

AB32: The California Global Warming Solutions Act

Goods Movement Sector Workshop



California Air Resources Board

April 15, 2008

Workshop Overview

- Overview of Scoping Plan Development and Timeline
- Goods Movement Sector Description
- Review of Early Action Measures
- Proposed Concepts for Additional Emission Reductions
- Next Steps and Open Discussion

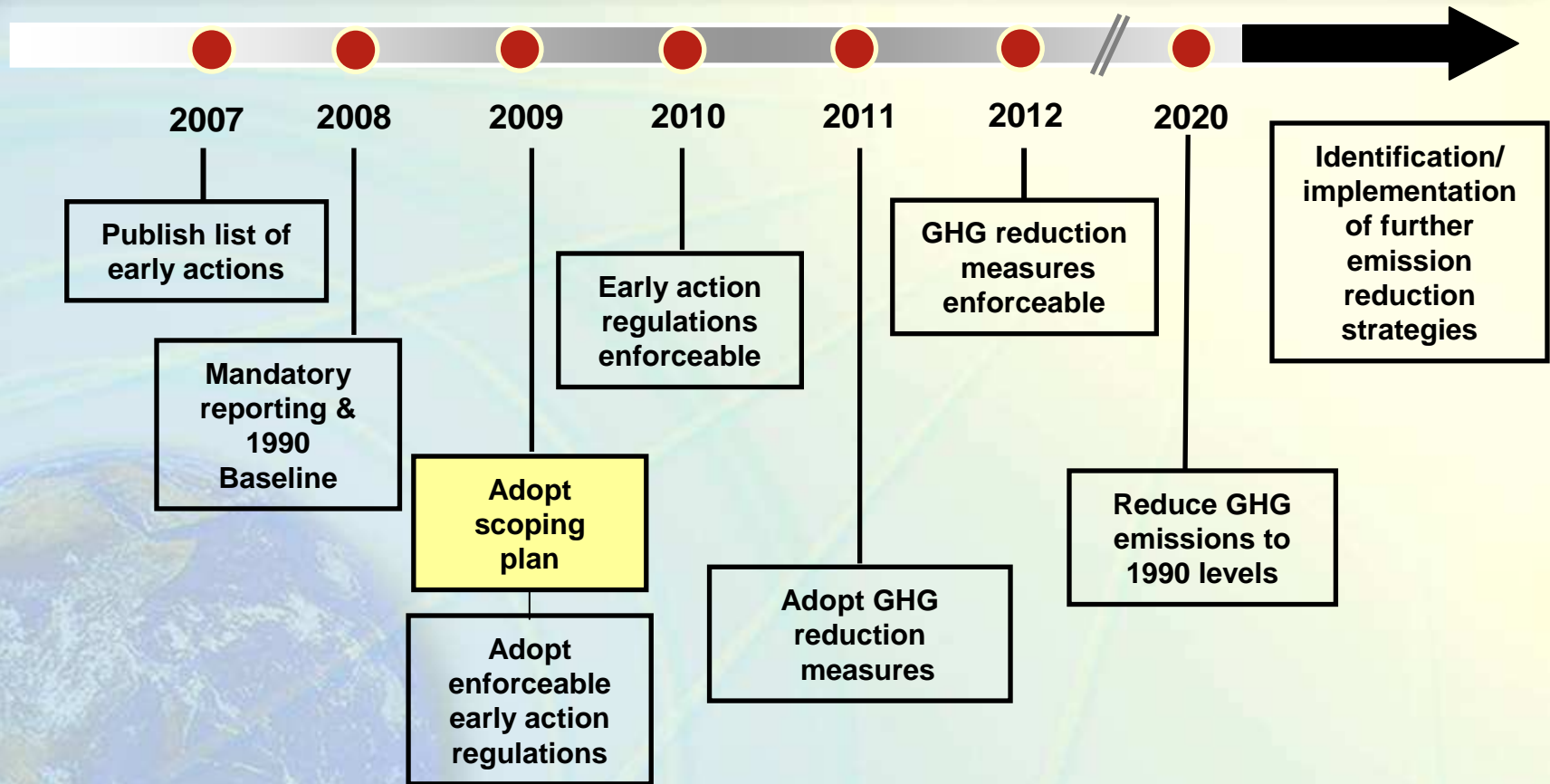
Overview of Scoping Plan Development and Timeline



AB 32

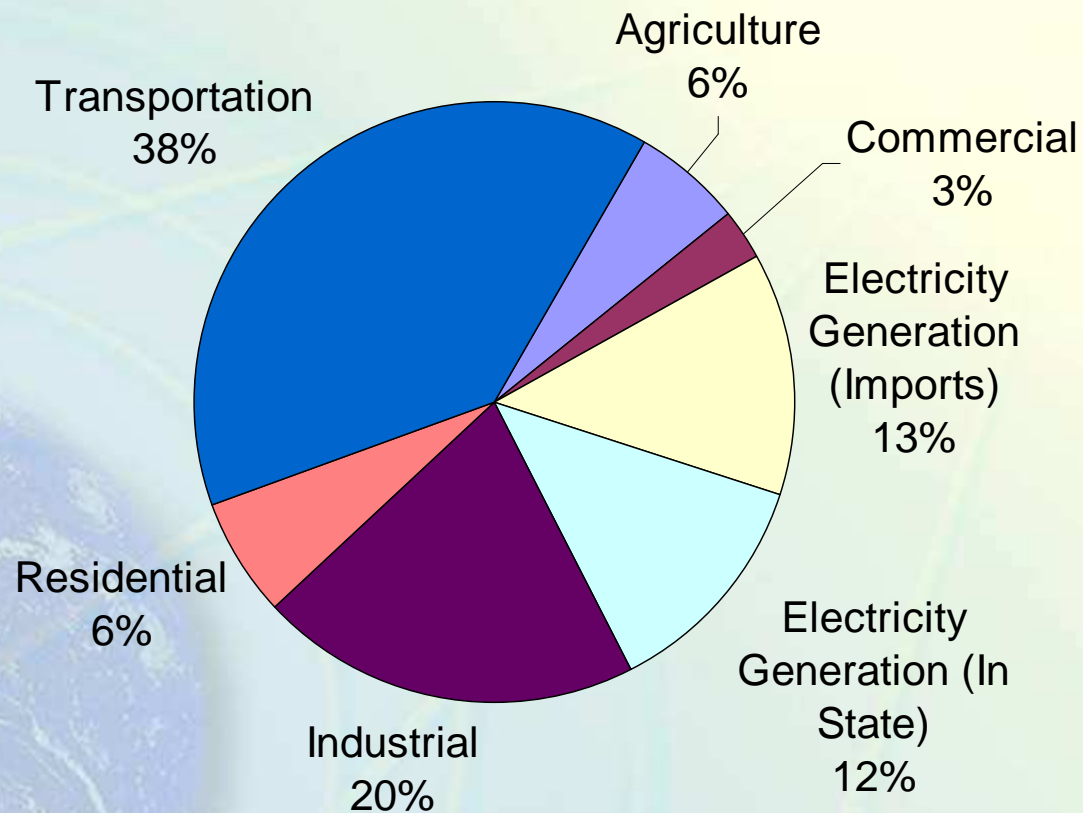
- Sets in statute 2020 GHG emissions limit at 1990 level
 - Acknowledges that 2020 is not the endpoint
- ARB to monitor/regulate GHG sources
- Air Resources Board lead, but extensive collaboration with other agencies
- Mandates that a Scoping Plan be adopted by January 1, 2009

