BAY AREA AIR QUALITY MANAGEMENT DISTRICT

# Diesel Free by ’33:

## Why Replacing Diesel is a Public Health Priority

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September 9, 2020

# Overview

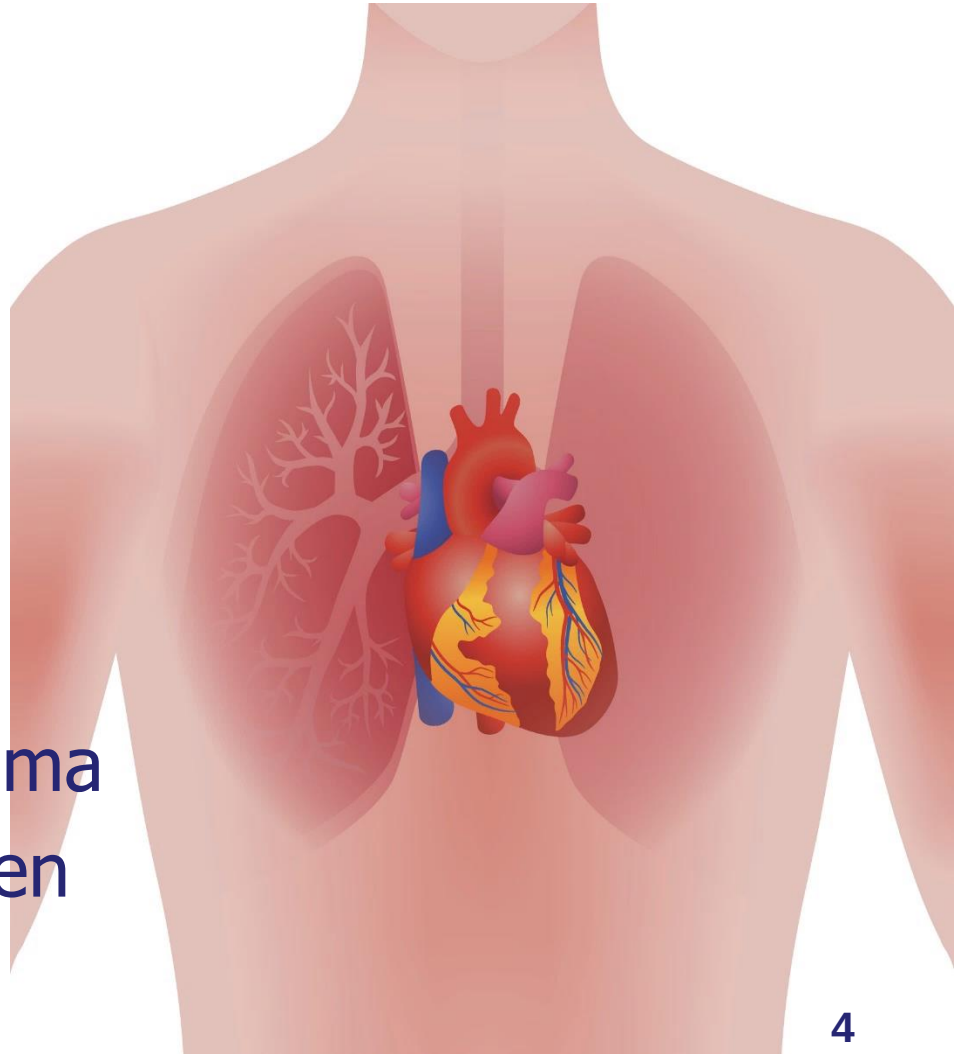
- Fine particles can penetrate deeply into the lungs causing cardiovascular, pulmonary and other health impacts
- Health effect studies have shown that diesel particulate matter (diesel PM) is a potent carcinogen
- Bay Area studies show diesel PM remains a significant contributor to regional cancer risk from air pollution
- Black carbon (BC) from diesel PM contributes to climate impacts
- Diesel PM from mobile sources still contributes significant risks in vulnerable, impacted areas

# Diesel PM

- Major sources include heavy-duty trucks, trains, ships, and large generators
- Composed of carbon particles, inorganic solids, and over 40 known toxic air contaminants (TACs) including
  - Polycyclic aromatic hydrocarbons
  - Benzene
  - Formaldehyde
  - Acetaldehyde
  - Acrolein
  - 1,3-Butadiene

# Health Effects of Diesel PM

- Exposure contributes to non-cancer health effects, including:
  - Premature death
  - Increased risk of heart disease and stroke
  - Respiratory disease, such as asthma
  - Decreased lung function in children
  - Dementia



