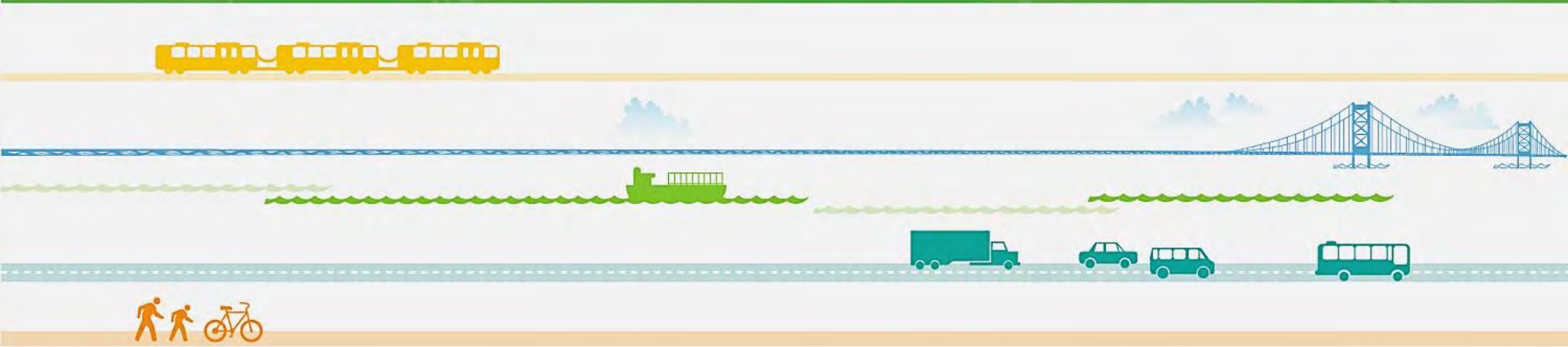
Draft DVRPC FY2014 Transportation Improvement Program for New Jersey

Federal Fiscal Years 2014-2017



DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

What is the TIP?

- ***Required*** **by federal legislation, Moving Ahead for Progress in the 21st Century Act (MAP-21)**
- **Agreed upon listing of all priority, regionally significant, transportation projects and all other projects seeking federal funds**
- ***Financially constrained***
- **The near-term expression of the Long-Range Plan**
- **Four-year program; updated every other year**
- **Effective October 1, 2013 to September 30, 2015**

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What is the TIP? (Continued)

- Multi-year and multi-modal program
- Best estimate of project schedule and costs
- Not a grant of money; based on reimbursements

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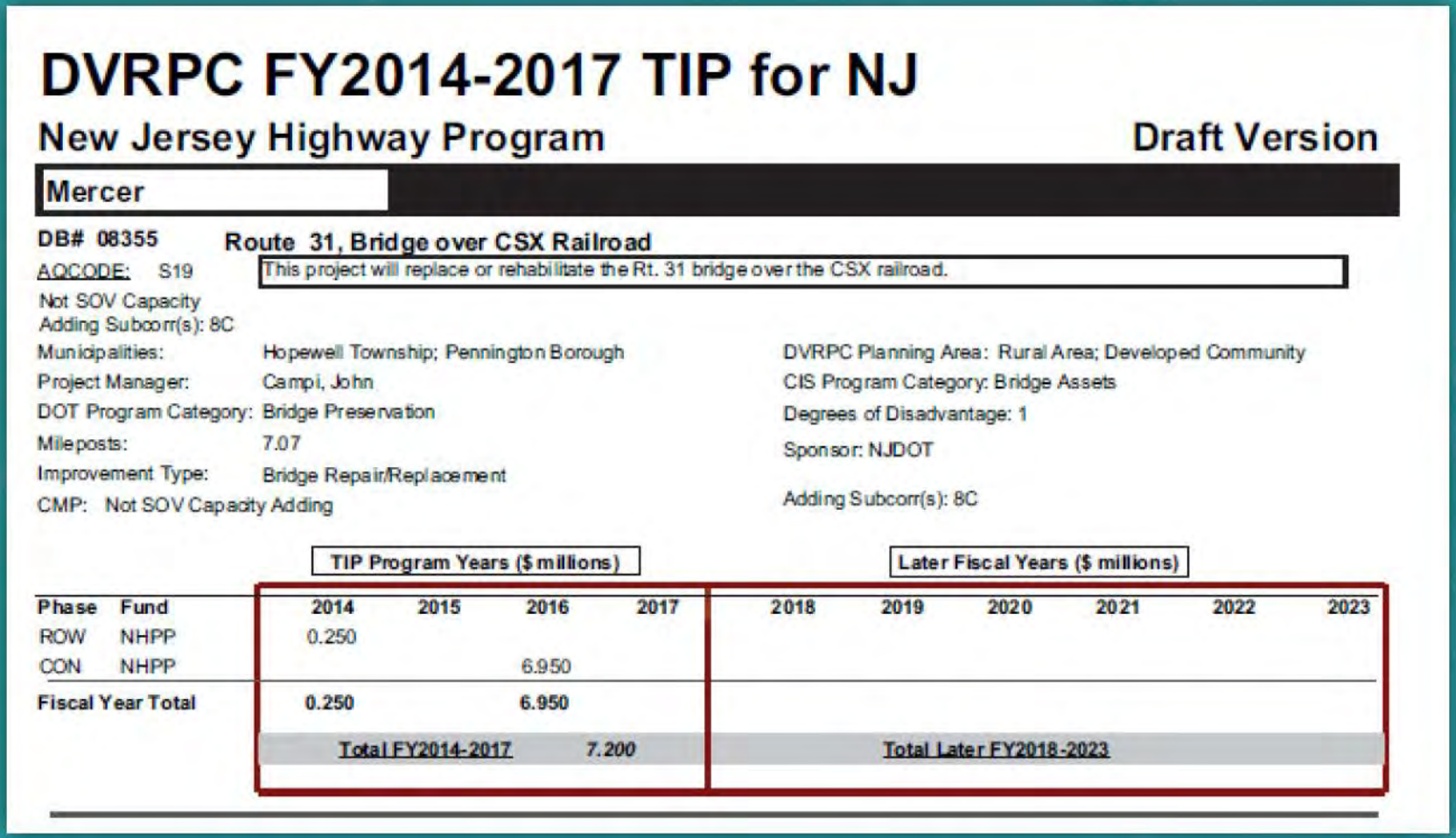
What is the TIP? (Continued)



DVRPC FY2014-2017 TIP for NJ

New Jersey Highway Program

Draft Version

Mercer

DB# 08355 **Route 31, Bridge over CSX Railroad**

AQCODE: S19

This project will replace or rehabilitate the Rt. 31 bridge over the CSX railroad.