AB 32 Timeline



California GHG Emissions

2004 Emissions (480 MMT CO₂E)

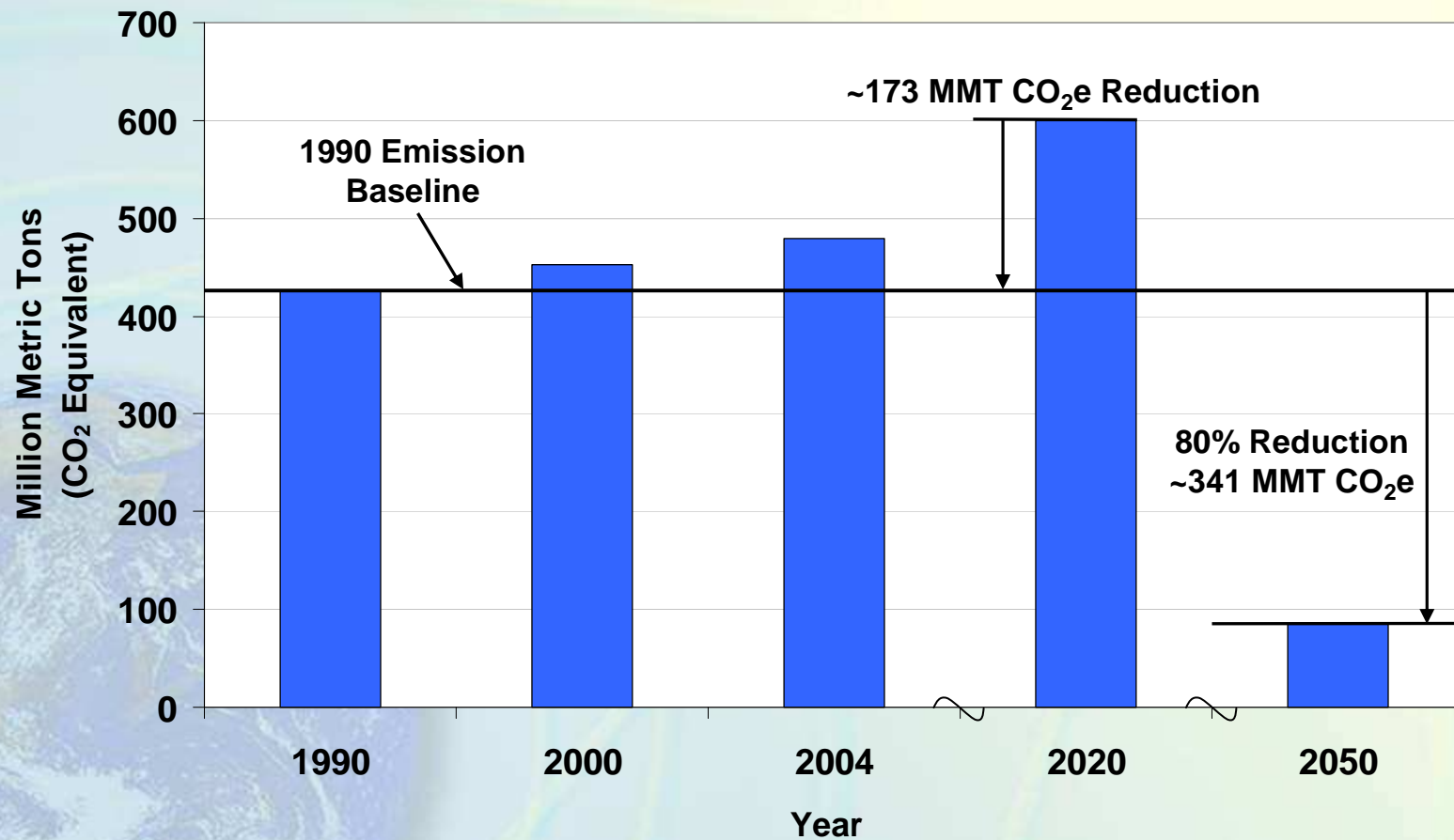


Scoping Plan

- Describe how California will reduce GHG emission levels to 1990 levels by 2020
- Identify maximum technologically feasible and cost-effective measures
- Assess possible mechanisms to achieve reductions
- Evaluate scenarios to achieve the 2020 limit
- Maximize benefits to California
 - Criteria and toxic air pollutant co-benefits
 - Economic development
 - Community participation

