Inland Impacts of Marine Emissions

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Marine Emissions Add to Global Warming – A Worldwide Issue

Our Focus Today: Marine Emissions and Health Impacts

U.S. Port Growth Predictions

- Most U.S. ports will grow – Asian imports
- L.A.: Port container throughput is expected to double or triple by 2020

What Creates Marine Emissions?

Ocean-Going Vessels, including cruise ships

Harbor Craft (e.g. tugboats)

Air Pollution Concerns

- Marine emissions are significant and are growing
  - Diesel PM, SOx, NOx, contribution to ozone
- Will prevent attainment of air pollution standards, if not controlled
- Impact local communities near the Ports
- Emissions impact regional air pollution
- Vessel emissions impact pollution levels even in regions that do not have a port

California Air Resources Board Study – October 2005

- Diesel PM from the Ports contributes >20 % of the South Coast Basin PM emissions (2003 data)
- Emissions from ship activities account for 73% of the emissions
- Cancer risk: elevated risk highest near the Ports but extend 15 miles inland

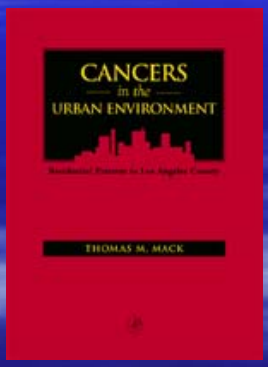
Diesel particulate matter

- Diesel particulate:
  - Includes carbon particles or “soot”
  - Declared a Toxic Air Contaminant in 1998 because of potential to cause cancer
  - Includes fine and ultrafine particles too small to see

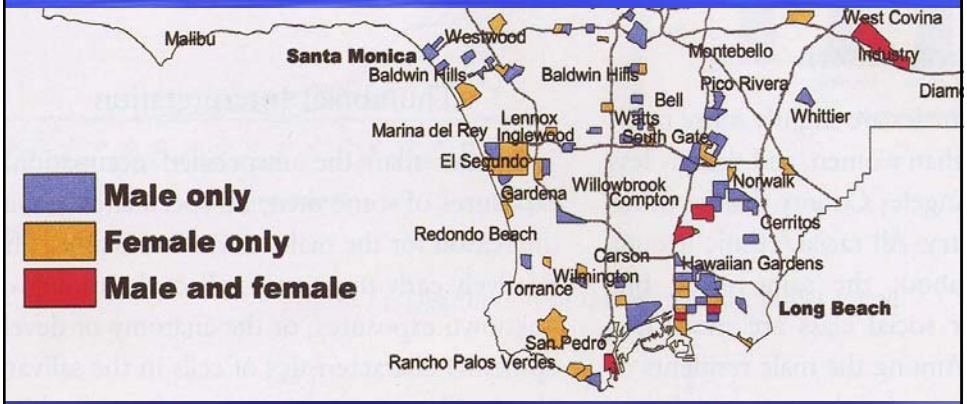
Cancer in Workers Exposed to Diesel

- More than 30 studies show an elevated risk of lung cancer in workers
- Most recent study – railroad workers

"Cancers in the Urban Environment" by Dr. Thomas Mack, USC



Oropharyngeal cancer (mouth and throat)



Elevated Cancer Risks – Mack Study

- Lung cancer
- Mouth/tongue cancers
- Pharyngeal cancers

Fine particles* in diesel exhaust

- "Numerous studies have associated fine particulate matter with a variety of respiratory and cardiovascular problems, ranging from aggravated asthma, to irregular heartbeats, heart attacks, and early death in people with heart or lung disease."