# Studies of PM

- Harvard School of Public Health studies of Medicare patients:
  - Higher estimated risk of death from fine PM ($PM_{2.5}$) exposure
  - At concentrations below the current air quality standards
  - Higher effects for racial minorities, low socioeconomic status

- Numerous health studies show:
  - Increased health effects for those living near major sources of diesel PM
  - Example: higher new-onset asthma in children living near roadways

# Diesel PM Identified as Carcinogen

- California Air Resources Board identified diesel PM as a Toxic Air Contaminant:
  - Cal EPA Office of Environmental Health Hazard Assessment (OEHHA) evaluation of diesel exhaust (1998)
- World Health Organization – International Agency for Research on Cancer classified diesel engine exhaust as carcinogen:
  - Lung cancer
  - Possible increased risk of bladder cancer

# Who is affected?

- Higher diesel PM near vulnerable Bay Area residents with low income and high cumulative health burden:
  - Disproportionately affecting people of color

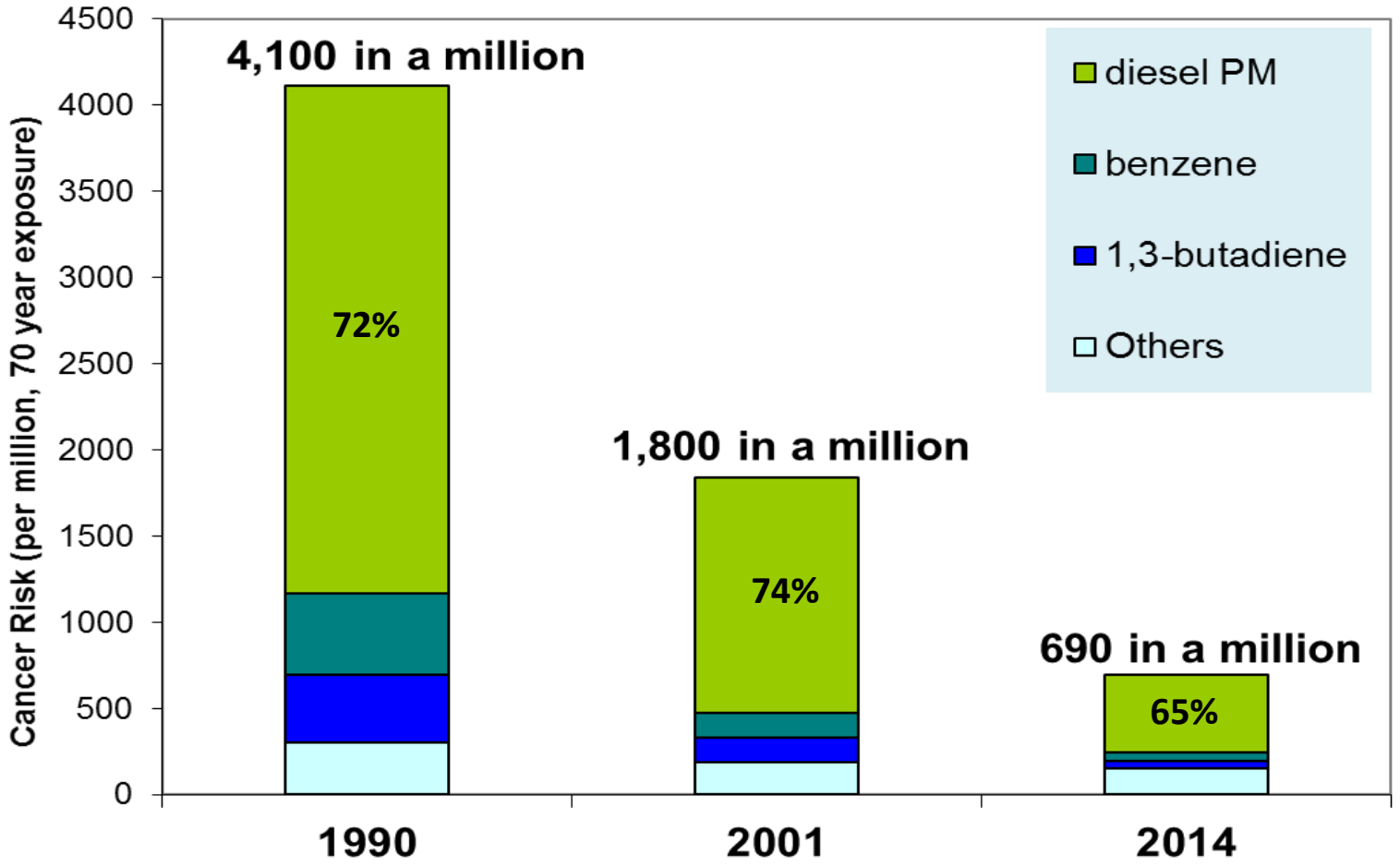
- Those most vulnerable to health effects:
  - Children
  - Pregnant women
  - Elderly

