



California's Draft Emission Reduction Plan for Ports and International Goods Movement

December 15, 2005

Public Health and Environmental Mitigation Work Group



Air Resources Board

California Environmental Protection Agency

Overview

- ✧ Why we prepared the draft plan
- ✧ What it covers
- ✧ Key findings
- ✧ Health and economic impacts
- ✧ Emission reduction strategies
- ✧ Next steps

Why Prepare this Plan

- ✧ Diesel Risk Reduction Plan
- ✧ State Implementation Plan
- ✧ Governor's Environmental Action Plan
- ✧ Environmental Justice Programs
- ✧ BTH-Cal/EPA Goods Movement Action Plan
 - Concern about the environmental impact of existing operations and growth in imports

What the Plan Covers

- ✧ All port emission sources, including cruise ships and fishing vessels
- ✧ Ship emissions up to 24 miles offshore
- ✧ Cargo handling equipment used at ports and intermodal rail yards
- ✧ Rail and truck emissions associated with imports and exports

ARB Staff Asked to Provide

- ✧ Comprehensive health analysis
 - Beyond port or rail yard fence lines
 - Particulate, ozone, and toxics
- ✧ Strategies to meet targets
 - Using “no net increase” as baseline
 - Fully enforceable

Emission Sources

- ✧ Ship emissions will ~triple by 2020
- ✧ Emissions from trucks, locomotives, and cargo handling equipment are going down, but not fast enough
- ✧ Land-based sources have a greater impact on community health than ships
- ✧ Ships emissions have a greater impact on regional pollutants – ozone and PM

Emission Reduction Strategies

- ✧ Combined strategies can achieve:
 - 2010 emissions 20% below 2001 levels
 - South Coast SIP targets for NOx met
 - Diesel PM risk cut two-thirds by 2020
- ✧ Need a mix of rules, fees/incentives, market concepts, enforceable agreements

Health Findings

- ✧ 750 premature deaths/year today
- ✧ 920 premature deaths/year by 2020 without new controls
- ✧ Other health effects also quantified
- ✧ Plan would reduce health impacts about 60 percent by 2020

Assessment of the Health and Economic Impacts



Air Pollutants of Concern

✧ Particulate matter (PM)

- Direct - emissions of diesel PM
- Secondary - formed from chemical reactions in the atmosphere
 - Nitrates - proportional to NO_x emissions
 - Sulfates - local SO_x emissions, air movement from other countries, natural sources in the ocean
 - Organic carbon - some types of ROG

✧ Ozone

- Formed from NO_x and ROG in complex, non-linear atmospheric reactions

Summary of the Health Effects of Ambient PM and Ozone

Effect	Identified		Quantified	
	PM	Ozone	PM	Ozone
Adult mortality	X	X	X	X
Infant mortality	X		X	
Asthma attacks	X		X	
New cases of asthma	X	X		
Increased respiratory symptoms	X	X	X	X
Chronic bronchitis	X		X	
Increased hospitalization for respiratory disease	X	X	X	X
Reduced lung capacity (adults)	X	X		
Decreased lung function in children		X		
Cardiovascular Disease	X			
Minor restricted activity days	X	X	X	X
School absences		X		X
Work loss days	X		X	

Key Steps of Methodology

Air Quality Data

Emissions Estimates

Total Exposure

Baseline Incidence Rates & Response Functions

Health Impacts

Goods Movement Fraction

Economic Value

Total Exposure

✧ Air quality data

- Air quality dispersion model
 - Ports of Los Angeles and Long Beach (diesel PM only, not secondary pollutants)
- Air quality measurements
 - Diesel PM inferred from PM10 data and source apportionment studies
 - PM nitrates, PM sulfates, ozone

✧ Emissions estimates

- Available for all sources and goods movement sources
- Offshore diesel PM emissions adjusted for dispersion and dilution effects

Health Impacts

- ✧ Baseline incidence rates
 - National, state and county records
- ✧ Concentration-response relationships
 - Premature death and PM based on American Cancer Society study
 - ~500,000 adults in 151 cities, 1981-1998
 - Pope et al. (2002): recommended by peer reviewers
 - Krewski et al. (2000): less years, 25% lower
 - Jerrett et al. (2005): Los Angeles only, 300% higher
 - Other health outcomes
 - Synthesis of 100's of peer-reviewed publications

Health Impacts-2005

Health Outcome	Cases per Year	Uncertainty Range (Cases per Year)
Premature Death	750	260 to 1,300
Hospital Admissions (respiratory causes)	290	170 to 410
Asthma Attacks	14,600	3,600 to 26,000
Work Loss Days	130,000	110,000 to 150,000
Minor Restricted Activity Days	880,000	630,000 to 1,100,000
School Absence Days	330,000	85,000 to 610,000

Economic Value

✧ Premature death

- U.S. EPA uses \$8.2 million (2005 dollars) as the value of a life
- Derived from 26 studies measuring an individual's willingness to pay to reduce a given death risk

✧ Other health outcomes

- Based on surveys synthesized by U.S. EPA and peer-reviewed by their Scientific Advisory Panel