- *Smaller than 2.5 microns in size*
- *Source: U.S. EPA press release, December 2005*

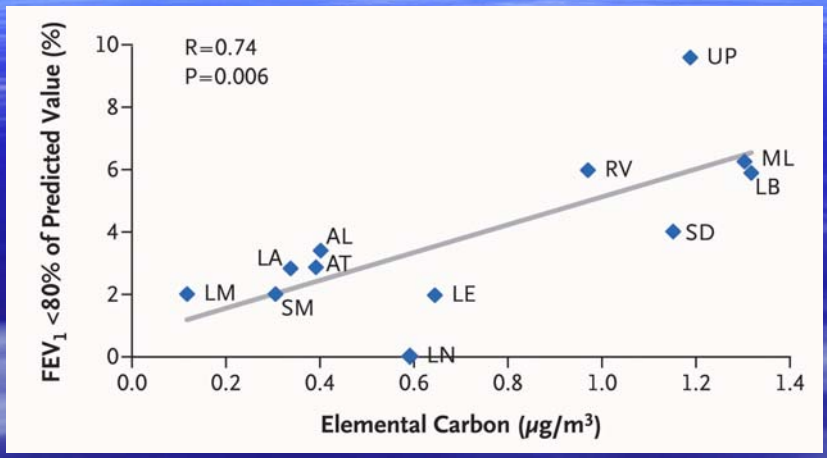
USC Children's Health Study

Perhaps most important USC finding to date:

18-year olds growing up in polluted communities in Southern California have a 5-fold risk of having abnormal lungs – related to a package of traffic-related pollutants (e.g., PM, NO2, elemental carbon)

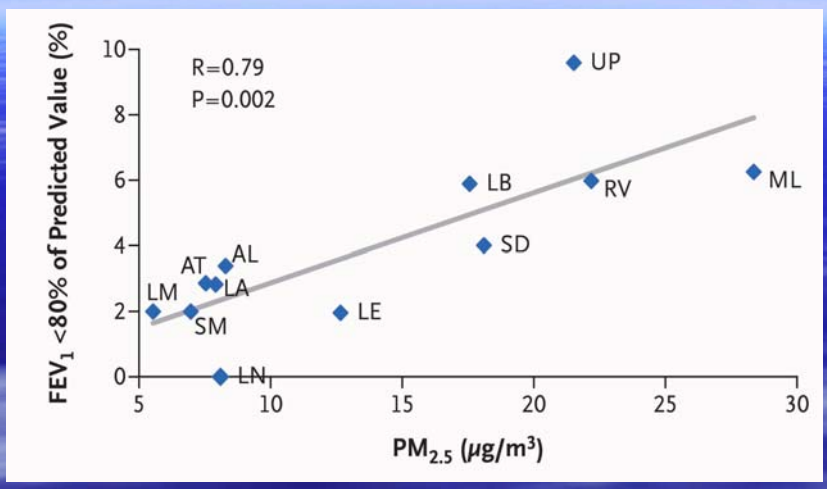
Gauderman et al. USC, *NEJM, 2004*

Abnormal Lung Function – Diesel Exhaust Exposure (as indicated by elemental carbon)



Gauderman et al [USC], *NEJM, 2004*

Abnormal Lung Function – PM2.5



Gauderman et al. [USC], *NEJM, 2004*

Ultrafine particles* in diesel exhaust

- Emerging evidence suggests that ultrafine particles may be more toxic than other particles
- In animal studies, they have been found in the brain
- They have been found in the mitochondria (energy storehouse) of cells

- *Smaller than 0.1 microns in size

NOx in Marine Emissions

- Contributes to the formation of regional smog (ozone) and formation of fine particulate matter
- Therefore, marine emissions impact health of those who live “inland” – away from the Ports
  - Ozone linked to asthma exacerbations and reduced school absences
  - Children who played exercised the most in high ozone communities developed new incident asthma

Sulfur Dioxide in Marine Emissions

- Southern California historically has very low levels of SOx in the air
- Marine emissions have been changing that picture