Not SOV Capacity Adding Subcorr(s): 8C

Municipalities: Hopewell Township; Pennington Borough

Project Manager: Campi, John

DOT Program Category: Bridge Preservation

Mileposts: 7.07

Improvement Type: Bridge Repair/Replacement

CMP: Not SOV Capacity Adding

DVRPC Planning Area: Rural Area; Developed Community

CIS Program Category: Bridge Assets

Degrees of Disadvantage: 1

Sponsor: NJDOT

Adding Subcorr(s): 8C

		TIP Program Years ($ millions)				Later Fiscal Years ($ millions)					
Phase	**Fund**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
ROW	NHPP	0.250									
CON	NHPP			6.950							
Fiscal Year Total		**0.250**		**6.950**							
		Total FY2014-2017			***7.200***	**Total Later FY2018-2023**					

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TIP Development Process

Joint effort
- DVRPC, Counties/Cities, NJDOT, NJ TRANSIT, DRPA/PATCO, and Citizen Representative

October 2012
- Began with "Project Pool" update of costs and schedules

November 2012
- Joint agreement on financial resources
- NJ Subcommittee negotiated constrained Draft FY2014 TIP and Study & Development Program

May 17, 2013 to June 18, 2013
- Public Comment Period

July 2013
- Present for adoption at RTC and DVRPC Board meetings

After July 2013
- Submit to NJ DOT for transmittal to FHWA/FTA

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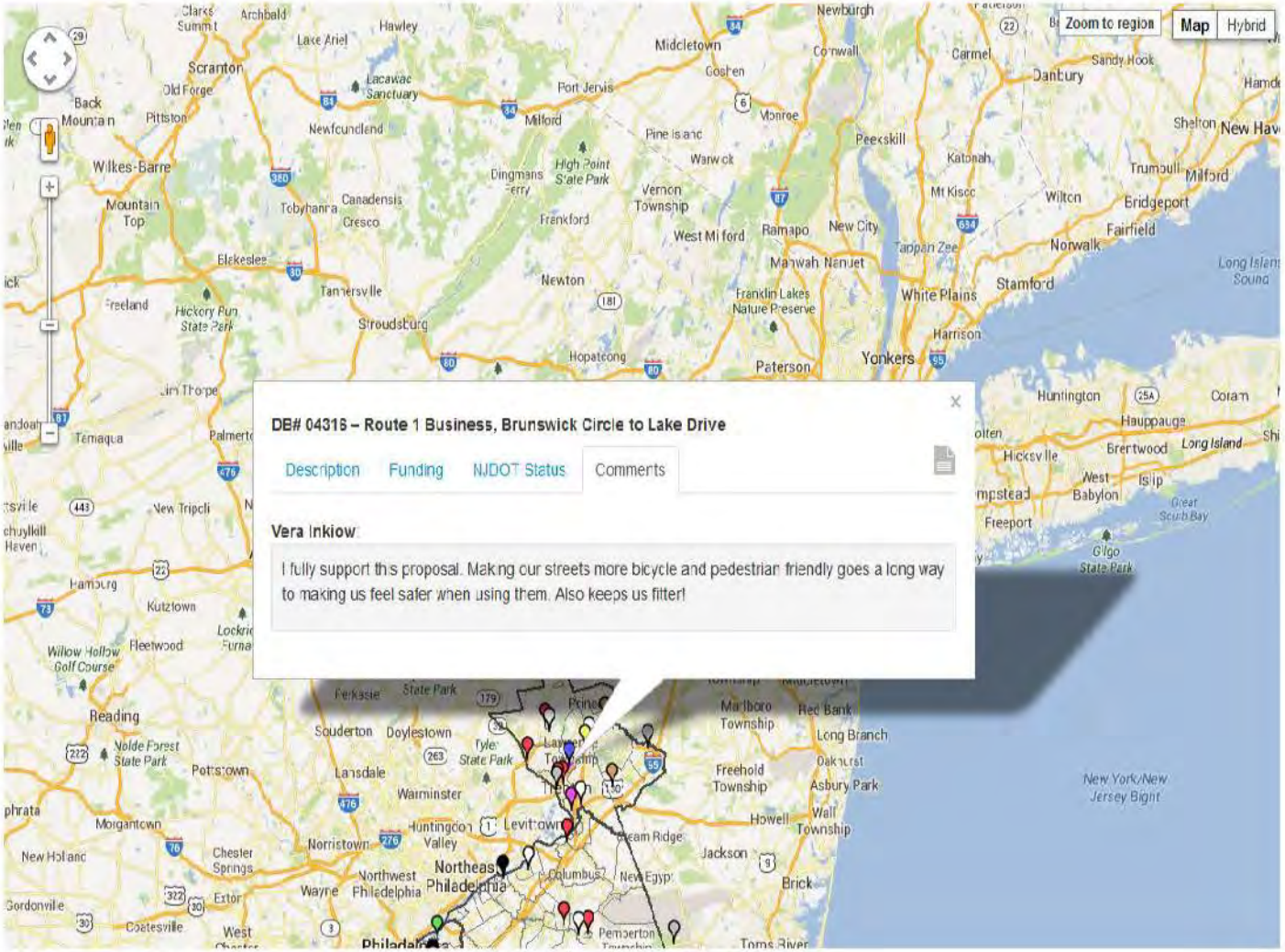
DRAFT FY2014 Transportation Improvement Program (TIP) for NJ



DB#	County	Title	2014	2015	2016	2017	2014-2017	Later
04316	Mercer	Route 1 Business, Brunswick Circle to Lake Drive	4.302	.000	.000	.000	4.302	.000
D0701	Mercer	Princeton-Hightstown Road Improvements, CR 571	.800	3.300	.000	3.300	7.400	3.300
D1203	Gloucester	Gloucester County Multi-Purpose Trail Extension	.000	.750	1.500	.000	2.250	.000

