US Port Emissions Overview and Research Directions

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Outline

- Background

- Existing efforts

- Research on port recognition programs

- Future research areas

Port emissions are a health, climate, and environmental justice issue

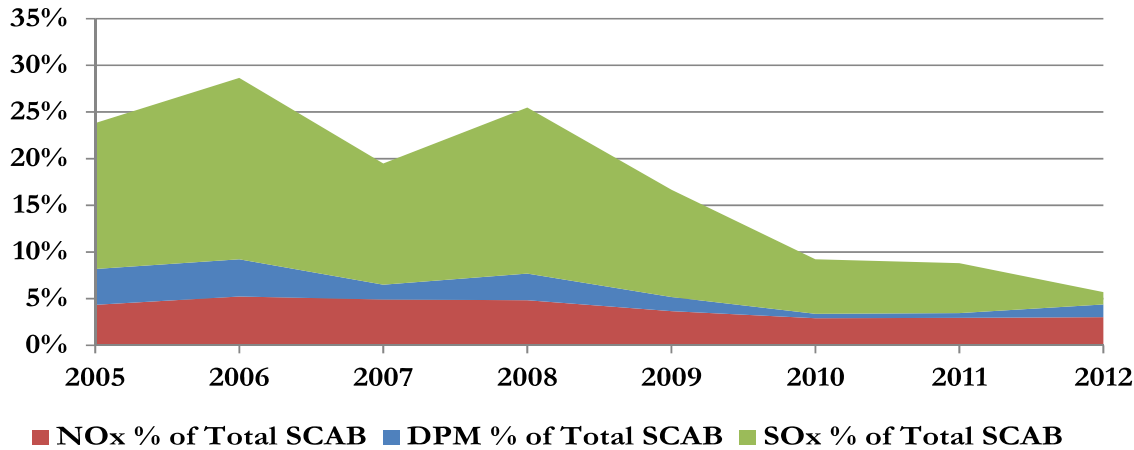Figure ES.8: Port's Emission Contribution in the South Coast Air Basin

- NOx % of Total SCAB
- DPM % of Total SCAB
- SOx % of Total SCAB

Figure ES.9: DPM Emissions Comparison by Category, tpy

Categories: Ocean-going vessels, Harbor craft, Cargo handling equipment, Locomotives, Heavy-duty vehicles

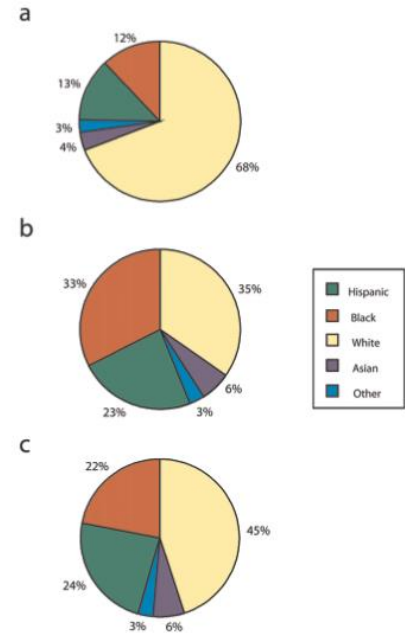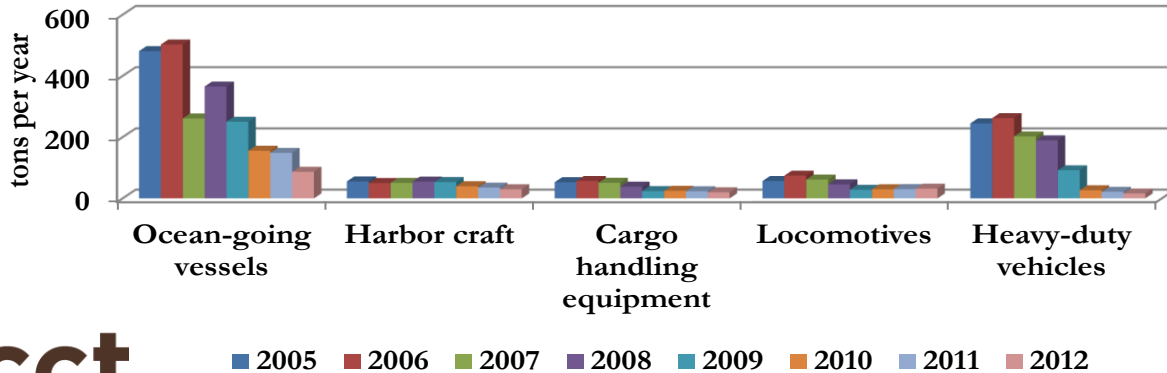Years: 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012