Economic Valuations-2005

Health Outcome	Valuation (millions)	Uncertainty Range (Valuation - millions)
Premature Death	\$6,200	\$2,100 to 12,000
Hospital Admissions (respiratory causes)	\$10	\$6 to 14
Asthma Attacks	\$1	\$0.1 to 1.9
Work Loss Days	\$23	\$19 to 26
Minor Restricted Activity Days	\$53	\$25 to 110
School Absence Days	\$28	\$7 to 53
TOTAL VALUATION	\$6,300	\$2,200 to 12,000

Scientific Peer Review

✧ Reviewers

- Emissions
 - Prof. James Corbett (University of Delaware)
 - Prof. Robert Harley (UC Berkeley)
- Air Quality and Exposure
 - Prof. Costantinos Sioutas (USC)
- Health
 - Prof. John Balmes (UC San Francisco)
 - Prof. Michael Jerrett (USC)
 - Dr. Melanie Marty and Dr. Bart Ostro (OEHHA)
- Overall
 - Prof. John Froines (UCLA)
 - Aaron Hallberg (Abt Associates, Inc.)
 - Dr. Jean Ospital (SCAQMD)
- Several others pending

✧ Comments due January 31, 2006

Preliminary Peer Review Comments

✧ Suggested additions

- Add infant mortality and chronic bronchitis
- Reduce future baseline mortality rates
- Adjust ozone estimates for background
- Add secondary organic carbon

✧ More explanation of methods/uncertainties

- Link between emissions and air quality
- Link between air quality and personal/indoor exposure

Development of the Emission Reduction Strategies



Strategy Development *Approach*

- ✧ Process similar to defining new measures for State Implementation Plans
- ✧ Over 30 engineers & scientists engaged
- ✧ Technical evaluation by sector teams
 - Emission trends and existing controls, plus potential and timing for cleaner engines, add-on controls, cleaner fuels, accelerated fleet turnover
- ✧ “No Net Increase” and other reports

Strategy Development

“What” and “When”

- ✧ Performance benchmark based on likely technology for 2010, 2015, 2020
- ✧ Outcomes that are aggressive, technically feasible, and cost-effective
- ✧ Type of technology or level of control per engine, plus percent of fleet affected
- ✧ Potential emission reductions and cost

Strategy Development

“How”

- ✧ What will it take to make the needed technology available?
- ✧ What clearly can and needs to be done via regulation?
- ✧ Where should we be open to a wider range of implementation possibilities due to legal or practical limitations?

Ships

- ✧ Emission reduction strategy
 - ARB rule for auxiliary engine fuel
 - Cleaner fuels and new engines
 - Cleanest ships in California service
 - Retrofit controls for existing engines
 - Shore-based electrical power
 - Speed reduction programs
- ✧ 2020 emission reductions (from 2001)
 - 21% reduction in diesel PM emissions
 - 53% exposure-weighted reduction

Phase In of Cleaner Ships (Percent of Ship Visits with Reduced Emissions by Year)

	<u>2010</u>	<u>2015</u>	<u>2020</u>
NOx + PM 30% less than IMO	20%	50%	40%
90% NOx + 60% PM control	---	25%	50%
Shore-based power use	20%	60%	80%

Commercial Harbor Craft

- ✧ Emission reduction strategy
 - Upcoming ARB rule for existing engines
 - Shore-based electrical power
 - Lower emission standards for new engines
- ✧ 2020 emission reductions (from 2001)
 - 48% reduction in diesel PM emissions
 - 45% exposure-weighted reduction

Cargo Handling Equipment

- ✳ Emission reduction strategy
 - New ARB rule for new/existing equipment
 - 85% PM control on all engines
 - Zero or near-zero emission equipment
- ✳ 2020 emission reductions (from 2001)
 - 94% reduction in diesel PM emissions
 - 88% exposure-weighted reduction

Trucks

- ✧ Emission reduction strategy
 - Port truck modernization program
 - Enhanced enforcement of truck idling limits
 - International trucks to meet U.S. standards
- ✧ 2020 emission reductions (from 2001)
 - 57% reduction in diesel PM emissions
 - 69% exposure-weighted reduction

Locomotives

✧ Emission reduction strategy

- Cleaner engines in switcher locomotives
- PM retrofit controls for existing engines
- Use of alternative fuels
- More stringent national standards for new and rebuilt engines
- Cleanest locomotives in California service

✧ 2020 emission reductions (from 2001)

- 89% reduction in diesel PM emissions
- 69% exposure-weighted reduction

Phase In of Cleaner Locomotives

- ✦ Tier 3 locomotive standards could achieve 90% control of NOx and PM
- ✦ Phase Tier 3 locomotives into the fleet at 10% per year, beginning in 2012
 - By 2015 – 30% of fleet
 - By 2020 – 90% of fleet

Other Strategies

- ✧ Operational efficiency
- ✧ Land use decisions
- ✧ Project and community specific mitigation
- ✧ Port programs

Cumulative Costs and Benefits (2005 – 2020)

- * \$3-\$6 billion to implement new strategies
- * Would prevent 4,500 premature deaths
- * Saves \$4-8 for each \$1 spent on controls

- * Infrastructure needs are ~\$40 billion
- * CA imports/exports worth \$400 billion in 2004, growing to \$516 billion in 2006

Next Steps

- ✧ Draft plan out for public comment
- ✧ Health assessment peer review to be completed by end of January
- ✧ Public workshops early February
- ✧ Revised draft out March 21
- ✧ Final draft to Board April 20-21
- ✧ Convert to State Implementation Plan elements by mid-2007 / early 2008