Magnitude of the Challenge

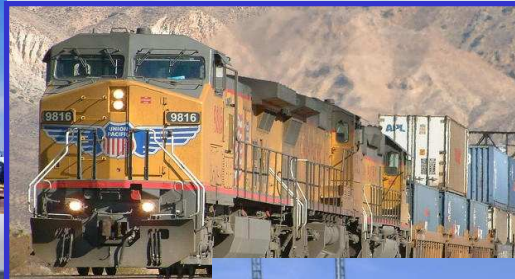
ARB Emissions Inventory



Tentative Scoping Plan Development Schedule

Nov 30, 2007	Scoping Plan Kick-Off Workshop
Dec 6, 2007	Board Hearing - 1990 Baseline, Mandatory Reporting
Dec 14, 2007	Sector Summary Workshop (Sac)
Jan 16, 2008	Mechanisms Workshop (Oakland)
May 5, 2008	Scoping Plan Scenarios Workshop (Sac)
June 26, 2008	Draft Scoping Plan released
July 2008	Workshops on draft plan (Statewide)
Oct 2008	Final Staff Proposal released
Nov 20-21, 2008	Board Hearing - Scoping Plan

Goods Movement Sector Description



Goods Movement Overview

- Sub-sector of transportation
- Sources include ocean-going ships, locomotives, cargo handling equipment, drayage trucks, commercial harbor craft, transport refrigeration units
- Majority of sector emissions from ports and intermodal rail yards
- Does not include airports

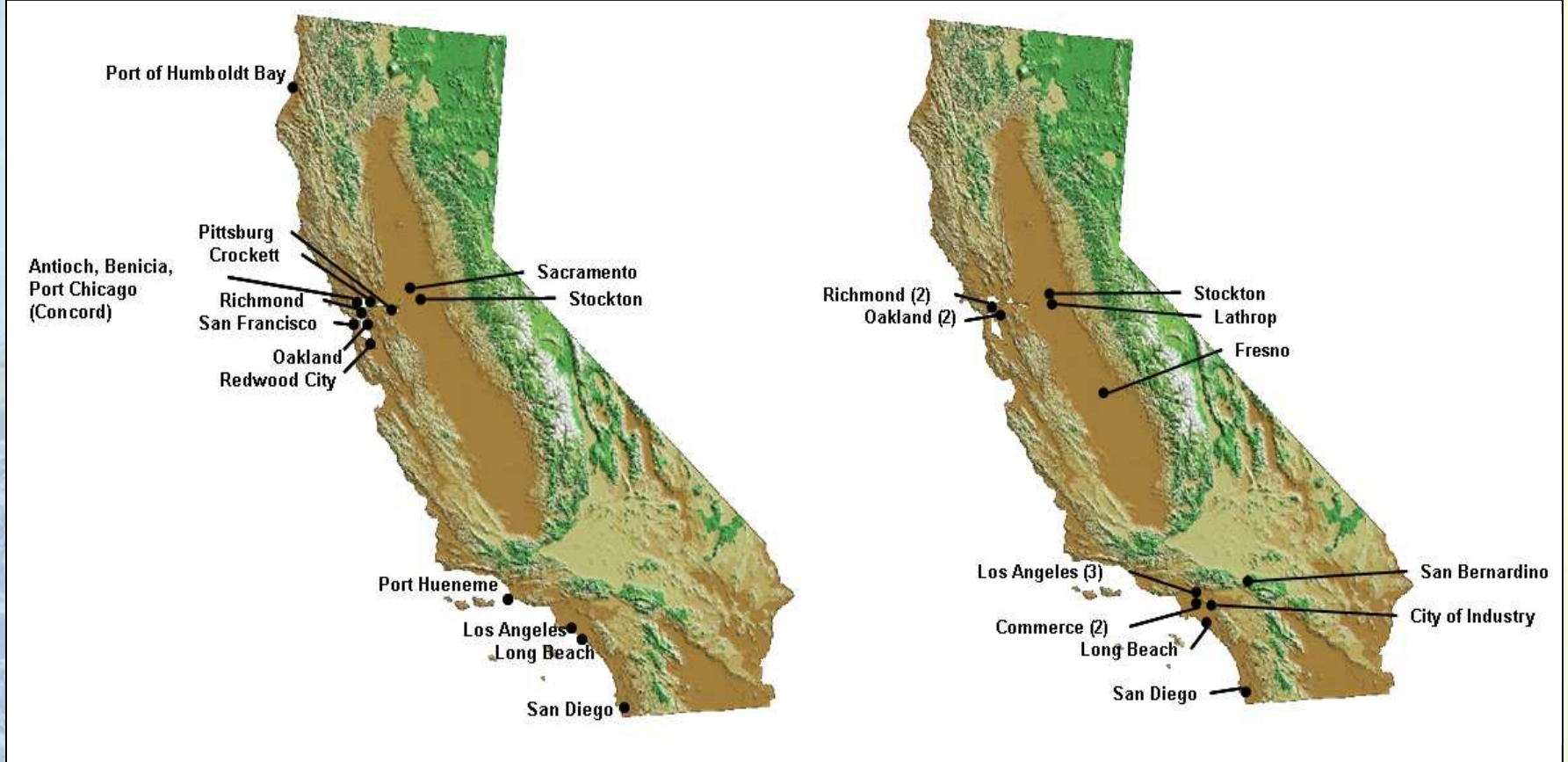
Economic Benefits to California

- Goods movement industry
 - supports one out of seven jobs
 - contributes more than \$200 billion/year to State's economy
 - produces more than \$16 billion in tax revenues