FIGURE 4—Racial/ethnic composition of year 2000 population (a) across the United States, (b) with diesel particulate matter cancer risk > 100 per million resulting from emissions from 43 selected US ports, and (c) with diesel particulate matter risk > 10 per million resulting from emissions from 43 selected US ports.

Legend: Hispanic, Black, White, Asian, Other

Variety of approaches to address port emissions

- New equipment standards
- In-use emission controls (retrofits, upgrades, operational best practices, etc.)
- Fuel switching requirements
- Port electrification
- Incentives for ports and for port customers
- Environmental management systems (EMS)
- Port recognition programs

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Example (1): Port of Long Beach

- Port of Long Beach reduced SOx emissions by 80% from 2005-2011
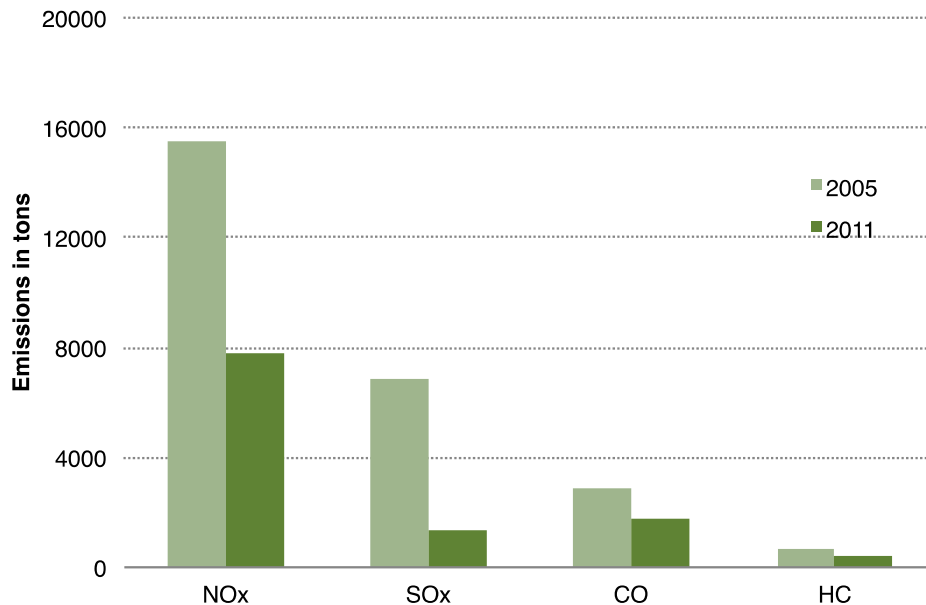
- Accomplished through the Port Clean Air Action Plan (2005)

  - Voluntary vessel speed reduction (Green Flag program)

  - Shore power for containerships and cruise ships

  - On-road, off-road, and vessel fuel switching

  - Clean Truck program: required 2007 model year or newer

  - Technology Advancement Program: focus is on supporting development of zero emission technologies and cutting emissions from ocean going vessels.

Research on port "recognition" programs

- ICCT conducted a 6 month study under contract with Environmental Defense Fund completed April 30, 2014.

- Intended to create general recommendations for an voluntary port recognition program focused on air pollution.

