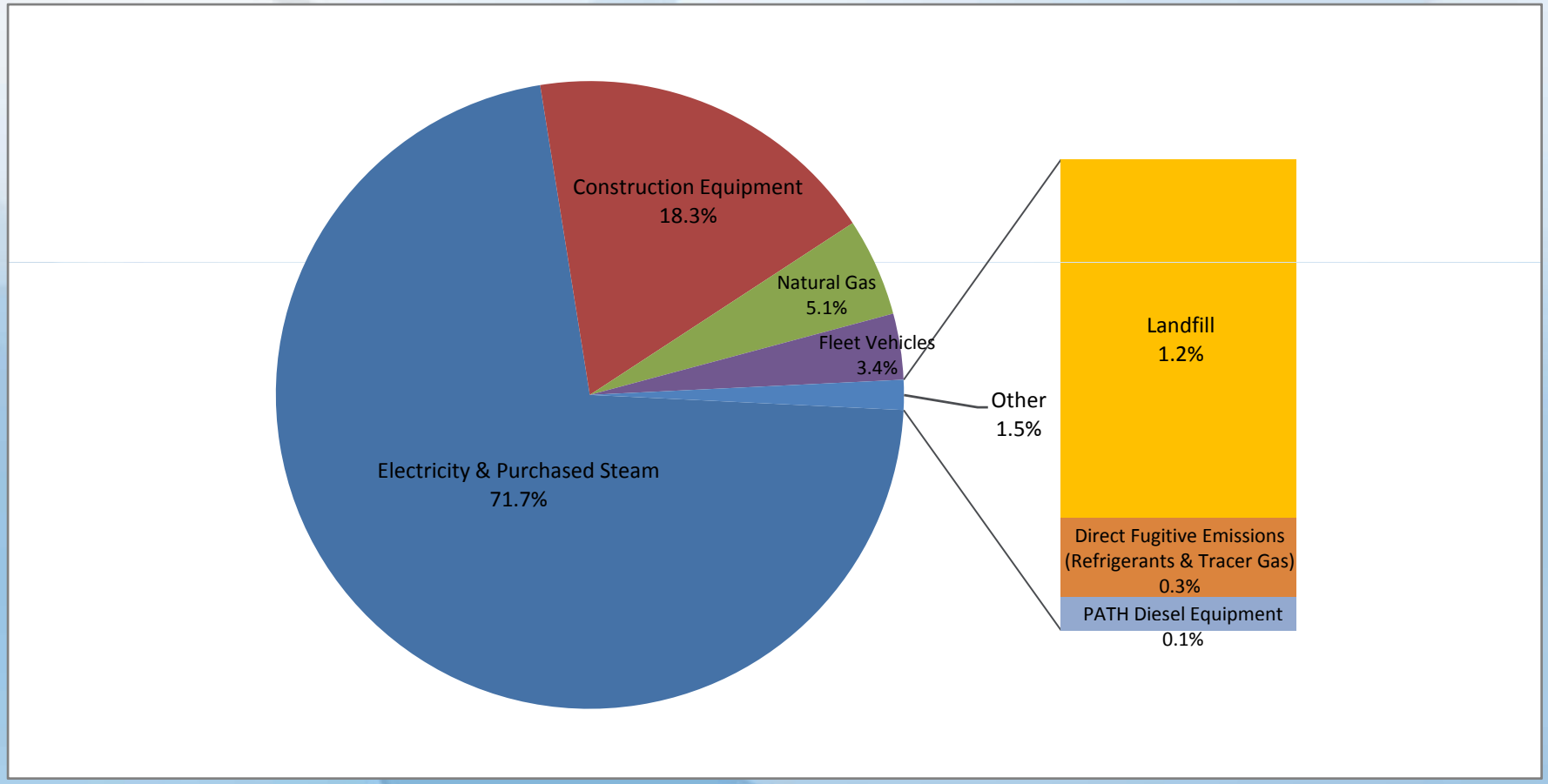
# GHG Emissions under Direct Management Control