Air pollution & health: a review of the science

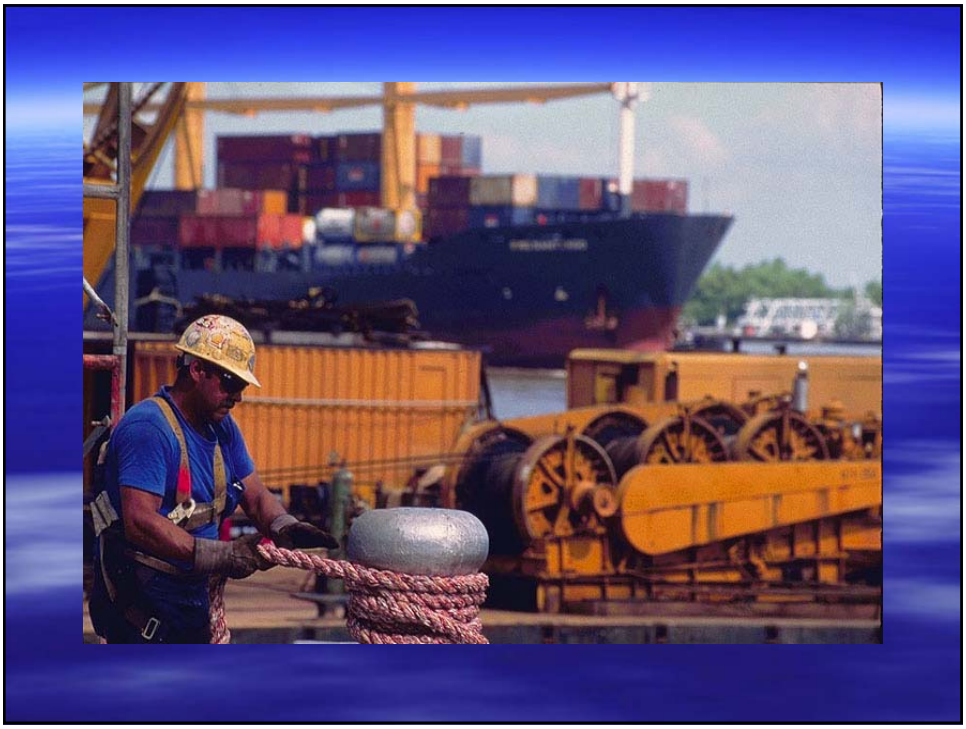
- DECREASED LUNG FUNCTION: decreased lung function in children in communities with high traffic-related air pollution
- INCREASED SCHOOL ABSENCES FROM RESPIRATORY PROBLEMS – and substantial economic costs – when air pollution is high
- INCREASED ASTHMA IN CHILDREN WHO EXERCISE THE MOST

- INCREASED CARDIOVASCULAR ILLNESS when levels of particle pollution rise
- REPRODUCTIVE EFFECTS – related to traffic pollution
- CANCER in workers exposed to diesel and in census tracts near ports and busy freeways

- LIVING NEAR BUSY ROADS AND FREEWAYS – ESPECIALLY WITH LOTS OF TRUCK TRAFFIC IS LINKED TO:
  - Increased asthma
  - Cardiopulmonary mortality (deaths related to the heart or lungs)
    - shortened life expectancy

The Bigger Picture – Beyond Vessel Emissions

- Ship emissions create regional pollution
- Ships bring millions of imported containers into our Ports
- Each container "becomes a truck" on the freeway or ends up on a train
- These locomotives and trucks and the infrastructure that supports them (rail yards, freeways, rail lines, distribution centers) create local problems in the communities where they operate
  - Noise, light, visual blight, pollution