1 - of 3 items

Search

County/Operator

Municipality

Fund

Category

Bicycle/Pedestrian Improvement

DB#

Keyword

Show only results with comments

Filter map by results

Clear Search

Project Categories

Zoom

Comments

Draft FY2014 TIP for New Jersey - $1.7B

HIGHWAY (DVRPC's NJ Region)

- 77 Highway projects totaling close to $904 million

TRANSIT (DVRPC's NJ Region)

- 36 NJ TRANSIT projects totaling $783 million
- 10 DRPA/PATCO projects totaling $60 million
- Transit total: $843 million

STUDY & DEVELOPMENT (DVRPC's NJ Region)

- 8 Study & Development Program projects

NJDOT's STATEWIDE PROGRAM

- 98 Statewide projects totaling $2.9 billion

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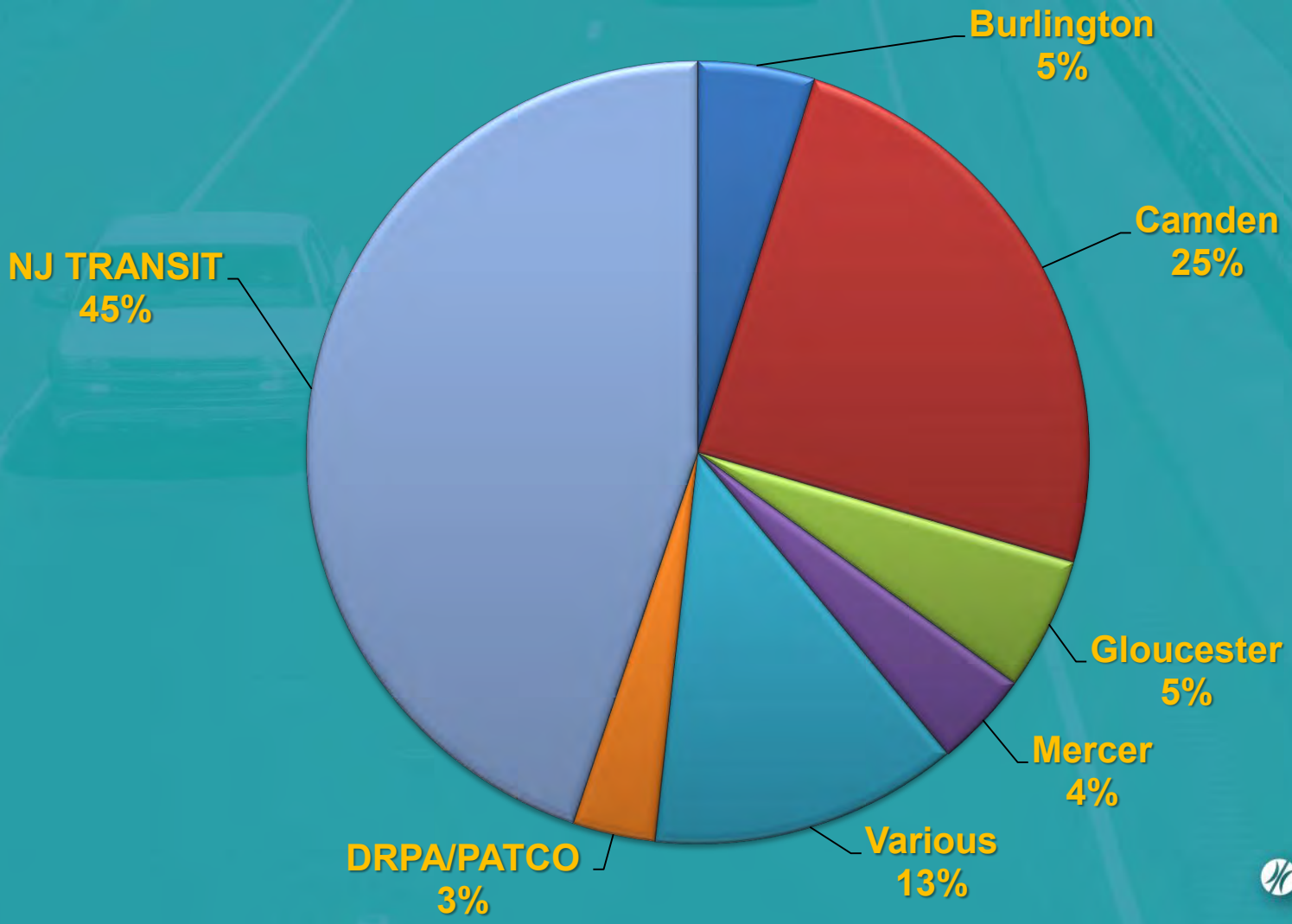
Draft FY2014 TIP for New Jersey