16 Ports and 16 Intermodal Rail Yards Engaged in Goods Movement Activities

Ports

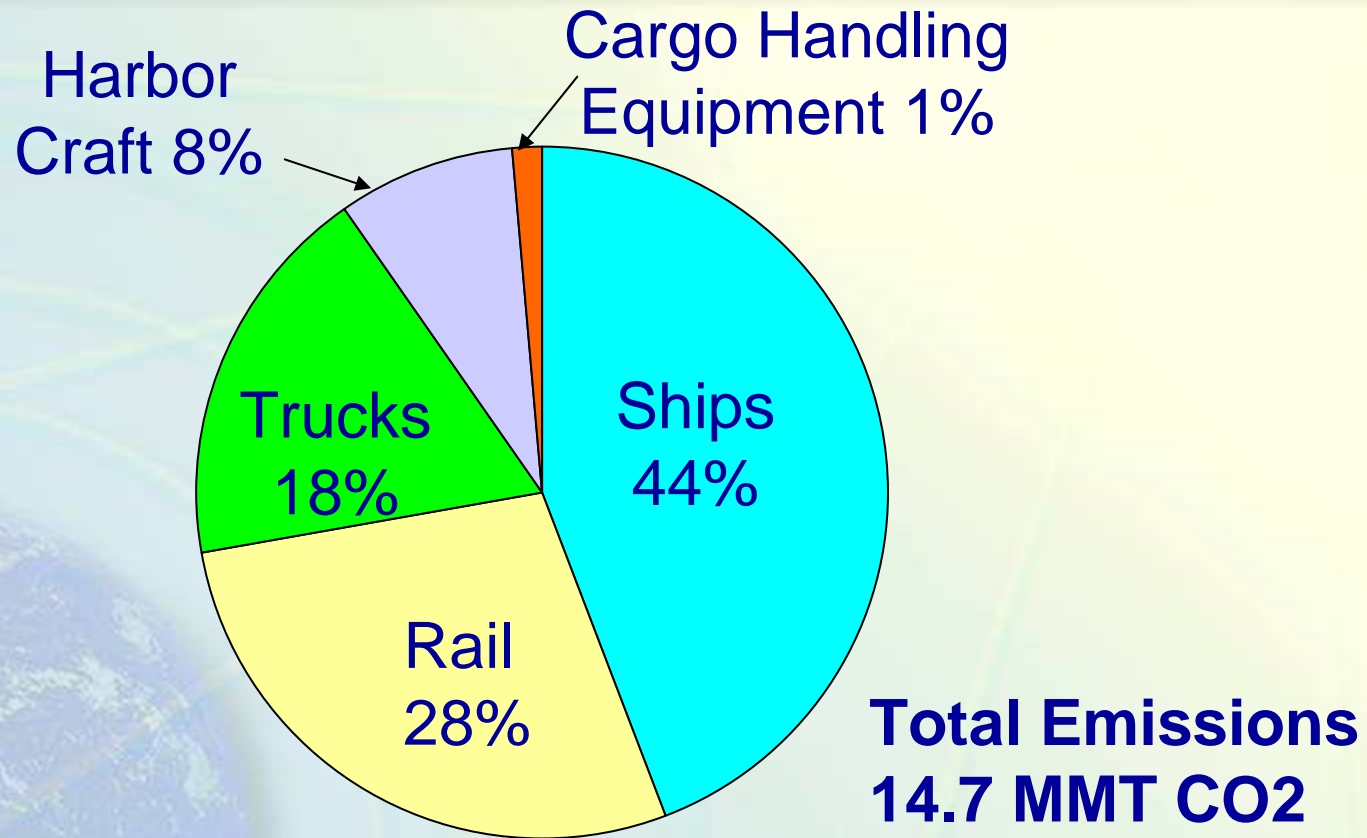
Intermodal Rail Yards



Key Emissions Sources

- Ocean-going vessels
 - 10,000 port calls annually from 2,000 ships
- Locomotives
 - 15,000 interstate, 800 intrastate
- 100,000 drayage trucks statewide
- 4,000 commercial harbor craft
- 4,300 cargo handling equipment
- 40,000 transport refrigeration units (TRU)

2020 Statewide Goods Movement CO₂ Emissions



Source: ARB Goods Movement Emissions Inventory

2020 Statewide Goods Movement CO₂ Emissions

Source Category	Emissions (MMT CO₂)	Share (Percent)
Ocean-going Vessels	6.49	44%
Locomotives	4.13	28%
Drayage Trucks	2.66	18%
Harbor Craft	1.22	8%
Cargo Handling Eqmt	0.20	1%
Total	14.7	100%

Guiding Principles for Development of GMS Emission Reduction Concepts

- Identify measures that result in continued progress toward a lower carbon, more sustainable goods movement system
- Leverage a variety of implementation and emission reduction strategies
- Maximize use of strategies that result in multi-pollutant benefits
- Ensure no adverse localized impacts

Goals for Near-and Long-term Measures

- **Near-term**

- Assist in meeting the 2020 target
- Maximize use of low carbon technologies
- Encourage operational efficiencies

- **Longer-term**

- Assist in meeting the 2050 target
- Foster development of innovative low carbon technologies
- Develop private public partnerships to improve overall efficiency of goods movement transportation network
- Leverage the consumer in promoting a greener goods movement system
- Identify public policies to promote less carbon intensive goods movement system

Emission Reduction Measures for the Goods Movement Sector

- Early Action Items
 - One discrete early action measure
 - Adoption and enforced by January 1, 2010
 - Four early action measures
 - Rulemaking initiated/adopted in 2007-2009 timeframe
- 2020 Target Measures
 - 4 measures currently under consideration
 - Adoption by 2011 and implementation 2012-2020
- Long-Term Measures
 - Exploring broad conceptual approaches
 - Reductions possible prior in 2020, focus on 2050 emission target

Review of Early Action Measures



Early Action Measures

- **Discrete Early Action**
 - Shore Power (Green Ports)
- **Early Action**
 - Vessel Speed Reduction
 - Anti-idling Restrictions for Cargo Handling Equipment
 - TRUs – Cold Storage Prohibition
 - Drayage Trucks at Ports and Railyards

Shore Power (Green Ports)

- Board identified “Green Ports” as a discrete early action item October 2007
- Board adopted regulation December 2007 to reduce emissions from ships while docked
 - Regulation will significantly reduce NO_x and diesel PM, with GHG reductions a co-benefit

Shore Power (Green Ports)