- Five tasks incorporated input from ports and other stakeholders to provide candidate metrics and make recommendations for recognition framework

Task	Key Deliverable(s)
1) Review Existing Programs	Comprehensive program table; scoping analysis of best practices
2) Identify Candidate Metrics	List of quantitative and qualitative metrics; conversion factors to support international expansion
3) Stakeholder Outreach	Directory of stakeholders; structured online survey; summary of interim results
4) Recommend Program Framework	Criteria for environmental performance evaluation, best practices, recognition levels and branding for inclusion
5) Clarify Principles for Effective Administration	List of potential administrators for the recognition program; strategies for program implementation

Ports included in the survey

- 18 largest US container ports defined by annual throughput larger than or near 500,000 TEUs (twenty-foot equivalent units).
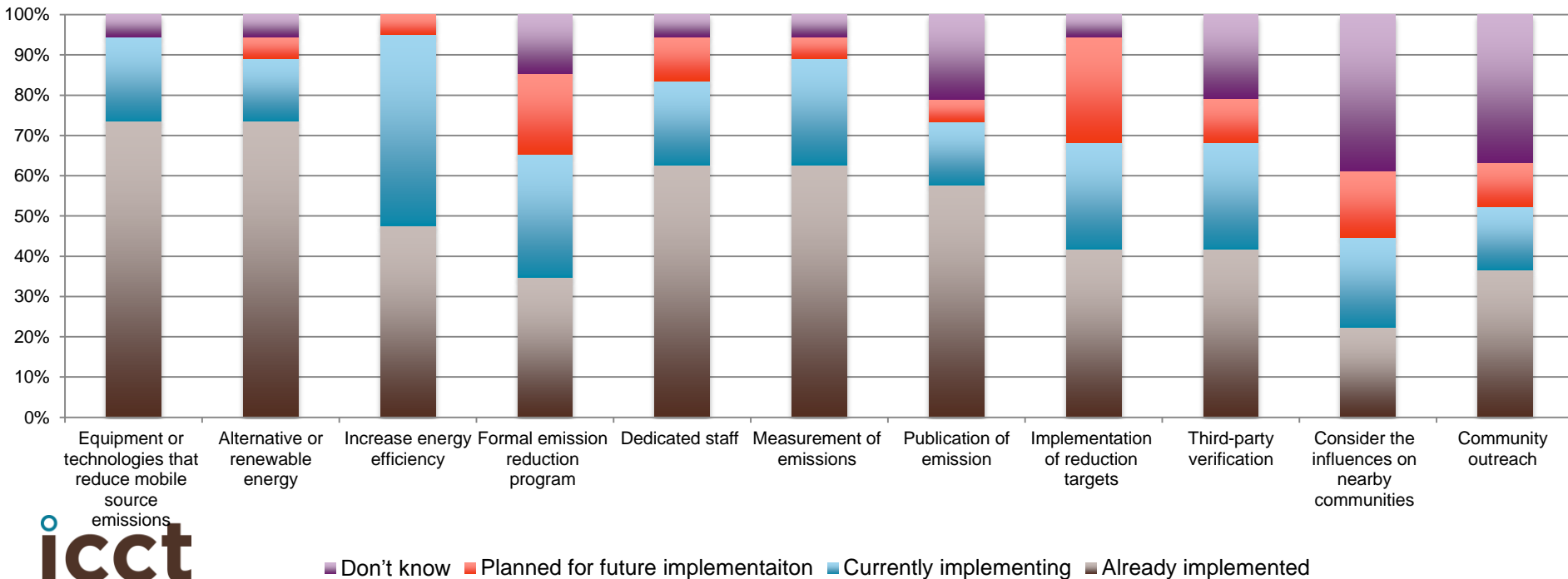   - 12% of US ports representing 93% of TEU throughput
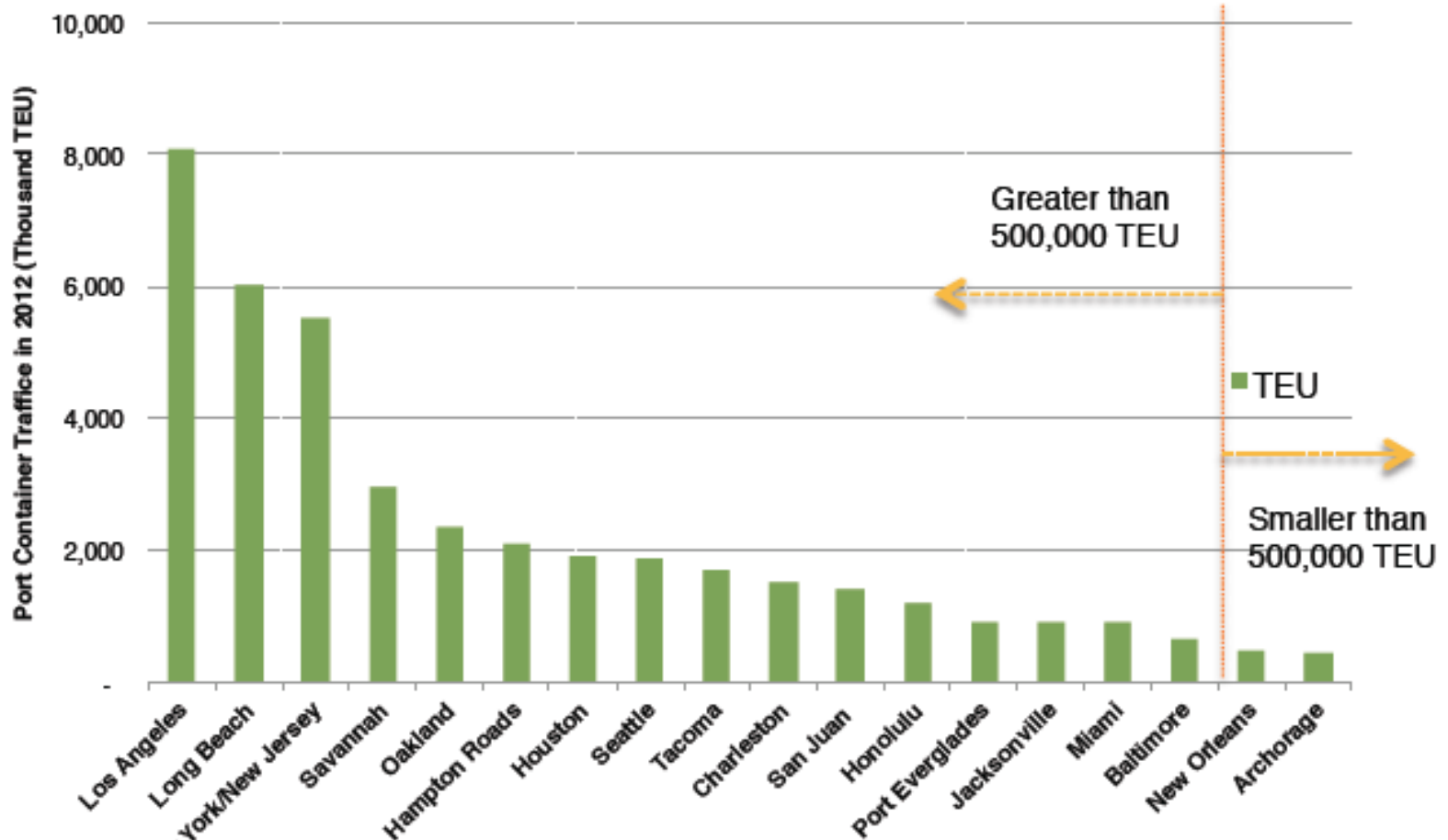
Data Source: American Association of Port Authorities