# Diesel PM contributes to $PM_{2.5}$

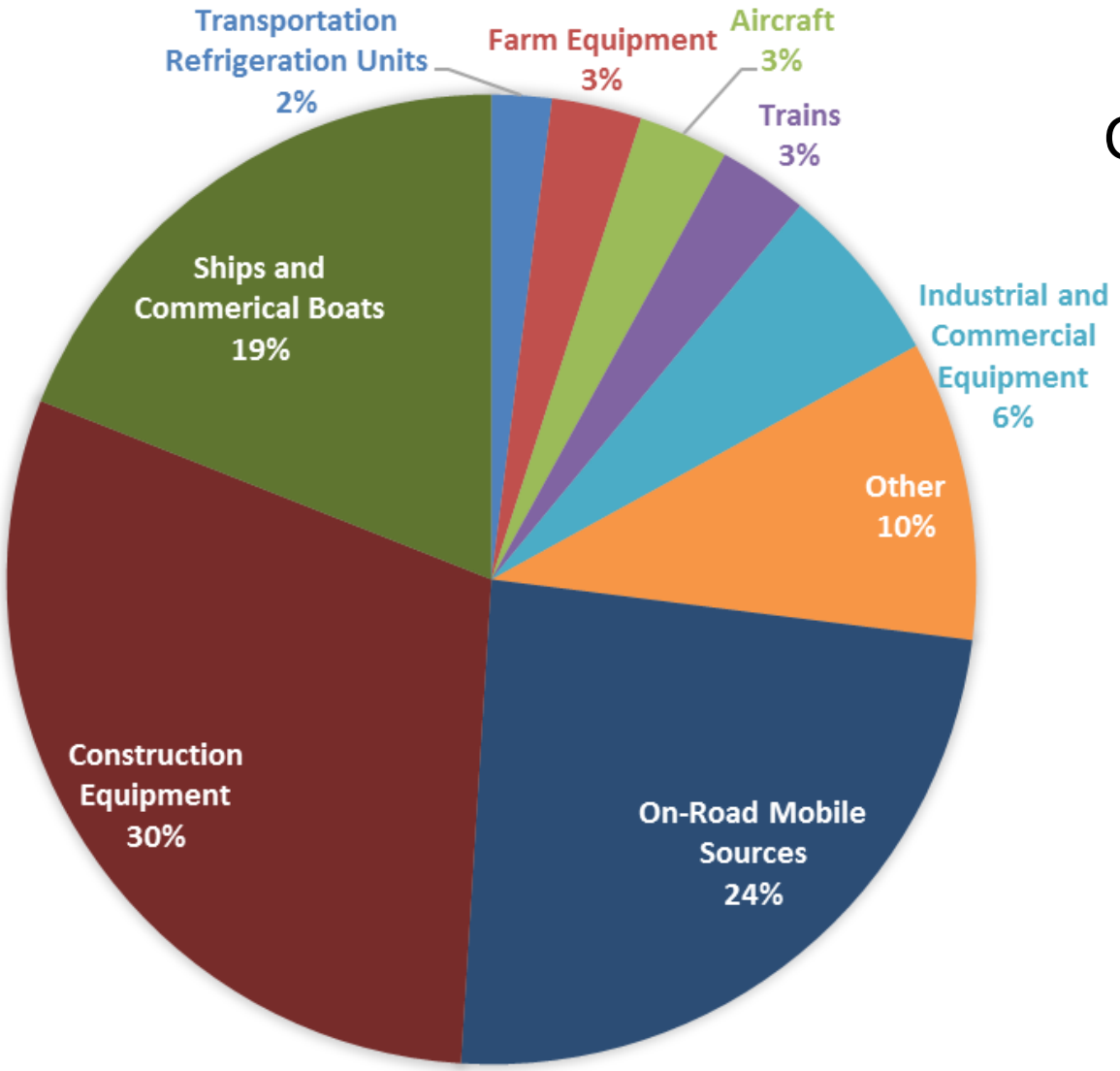
- Bay Area (in 2014):
  - Diesel PM is about 6% of the regional annual average $PM_{2.5}$
- West Oakland Monitoring Study (2009-10):
  - Diesel PM is 7% to 16% of $PM_{2.5}$
- West Oakland Modeling Study (2017):
  - Diesel PM is about 8% of $PM_{2.5}$