By County and Operator



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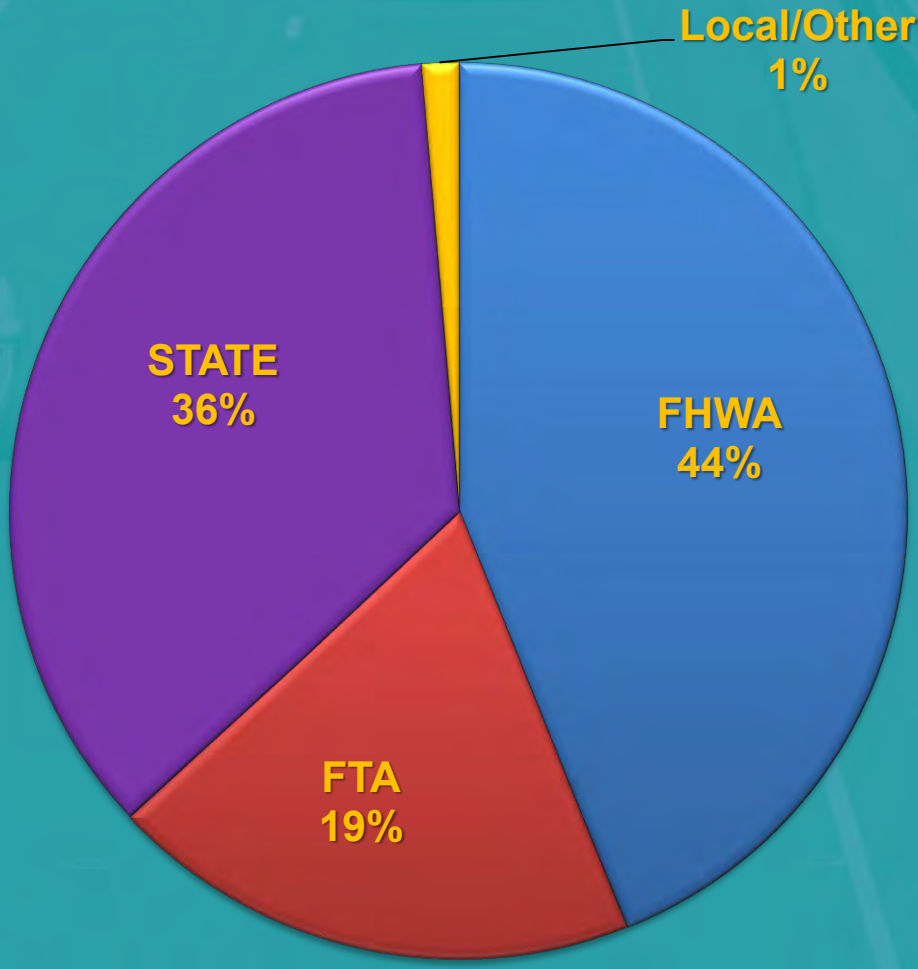
Draft FY2014 TIP for New Jersey

By Funding Source



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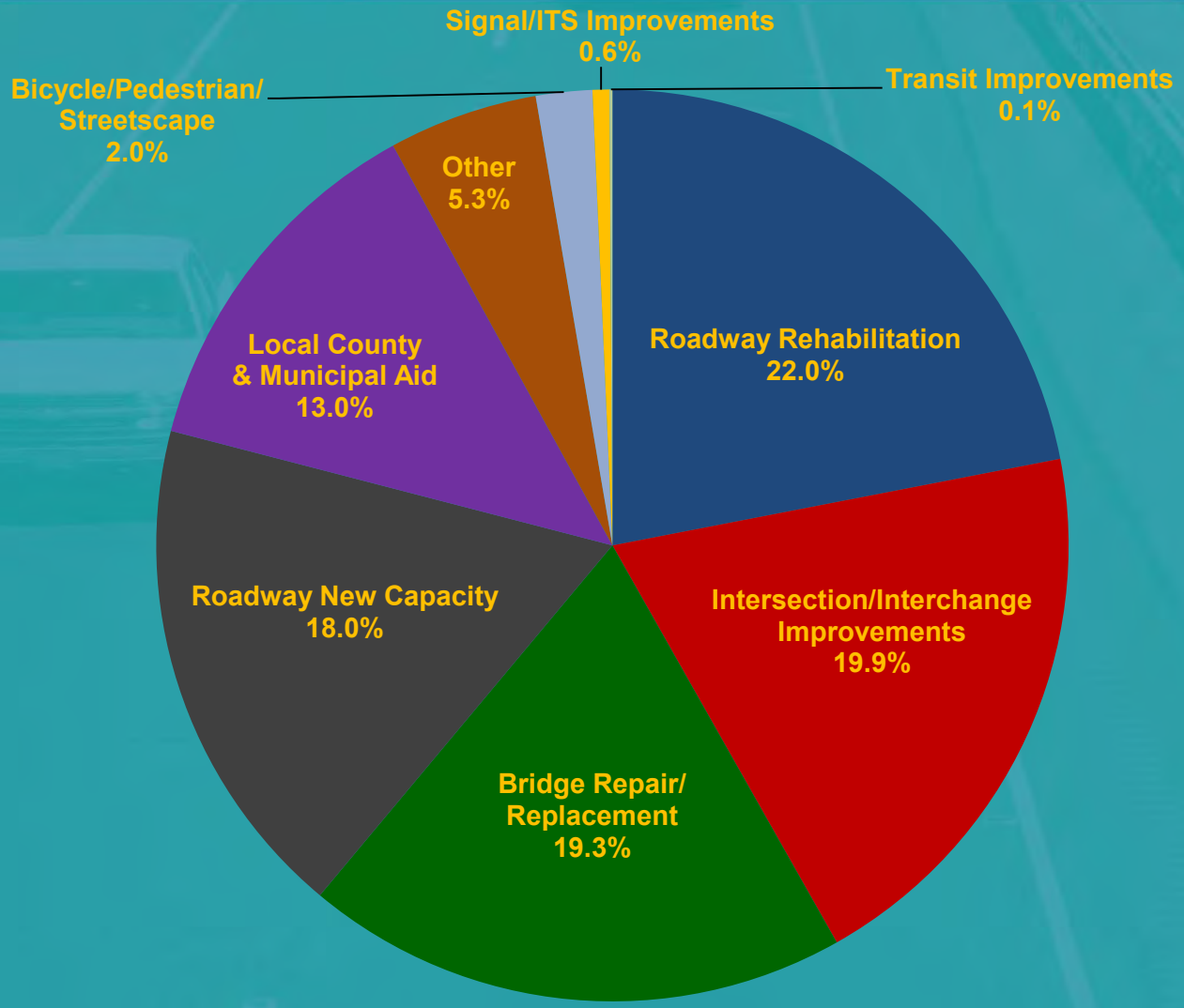
Draft FY2014 TIP for New Jersey

FY2014-2017 DVRPC Highway Program for NJ



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Draft FY2014 TIP for New Jersey

FY2014-2017 DVRPC Highway Program

There is an additional $71 million statewide for the:

- **Interstate Service Facilities**
- **Ferry Program**
- **Freight Program**
- **Maritime Transportation System**
- **Rail-Highway Grade Crossing Program, State**