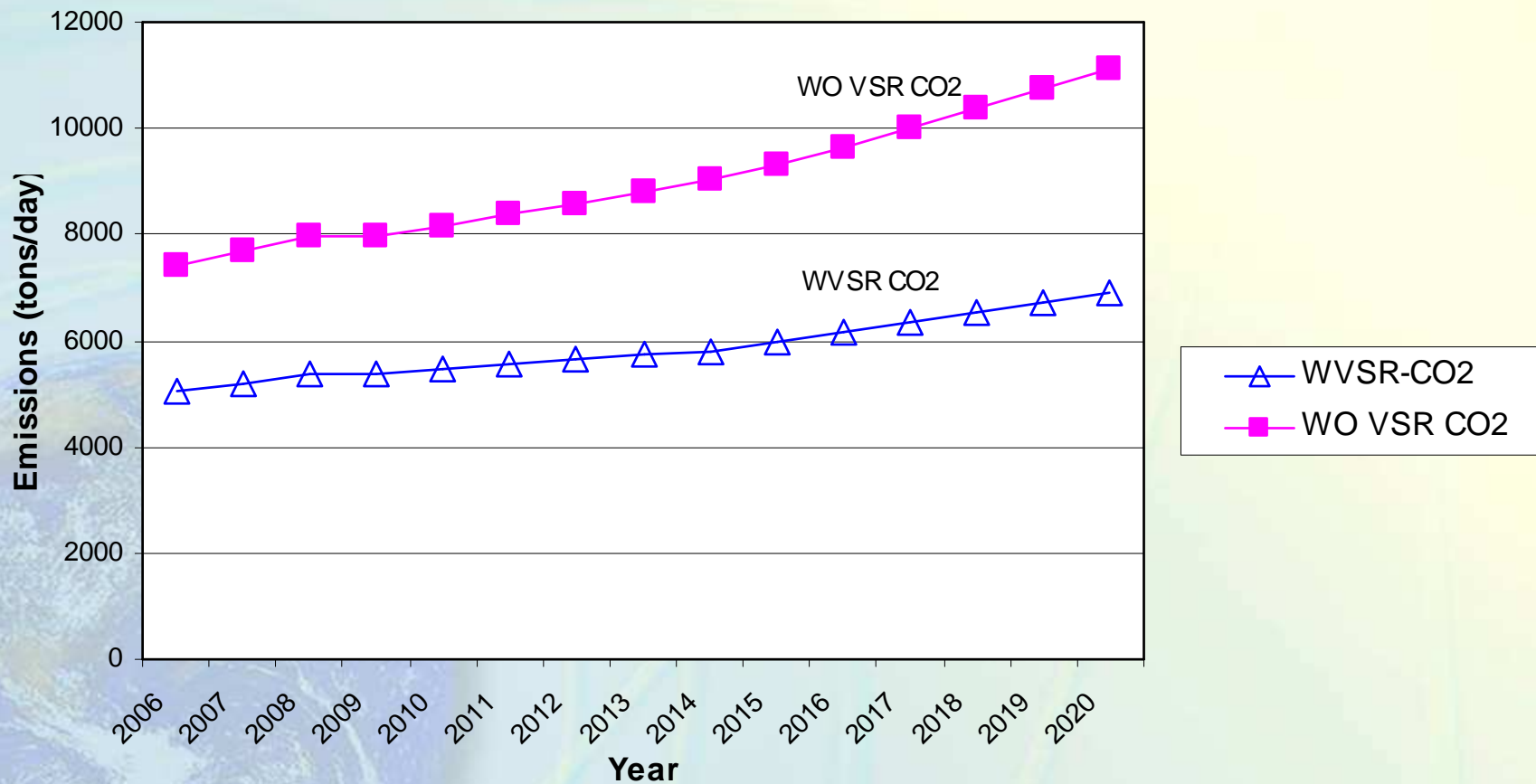
- CO₂ emissions from electricity grid less than emissions from ships' auxiliary engines
- Estimated CO₂ reductions in 2020 = 120,000 – 240,000 metric tons
- As grid gets cleaner, benefits get larger

Vessel Speed Reduction for Ocean-Going Vessels

- Board identified Vessel Speed Reduction as Early Action Item in October 2007
- ARB is evaluating the impacts of a VSR measure (i.e., voluntary, incentive-based, or regulatory)
- Evaluation will include impacts at Ports at 24 and 40 nm from the California coastline

CO₂ Emissions Benefits

Emissions Comparison With and Without VSR at 12 Knots Out to 24 nm*



* VSR @40 nm will result in about twice the emissions benefits

Vessel Speed Reduction

- Emissions benefits estimated at about 1.4 MMTCO₂ by 2020
- Work with Stakeholders to address key components in evaluation
- Draft report to public this summer
- Schedule workshop

Anti-idling Restrictions for Cargo Handling Equipment

- Statewide regulation
- Limit unnecessary idling
- Applicable at California ports and intermodal rail yards
- Safety may be a factor
- Reductions dependent on extent of unnecessary idling - to be evaluated
- Possible annual reductions:
 - 0.01 million tons of CO₂
 - 1 million gallons of diesel fuel

Transport Refrigeration Units - Cold Storage Prohibition

- What is a TRU?
 - Refrigeration systems powered by integral internal combustion engines designed to control the environment of temperature sensitive products that are transported in trucks and refrigerated trailers
 - TRUs may be capable of both cooling and heating
- Why are TRUs used for cold storage?
 - Distribution centers, cold storage warehouses, and grocery stores run out of cold storage capacity
 - Most often around all of the major holidays
 - Some year-round practice

Transport Refrigeration Units - Cold Storage Prohibition

- Regulation would eliminate the use of TRUs for extended cold storage at any facility
 - Distribution centers
 - Grocery stores
 - Any other business where TRUs operate
- Rule development schedule

Preliminary Activities	Late 2008
Formal Rulemaking	Spring 2009
Board Adoption	Late 2009
Compliance Begins	Early 2011

Transport Refrigeration Units - Cold Storage Prohibition (cont'd)

- Extended cold storage TRU use means “switch-on” time that is greater than 24 hours
- Compliance options
 - Build additional facility cold storage capacity
 - Use plug-in refrigerated shipping containers
 - Use plug-in electric standby-equipped TRUs or Hybrid electric TRUs
 - Use cryogenic refrigeration systems

Transport Refrigeration Units - Cold Storage Prohibition (cont'd)

- Benefits

Estimated Reductions	
Diesel PM (toxic)	22 tons/yr
Diesel fuel use	1.7 million gal/yr
Greenhouse gases	0.02 million metric tons/yr CO ₂