CSAV


916
BNSF

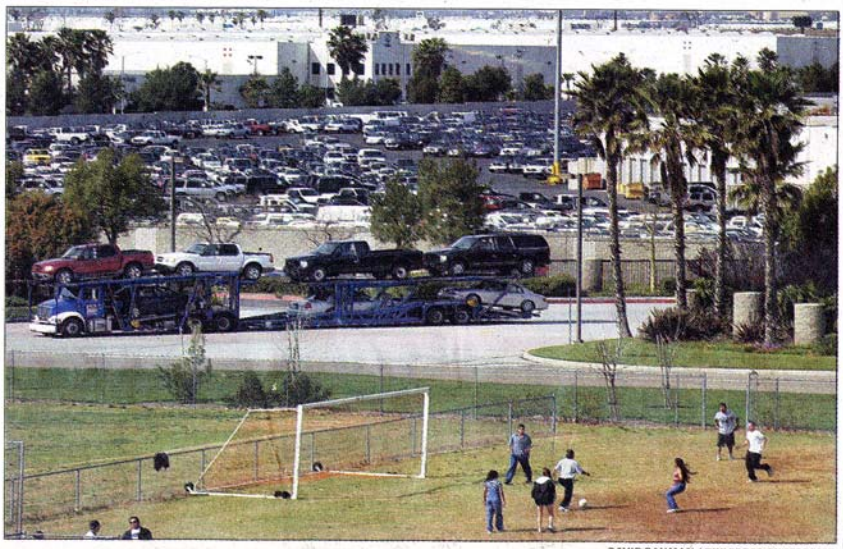

501
Pacific


Truck on 710 Freeway


APL
APL
England
06/14/2004

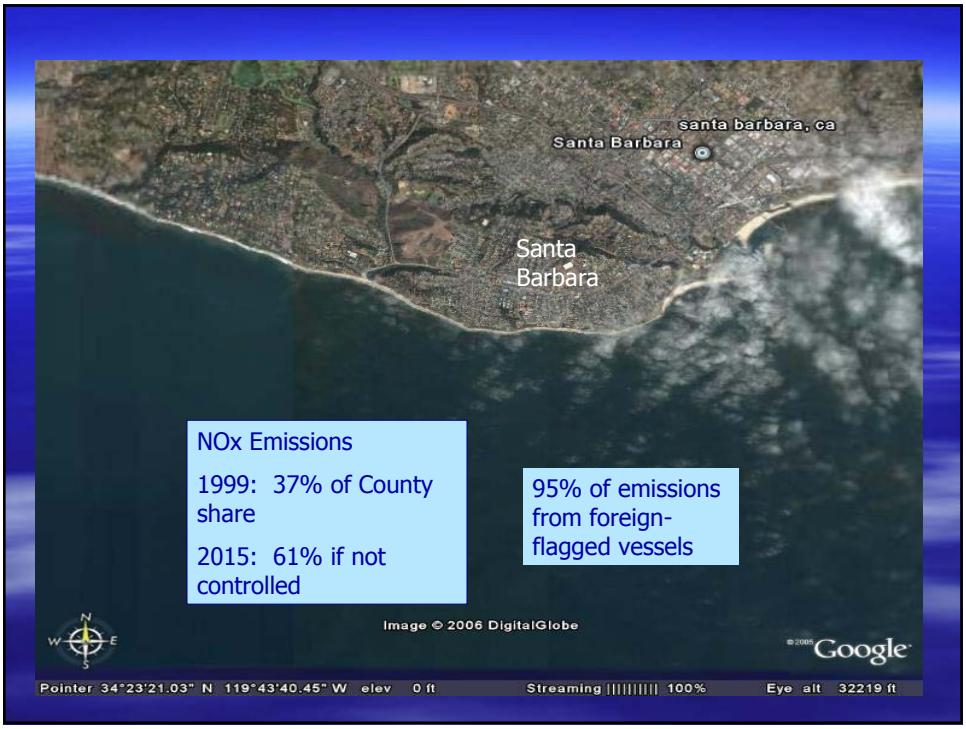
INDUSTRY VS. ENVIRONMENT

First of two parts

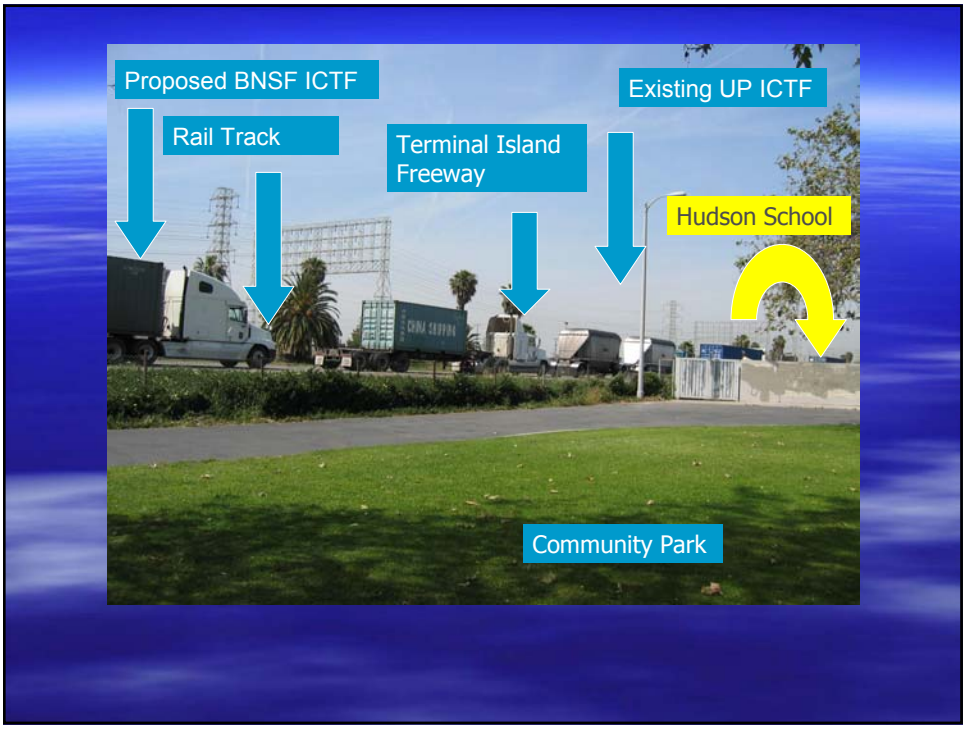


DAVID BAUMAN / THE PRESS-ENTERPRISE

Jurupa Valley High School is across the street from a distribution center where new cars and trucks are transferred from trains to trucks for delivery to dealers. Air-quality regulators say diesel soot from trucks poses an increased cancer risk in the area.


santa barbara, ca
Santa Barbara
Santa
Barbara
NOx Emissions
1999: 37% of County share
2015: 61% if not controlled
95% of emissions from foreign-flagged vessels
Image © 2006 DigitalGlobe
©2005 Google
Pointer 34°23'21.03" N 119°43'40.45" W elev 0 ft
Streaming 100%
Eye alt 32219 ft


ELIZABETH HUDSON
ELEMENTARY SCHOOL
Hudson School


Proposed BNSF ICTF
Rail Track
Terminal Island Freeway
Existing UP ICTF
Hudson School
Community Park

Conclusions

- We are observing harmful health effects today, under current air pollution levels, with current levels of imported goods
- Air pollution levels must be reduced to protect health