# Diesel PM Contributes Most of the Cancer Risk from Ambient Air Pollution

Lifetime Cancer Risk Based on Air Monitoring Data

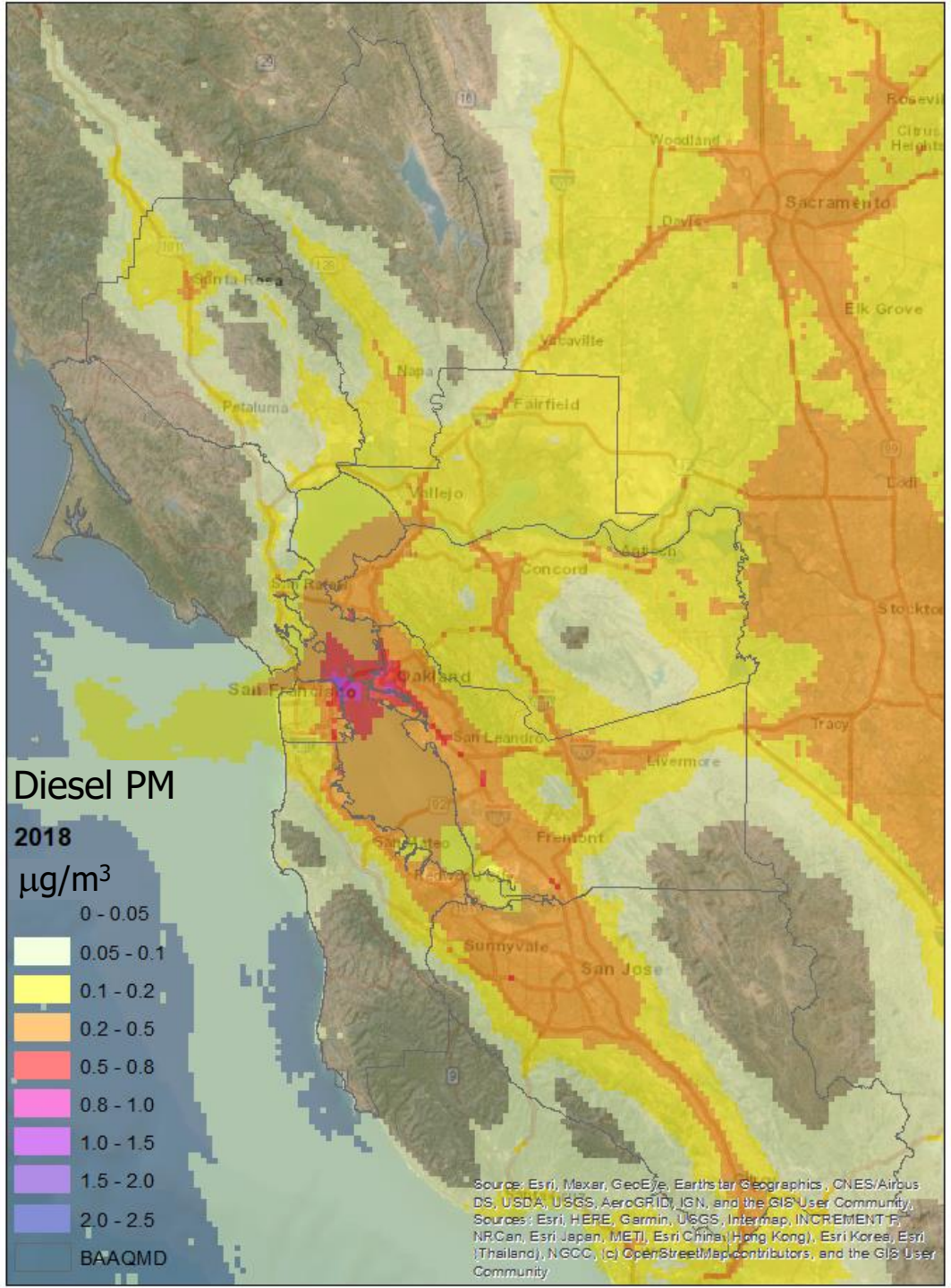


# Most of the Toxic Air Contaminants Emitted are from Mobile Sources




Cancer-Risk Weighted Toxic Emissions by Source Category (2015)

# Bay Area Diesel Particulate Matter (2018)




- Mobile sources remain top contributors to diesel PM concentrations in the Bay Area
  - Diesel PM concentrations (micrograms per cubic meter)
  - Modeling estimate
  - Annual average (2018)