- Estimated costs
 - \$44 million in 2011

Drayage Truck Regulation



- Approved by Board on December 7, 2007
- Publish 15-day changes
- Becomes law after approval from OAL - estimated 1st half of 2008

Drayage Truck Compliance Schedule and Emission Benefits

Compliance Schedule

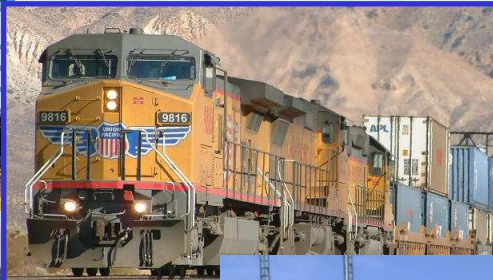
Phase 1: To be completed by December 31, 2009

Phase 2: To be completed by December 31, 2013

Emission Benefits

- PM = 770 tons/yr NO_x = 12,100 tons/yr
- Estimated CO₂ reductions of 55,000 - 89,000 t/y (3-5%) due to replacement of pre-1994 trucks

Proposed Concepts for Additional Emission Reductions



Proposed Additional Measures for the Goods Movement Sector

- **Near-term Measures***
 - Energy Efficiency Guidelines for Refrigerated Trucks and Trailers
 - Identification and Documentation of Improved Maintenance Practices for Harbor Craft Vessels
 - Green Ships
 - Ports and Intermodal Railyard Declining Carbon Footprint
- **Long-term Measure**
 - Greening of the Goods Movement Transportation Network

* Additional statewide measures for heavy-duty trucks also under consideration for transportation sector that will impact drayage trucks

Transport Refrigeration Units - Energy Efficiency Guidelines

- Proposed near-term measure – assist with 2020 target
- Best practices guidance document on energy efficiency improvements for refrigerated transport supply chain
 - Thermal efficiency of insulated vans
 - Refrigeration system improvements
 - Operating procedures
 - Information on alternative cooling systems

Transport Refrigeration Units - Energy Efficiency Guidelines (cont'd)

- Multiple benefits
 - Reduced greenhouse gas emissions
 - Goal of 50 percent by 2020
 - Reduced engine operating time
 - Fuel cost savings
 - Maintenance cost savings
 - Reduced diesel PM emissions (toxics)
- Schedule
 - Begin outreach in 2011
 - Implement through 2020

Commercial Harbor Craft Maintenance Good Practices and Improved Operational Efficiencies

- Proposed near-term measure – assist with 2020 target
- Statewide educational program
- Promote reduced fuel use through:
 - Engine maintenance good practices
 - Vessel operation and maintenance good practices
- Resulting GHG reductions dependent on:
 - Degree to which practices currently are in use
 - Voluntary increase in use