- Imports continue to skyrocket
- Any further expansion of ports, freeways and rail yards to accommodate increasing imports will require:
  - extraordinary technological fixes to control emissions, prevent noise and other health hazards, and protect health
  - Implementation of land use guidelines and buffer zones.
- We will not achieve clean air standards or ensure health protection simply by moving freight faster.

The End

- Thank you.

Photos

- Please do not use any photos in this presentation for other purposes (e.g., publication or other Power Point presentations) without first checking on necessary credits with Andrea Hricko at ahricko@usc.edu. Thanks.

Cancers in Census Tracts Near I-710 and Ports

Type of cancer	LA County Rates Male/Female	I-710	Ports
Lung (small cell)	1.0/1.0	1.3*/1.3*	1.1/ 1.3*
Lung (squamous cell)	1.0/1.0	1.2* /1.1	1.1/ 1.3*
Mouth/tongue	1.0/1.0	1.1/ 1.3*	1.5*/ 1.6*
Pharynx	1.0/1.0	1.2/1.1	1.3*/1.4*

*=P< 0.05

CHS: How Do NO_2 and Traffic Correlate with Asthma Prevalence?

Exposure metric	Odds Ratio per IQR	
	OR[a]	(95% C.I.)
Measured NO_2	1.83	(1.04, 3.21)
Distance to Freeway	1.89	(1.19, 3.02)

Gauderman at al., [USC Children's Health Study]
Epidemiology, 2005