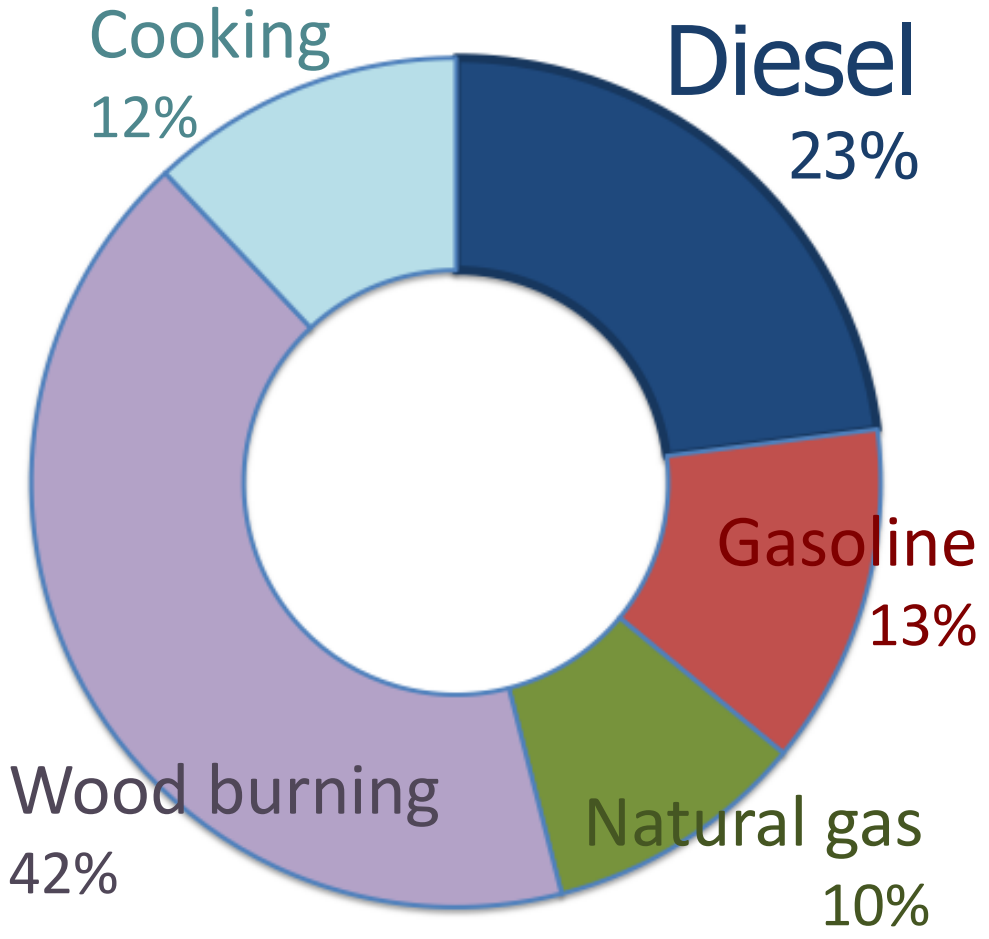
# Diesel PM is a Source of Black Carbon and Warms the Climate

- Black carbon (BC) absorbs sunlight and warms the atmosphere
- When BC lands on snow or ice, it accelerates melting
- BC's warming influence is comparable to methane
- Reducing BC now has immediate climate benefits

# Diesel Exhaust Contributes About 25% of the Black Carbon in the Bay Area*

The remainder is from

- wood burning (including wildfires),
- gasoline combustion,
- natural gas combustion, and
- cooking




* Annual basis, based on a 2011-2012 analysis

# Diesel Emission Controls Require Constant Checking

- The long-term durability of diesel particle filters (DPFs) is a concern
- Some DPFs on 2007–2009 engines were found to fail:
  - For these engines, BC emission rates increased by 50–67% in 2015 relative to two years earlier

# Diesel PM Contributes to Fine PM, Black Carbon, and Cancer Risk

| Diesel PM/ Total $PM_{2.5}$ | Diesel PM/ Total BC | Diesel PM Cancer Risk/ Cancer Risk from Ambient Air Pollution |
|---|---|---|
| 5-15% | 20-30% | 60-70% |

# Key Findings

- Diesel PM is still the main contributor to cancer risk from toxic air contaminants
- Diesel PM, especially from mobile sources, is still an important contributor to health risk in impacted areas
- Fine PM of all types is linked to poor health outcomes and mortality
- Diesel PM is a significant source of black carbon, a climate forcing pollutant

# Key Findings

- Grants, regulatory programs, and enforcement efforts have resulted in significant reductions in diesel PM
- More reductions in diesel PM are needed to prevent backsliding and to accelerate air quality improvements in the Bay Area's most impacted areas