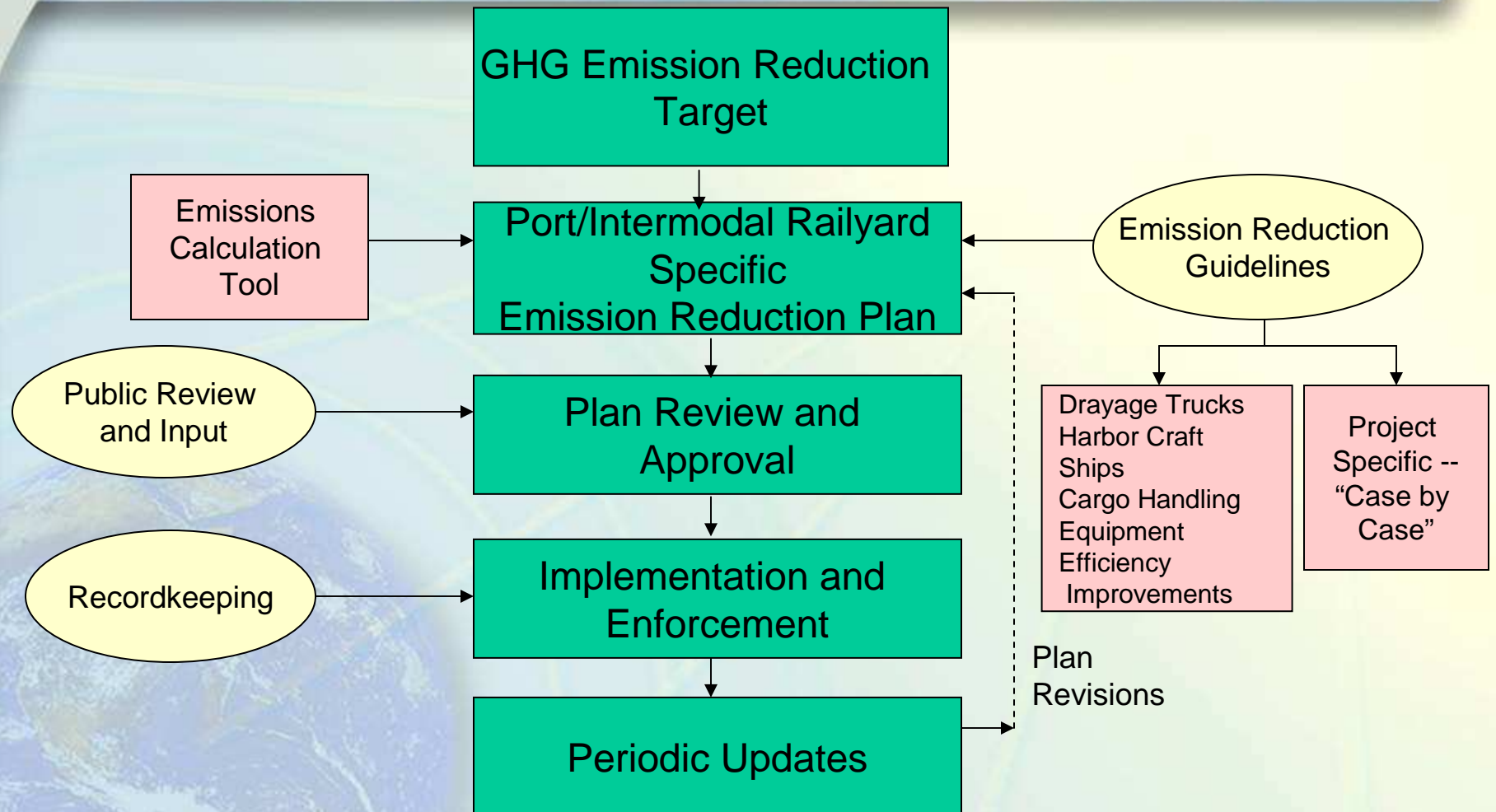
Green Ship Measure

- Proposed near-term measure – assist with 2020 target
- Measure is part of the Goods Movement ERP and will reduce both criteria pollutants and GHG's
 - GHG emission reductions from a variety of strategies
 - optimized hull and propeller design
 - advanced heat recovery systems
 - air cavity system to reduce hull friction
 - advanced hull coatings and maintenance
 - wind power (using sails/panels to assist propulsion)
 - operational changes (speed reductions and route planning)
 - alternative/renewable fuels
- Preliminary estimates of 1.6 mmt/yr (assumes 25% reduction)

Ports and Intermodal Railyard Declining Carbon Footprint

- Proposed near-term measure – assist with 2020 target
- Establish program to GHG emissions at individual ports and intermodal railyards
 - Port/Intermodal Railyards develop individual emission reduction plans
 - ARB would develop program requirements for plans in a public process- boundaries, GHG sources covered, emission reduction targets/monitoring metrics, mechanisms and timeline for monitoring progress, safeguards to ensure public health protected, alignment with other programs
 - ARB to provide supporting tools – standardized emission reduction calculation methodologies/guidelines, tracking tools, technology evaluations

Port and Intermodal Railyard Declining Carbon Footprint



Port/Intermodal Railyard Declining Carbon Footprint - Emission Reduction Concepts for Drayage Trucks

- Hybrid Trucks
- Electric Trucks
- Alternative Fuels
- Improve Fuel Efficiency by Using Aerodynamic Technologies
- Driver Training and Performance Monitoring

Port/Intermodal Railyard Declining Carbon Footprint - Emission Reduction Concepts for Locomotives

- Idle Reduction Devices
 - Intrastate and Interstate Locomotives
- Fuel Efficiency Devices/Approaches
 - Trip Optimizer
 - Use of Dynamic Braking Energy (e.g., GE Hybrid)
- Advanced Technology Switch Locomotives
 - Electric Hybrid, Gen-Set, and LNG
 - 20 to 40% fuel reduction or displace diesel
- Lower carbon fuel standard

Port/Intermodal Railyard Declining Carbon Footprint - Emission Reduction Concepts for Harbor Craft

- In-use vessel operational and maintenance strategies:
 - Vessel speed reduction zones
 - Enhanced engine and propeller maintenance
 - Improved hull smoothness
 - Enhanced use of navigational technologies
- New vessel and retrofit strategies:
 - Hybrid power system
 - Improved propeller design

Port/Intermodal Railyard Declining Carbon Footprint - Emission Reduction Concepts for Ships

- Optimized hull and propeller designs
- Advanced heat recovery systems
- Air Cavity systems
- Wind power
- Alternative fuels
- Hull coatings and maintenance
- Operational changes (speed reduction, route planning)

Port/Intermodal Railyard Declining Carbon Footprint - Emission Reduction Concepts for Cargo Handling Equipment

- Retrofit to hybrid systems
- Electrification of diesel powered equipment
- Use of low carbon fuels
- Wind powered turbines atop cranes

Port/Intermodal Railyard Declining Carbon Footprint – Emission Reduction Concepts

- Improving efficiency
 - Accelerates goods movement
 - Increases effective port capacity
 - Reduces emissions
- Rising fuel prices and new environmental requirements increase relevance
- Cooperative relationships/policies needed to affect change

Port/Intermodal Railyard Declining Carbon Footprint – Emission Reduction Concepts for Efficiency Improvements

- **Efficiency and Other Improvements**

- Increased double-moves
- Virtual Container Yard for empty containers
- Chassis pooling
- Trip assignment
- Wheeled storage
- CHE Automation



Port/Intermodal Railyard Declining Carbon Footprint Emission Reduction Concepts for Transport Mode Shifts

Mode shifts

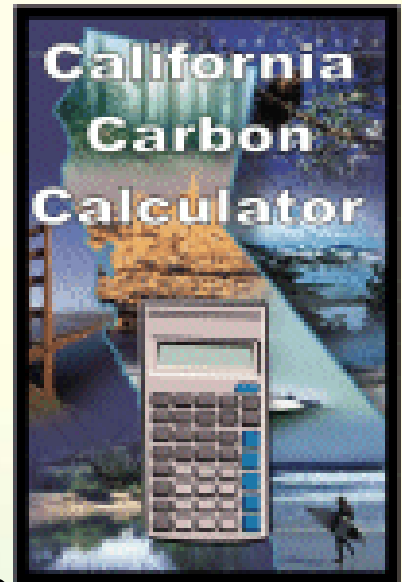
- On- or near-dock rail diversion
- Waterway diversion
- Inland facility could reduce need for waterside storage
- Rail/barge already becoming more competitive with increased fuel prices
- Shift to rail/barge from truck would result in reduced emissions
- Capacity of existing on-dock transfer facilities and inland facilities would need to increase