RiverLink Ferry Terminal at Penn's Landing


RiverLink Ferry

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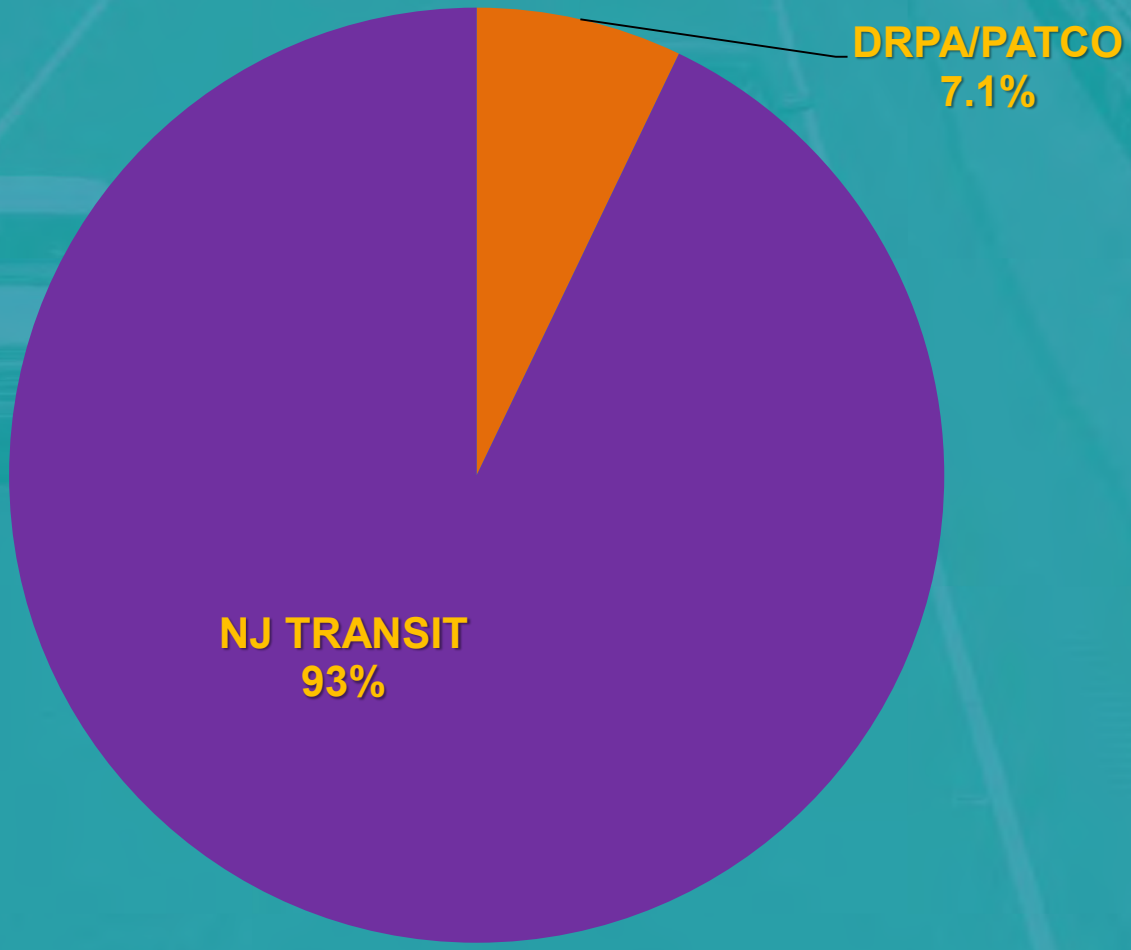
Draft FY2014 TIP for New Jersey

DVRPC's 4-Year (FY2014-2017) Transit Program for NJ



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Freight-Associated Projects

Maximize Railroads

- Rail-Highway Grade Crossing Program, Federal (DB# X35A1), $28 Million

Maintain Primary Truck Routes

- Route 76/676, Bridge Deck Replacements (DB# 11326), $40 Million

Improve Distribution Patterns and Eliminate Bottlenecks

- Route 295/76/42 Missing Moves (DB# 355A), $155 Million
- Routes 295/42/I-76, Direct Connection (DB# 355 C, D, E), $470 Million

Speed Delivery

- Route 295, Northbound Approach to Route 1 Exits, ITS (DB# 06358), $1 Million

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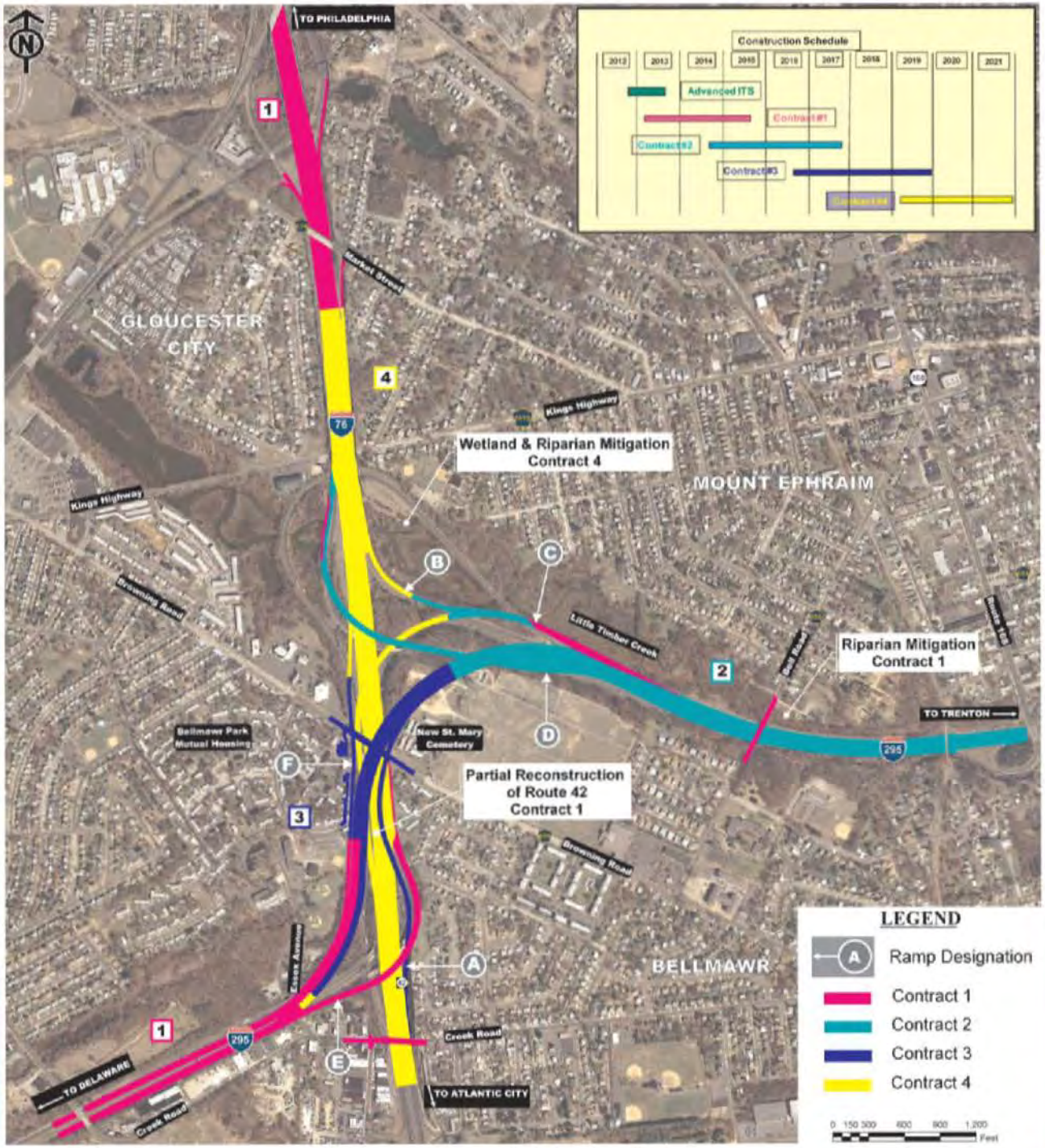
March 28, 2013 : Overturned tractor trailer at the NJ 42 and I-295 north interchange