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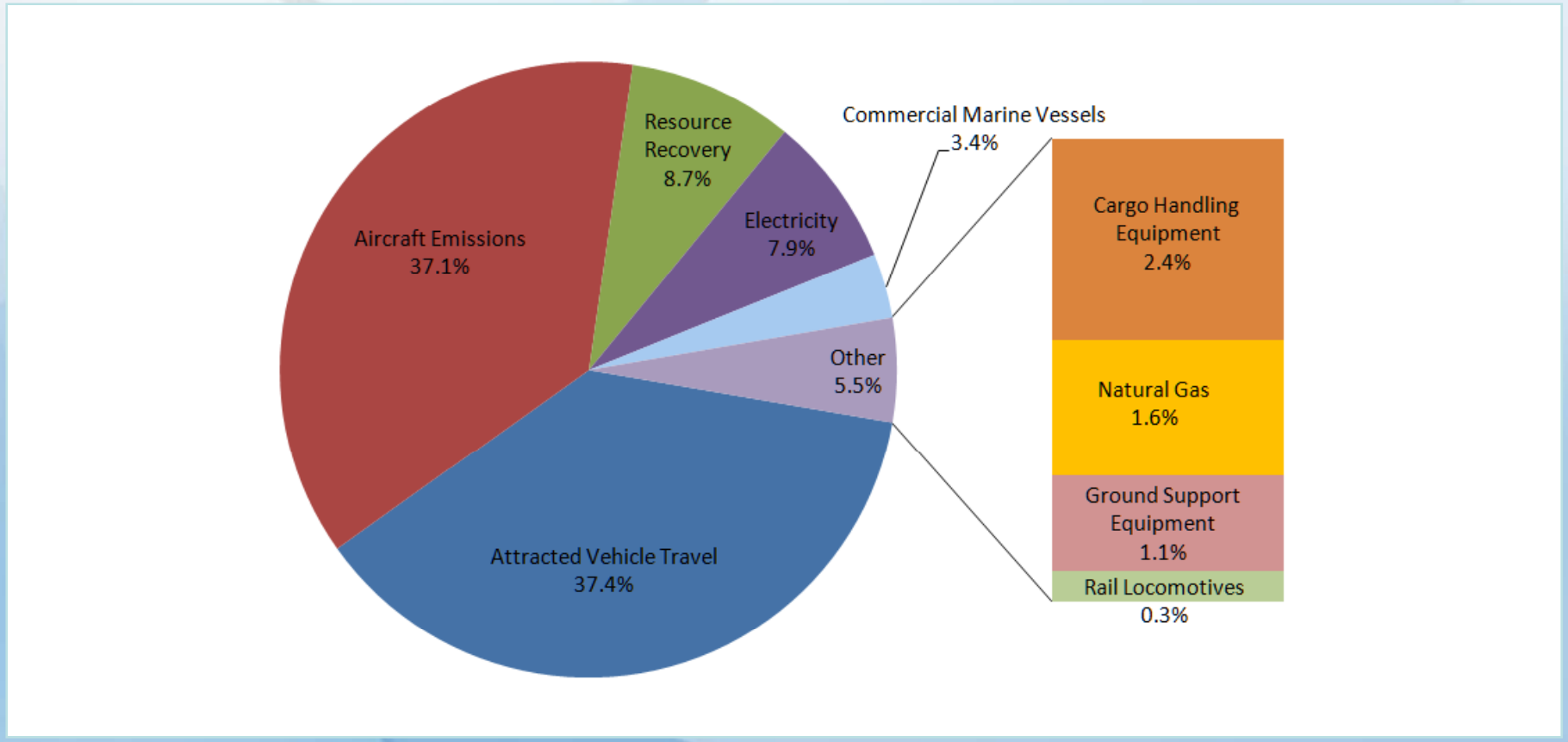
# Emissions Outside Management Control