Ports are implementing a wide range of programs at various stages

- In all categories, the majority of respondents were engaged in implementing or planning emissions reduction activities or programs
- Additional questions showed that ports are measuring SOx, NOx, DPM as well as energy consumption

Implementation of Programs

Legend: Don't know · Planned for future implementaiton · Currently implementing · Already implemented

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Eight environmental achievement programs reviewed in this study

Clean Cargo Working Group is dedicated to performance improvement in marine container transport

Provide practical tools for companies to control their environmental impact and improve performance

Ecoports mission is to create a level playing field for port environmental management

Sustainability through cost efficient and energy saving green buildings

Green Marine mission is to make marine transportation greener through process of continuous improvement.

Existing Vessel Design Index specializes in ship vetting to promote safety and efficiency in the global maritime industry

Committed to promoting smart transportation choices for freight movement

Environmental Ship Index Identifies top performing sea-going ships based on air emissions reductions

Summary of existing programs

	CCWG	Green Marine	ISO 14001	LEED	SmartWay
Goal Setting	User defined	User defined	User defined	Program defined	Program defined
Ranking structure	Confidential ranking	Scaled ranking (1-5)	No ranking	Ranked by total score (1-100)	Ranked by performance
Data	Numerical	Primarily Qualitative	Qualitative	Qualitative and Numerical	Numerical
Verification	3rd party verified	3rd party verified	3rd party verified	3rd party verified	SmartWay verified
Applicability	Ships – international container vessels	Ports/terminal – focused on Canada and Great Lakes	Ports/buildings – internationally recognized	Buildings – internationally recognized and applied to ports	Trucks, Rail and Barge – US&CA + international programs
Familiarity	65%	70%	80%	80%	60%

Port preferences for an environmental recognition program

Approach should be tiered

- Program should have multiple achievement levels (such as LEED or Green Marine)
- Levels should be broad enough to allow participation by ports at all stages of environmental program maturity

Program should use a "menu" approach

- Because ports are unique, program should provide multiple options (best practices) to achieve emissions reductions (LEED or Green Marine)
- Ports will implement options that are relevant for their port operations and major sources (SmartWay)

Self-determined benchmarks or indicators

- Program milestones should be self-determined (Clean Cargo Working Group or ISO)
- Ports at different stages will have different goals and those goals should be incorporated into defining achievement benchmarks

Regulatory and non-regulatory programs are complementary

- Existing regulatory programs include national and state vehicle and fuel emission standards, SmartWay program, IMO-based Emission Control Area.

- Non-regulatory programs include funding for truck retrofits, participation in voluntary programs such as Clean Carbon Working Group, port-specific programs, etc.

- Voluntary programs may not adequately protect human health in areas where port emissions strongly impact local communities, particularly when impact thresholds are not defined.

- Challenges with voluntary programs include:
  - Emission reductions provided may be limited
    - Insufficient pull for BACT and resources for planning, particularly if shippers are not adequately involved
    - Risk free riders --> aggressive action may disadvantage "discretionary" ports
    - For GHGs, voluntary approaches are unlikely to address underlying market barriers
  - Doesn't address principle/agent problem (ports having limited control over tenants actions)
  - May not promote control strategies benefiting from cross-port coordination (e.g. shorepower)

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Future Research

- Refine information on full suite of US ports by type and size (not just large container ports).

- Sector assessment to identify air pollution and inventory data, status of ports by investment and achievement, and key opportunities and barriers to progress (similar to starting point for US SmartWay)

- How best to leverage existing programs, methods, etc., rather than reinvent or duplicate existing efforts, e.g., reciprocity with CCWG and other programs

- Identify widely applicable mitigation technologies / practices to use as "proof of concept" in initial roll out of program.

- Explore methods of monitoring and evaluation of programs to assess environmental and health benefits

- Assess data needs for baseline emissions estimates and reevaluation intervals

- Explore creation of functional forum to discuss next steps, conflicts and solutions

- Review SmartWay Legacy Fleet Workgroup recommendations for insight

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