I-295/I-76/ Route 42 Direct Connection Project

dvrpc

Freight-Associated Projects


Invention Factory at Roebling

Advance Safety and Security

- Mercer County Roadway Safety Improvement (DB# D0412), $4 Million

Balance Freight Operational Needs with Community Goals

- River Road Improvements, Cramer Hill (DB# D0902), $4 Million

Fortify Central Business District

- Roebling Phase 3, Rehabilitation for the Invention Factory (DB# X107), $250,000

Improve Air Quality

- Local CMAQ Initiatives (DB# X065)

2 Freight-Related Projects out of 5 selected projects were awarded during the DVRPC FY2011-2012 Competitive CMAQ Program, $1.3 Million of the total $2.7 Million

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River Road Improvements, Cramer Hill Project:
Existing Conditions

River Road Improvements, Cramer Hill Project: Existing Conditions

Proposed Action

That the Delaware Valley Goods Movement Task Force recommend the DVRPC Board to adopt the proposed DVRPC FY2014-2017 Transportation Improvement Program for New Jersey.

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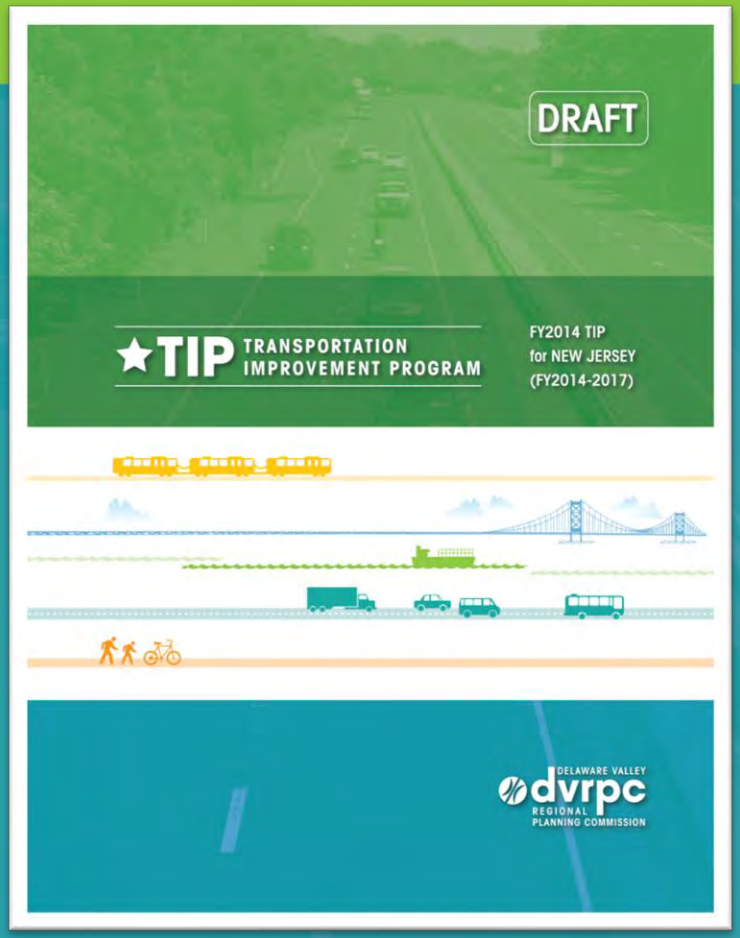
Thank You.