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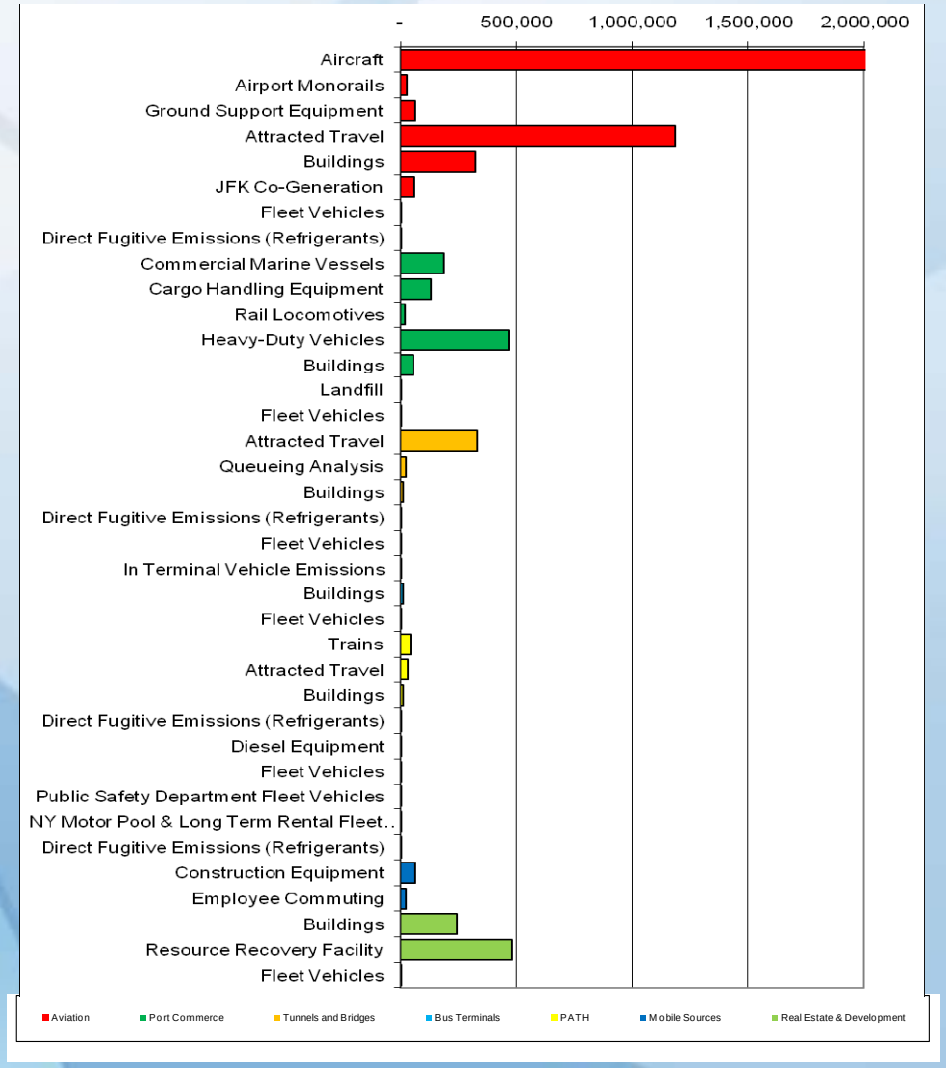
# GHG Emissions by Activity Type

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# 2008 Criteria Air Pollutant Emissions by Department (metric tons per year)

| | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|
| Aviation | 12,266 | 1,629 | 663 | 599 |
| Port Commerce | 7,836 | 3,019 | 489 | 408 |
| Tunnels, Bridges, and Terminals | 986 | 26 | 32 | 20 |
| PATH | 177 | 502 | 38 | 33 |
| Mobile Sources | 1,361 | 61 | 35 | 33 |
| Real Estate and Development | 701 | 901 | 71 | 63 |
| **Totals** | **23,327** | **6,138** | **1,328** | **1,156** |

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# Summary and Conclusions

1. Methods successfully developed to consistently track GHGs plus CAPs
2. Fine-tuning needed to reflect mitigation actions
3. Some organization actions increase Port Authority emissions – but decrease net GHGs
4. Model updates are improving multi-pollutant capabilities
5. Some bottom-up methods are too costly to do annually
6. New and updated protocols affect methods/results

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