Port/Intermodal Railyard Declining Carbon Footprint - Tools for Tracking Changes

Carbon Calculator for Ports and Intermodal Railyards

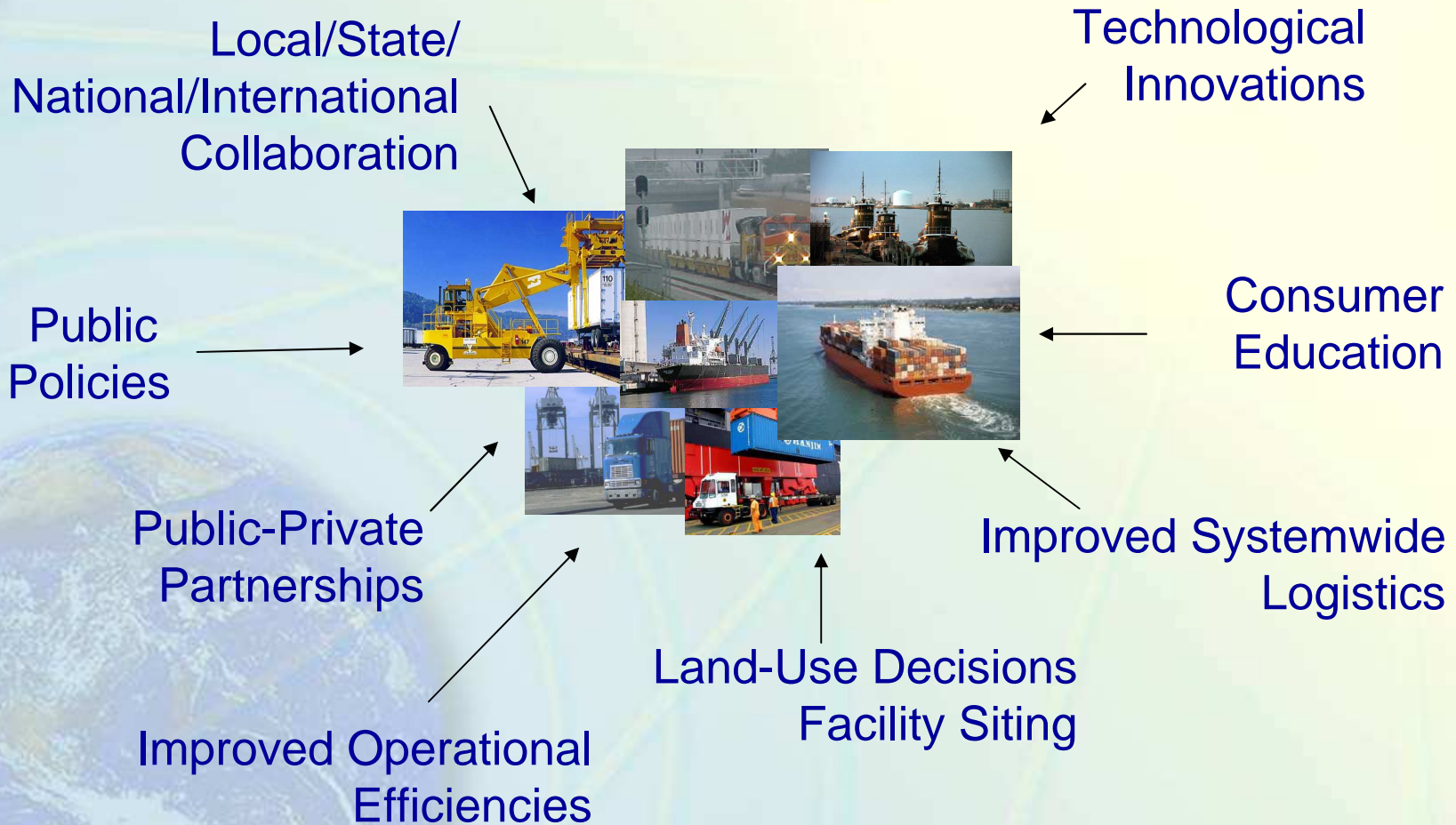
- Estimate GHG emissions from trucks, locomotives, ships, harbor craft and cargo equipment serving ports and intermodal railyards
- Use port/rail yard specific inputs such as equipment types, route, speed, fuel type, operational duration, etc.



Long-term Vision for Goods Movement

- Goods movement is integrated broad-based complex supply chain system
- To achieve goals, need to create 2050 vision of a low carbon sustainable goods movement network
- Creating vision requires looking in and beyond California
- Numerous stakeholders need to be involved

Low-Carbon Goods Movement System Requires Multi-faceted Approach



2020 & Beyond: Greening of the Goods Movement Transportation Network

- Establish Taskforce
- Commitment to develop 2050 Vision through collaborative process
- Identify:
 - Private-public partnerships that foster efficient logistics systems and goods movement network
 - Public policies that support and promote low carbon goods movement network
 - Consumer choices that encourage efficient transport
 - Programs to foster and implement low carbon innovations

Next Steps and Open Discussion



Next Steps

- Refine and further define proposed goods movement sector measures (GMS)
- Incorporate GMS measures in Scoping Plan
- Summer public workshops on draft Scoping Plan
- Board consideration of Scoping Plan – December 2008

Contacts

- **Early Actions**

- Shore Power
 - Mike Waugh, mwaugh@arb.ca.gov, (916)-445-6018
- Vessel speed Reduction
 - Robert Krieger, rkrieger@arb.ca.gov, (916) 323-1202
- Anti-idling Restrictions for Cargo Handling Equipment
 - Cherie Rainforth, crainfor@arb.ca.gov, (916) 327-7213
- Transport Refrigeration Units – Cold Storage
 - Richard Boyd, rboyd@arb.ca.gov, (916) 322-8285
- Drayage Trucks
 - Mike Miguel, mmiguel@arb.ca.gov, (916) 445-4236

Contacts (cont.)

- Proposed Additional Measures for the Goods Movement Sector
 - Energy Efficiency Guidelines for Refrigerated Trucks and Trailers
 - Richard Boyd, rboyd@arb.ca.gov, (916) 322-8285
 - Identification and Documentation of Improved Maintenance Practices for Harbor Craft Vessels
 - Cherie Rainforth, crainfor@arb.ca.gov, (916) 327-7213
 - Green Ships
 - Paul Milkey, pmilkey@arb.ca.gov, (916) 327-2957
 - Ports and Intermodal Railyard Declining Carbon Footprint
 - Peggy Taricco, ptaricco@arb.ca.gov, (916) 323-4882
 - Todd Sax, tsax@arb.ca.gov, (916) 322-5474
- Long-term Measure
 - Greening of the Goods Movement Transportation Network
 - Peggy Taricco, ptaricco@arb.ca.gov (916) 323-4882 (+ others TBD)