View TIP documents on the DVRPC website at:
http://www.dvrpc.org/TIP/



Kwan Hui

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dvrpc

The Lower Schuylkill Master Plan

PIDC PCPC

July 17, 2013

THE LOWER SCHUYLKILL – KEY FACTS

- 3,700 acres of historically industrial land
  - 68% of the City's vacant and underutilized industrial land is located here
- Strong industrial character
  - Refining, freight rail, logistics, distribution, warehousing, scrapyards, construction
  - Limited residential
  - Primarily zoned industrial
- Surrounded by strong and growing economic anchors - University City, Center City, PHL and The Navy Yard

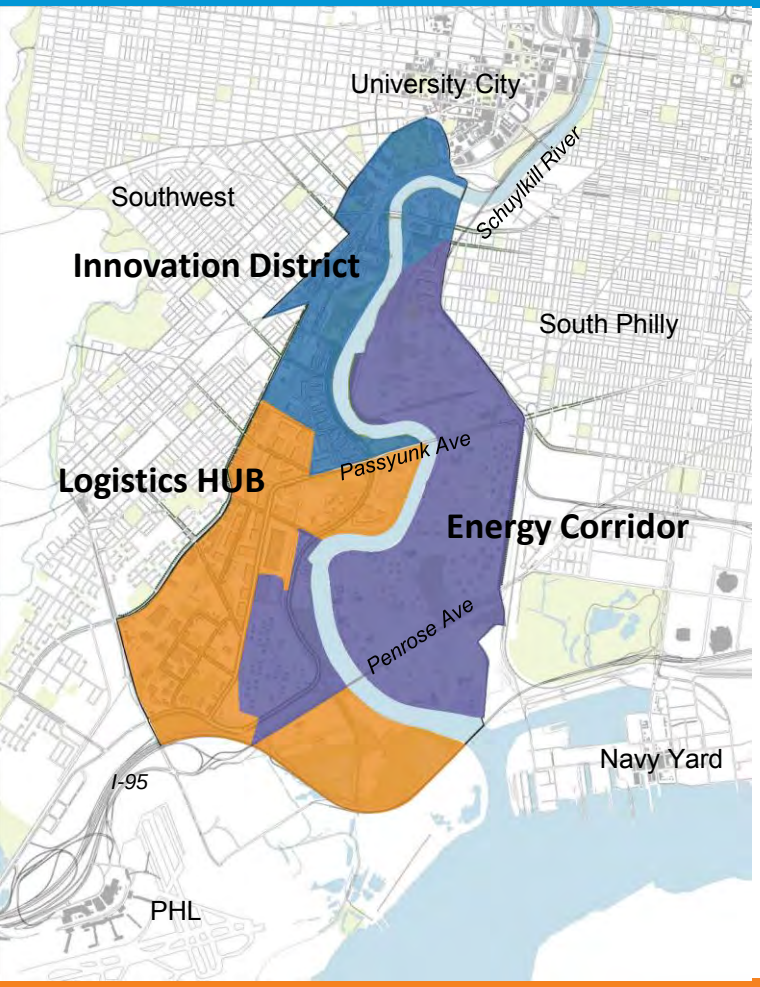
GOALS OF THE MASTER PLAN

- Create a new identity as Philadelphia's 21st century industrial district
- Attract private investment & create new jobs
- Provide dedicated public river access and new amenities
- Improve environmental conditions

PHILADELPHIA'S
21ST CENTURY INDUSTRIAL DISTRICT

PIDC PCPC

DEVELOP AN INTEGRATED NETWORK OF CAMPUSES



- **Innovation District:** R&D, institutional, advanced and artisanal manufacturing
- **Energy Corridor**: Energy generation & distribution, heavy industrial, traditional manufacturing
- **Logistics Hub**: PHL-related, distribution, warehousing, traditional manufacturing

INNOVATION DISTRICT

- **183 developable acres**
- **Concept:** Vibrant innovation campus leveraging proximity to University City, South Bank & CHOP's Schuylkill Avenue campus
- **Target Industry Sectors:**
  - Technology, material & life science companies
  - Institutional and related businesses
  - Advanced and artisanal manufacturing
- **Key Projections:**
  - Over 2800 new jobs
  - $230M in public infrastructure investments
  - $420M in private investment
  - $33B in total economic impact

INNOVATION DISTRICT – RECOMMENDATIONS

- **Create a distinct campus identity**
  - New gateways
  - Consistent streetscape & landscape
- **Provide public river access & new amenities**
  - Extend the Schuylkill Banks trail
  - Potential new park at Passyunk Crescent
- **Manage stormwater district-wide**
  - Green infrastructure manages runoff and beautifies the campus
  - Reduced stormwater obligation incentivizes new development

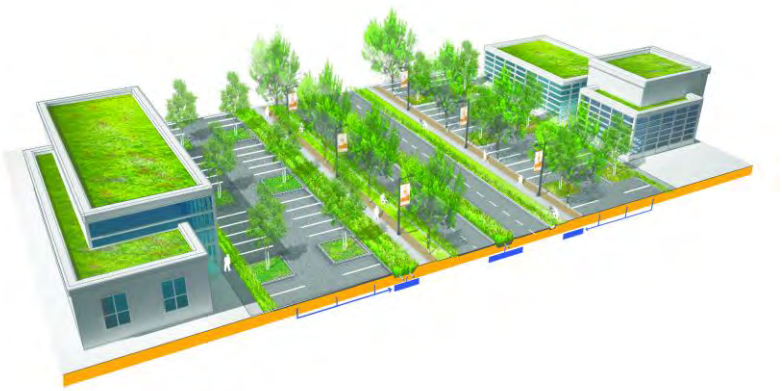
INNOVATION DISTRICT – RECOMMENDATIONS

- **Short-Term Access:**
  - Upgrade existing access and circulation roads to facilitate early development
  - Improve Grays Ferry Bridge to more closely connect the east and west banks

INNOVATION DISTRICT – THE NEW "RIVER ROAD"

- **Long-Term Access - Construct A New "River Road" to:**
  - Provide efficient, streamlined access from University City
  - Unlock riverfront development opportunities
  - Provide the "missing link" to connect dead-end streets into a functioning grid
  - Facilitate public access to the river and the Schuylkill Banks trail

LOGISTICS HUB



- **311 developable acres**
- **Concept:** Premier logistics campus with special focus on PHL-related businesses.
- **Target Industry Sectors:**
  - Warehousing, distribution, logistics
  - PHL suppliers & service providers
  - Passenger & air freight related businesses
  - Traditional & advanced manufacturing
- **Key Projections:**
  - Over 2500 new jobs
  - $180M in public infrastructure investments
  - $340M in private investment
  - $30B in total economic impact

LOGISTICS HUB - RECOMMENDATIONS

- **“Extreme Makeover” for Essington/Passyunk**
  - Embed green infrastructure in roadway ROWs to handle runoff and transform appearance
  - Distinctive signage & wayfinding, consistent streetscape & landscape
  - New gateways at Essington & Bartram and 61st & Passyunk
- **Provide public amenities**
  - Incorporate bicycle & pedestrian features as roads are upgraded
  - Phased extension of the Schuylkill Banks trail
- **Manage stormwater district-wide to incentivize new development**

ENERGY CORRIDOR

- **326 developable acres**
- **Concept:** Energy-focused campus with opportunities for businesses with compatible products/processes
- **Target Industry Sectors:**
  - Traditional energy generation and distribution
  - Marcellus Shale gas processing, distribution and export
  - New energy technologies and facilities, potentially including gas-to-liquids, co-generation, trash-to-steam
  - Energy-related R&D, including collaborations between public/private/institutional entities
- **Key Projections:**
  - $100M in publicly announced investment plans
  - 200+ new jobs

ENERGY CORRIDOR - RECOMMENDATIONS

- **Support high-quality development of vacant and under-utilized parcels**
  - Public-private collaboration to attract new energy-related businesses
  - Infrastructure support for companies making significant investments (e.g. Commonwealth $$ for PES' high-speed unloading facility)
- **Improve the appearance of the Energy Corridor in places where the public encounters it**
  - Green campus perimeters and view corridors
  - New gateway at 26th & Passyunk
  - Attractive tank exteriors
  - Upgraded perimeter streets, with enhanced amenities for bicyclists and pedestrians

ATTRACT PRIVATE INVESTMENT & CREATE NEW JOBS

PIDC PCPC

KEY DEVELOPMENT PROJECTIONS BY CAMPUS

CAMPUS	NEW DEV. CAPACITY	PUBLIC INFRA. INVESTMENT	PRIVATE INVESTMENT	NEW JOBS	TOTAL ECONOMIC IMPACT
INNOVATION DISTRICT	183 Acres 2.4M+ SF	$230M	$420M	2800	$33B
ENERGY CORRIDOR	326 Acres TBD	*Future investment tied to development	$100M+	200+	TBD
LOGISTICS HUB	311 Acres 3.1M SF	$181M	$340M	2500	$30B
TOTAL FOR LOWER SCHUYLKILL	820 Acres 5.5M+ SF	$411M+	$860M+	5500+	$63B+

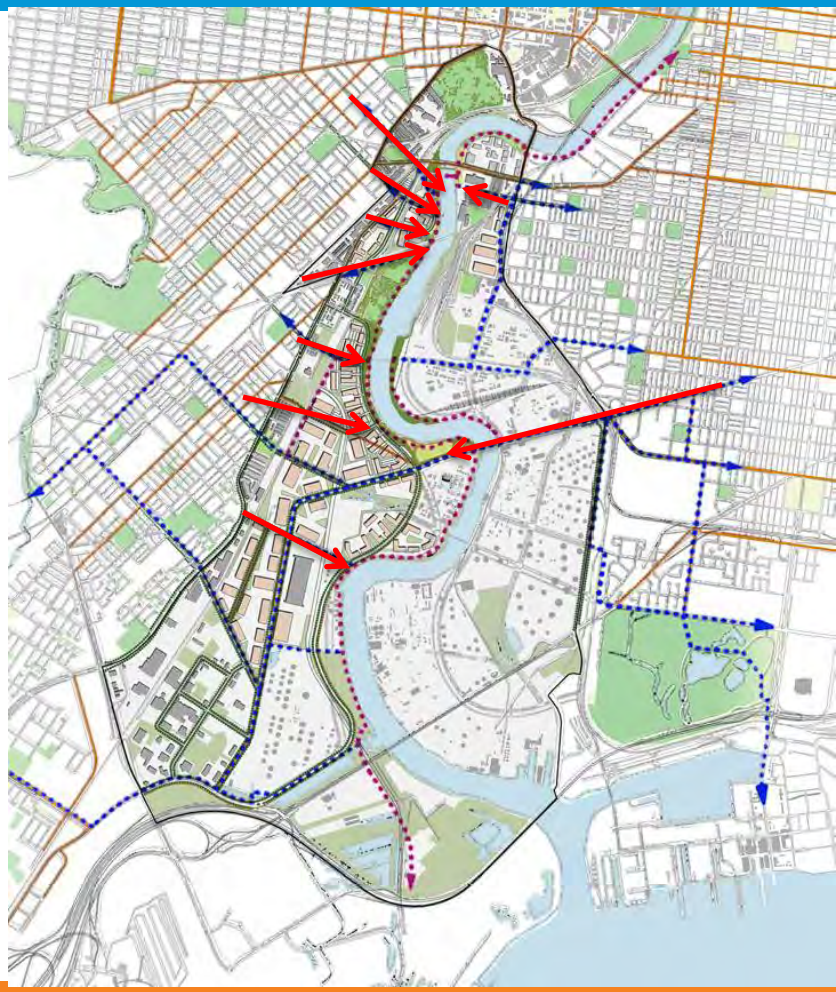
PROVIDE DEDICATED PUBLIC RIVER ACCESS & NEW AMENITIES

PIDC PCPC

PUBLIC RIVER ACCESS

- Schuylkill Banks trail extension will provide public river access from 49th St. to Passyunk Ave.

- Upgraded streets will connect adjacent communities to the river & trail



PROPOSED NEW AMENITIES

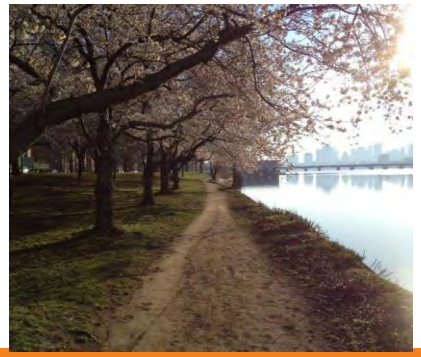
- **5 miles of new recreational trail**
  - Trail network will ultimately connect to FDR Park, Cobbs Creek, East Coast Greenway & Heinz Refuge
- **46 new acres of green space**
- **Parks every mile**
  - Leverages existing assets such as Grays Ferry Crescent, Bartram's Garden & The Woodlands
  - Proposed new 26 acre park at Passyunk Crescent
- **Public river sports center in Bartram's North**

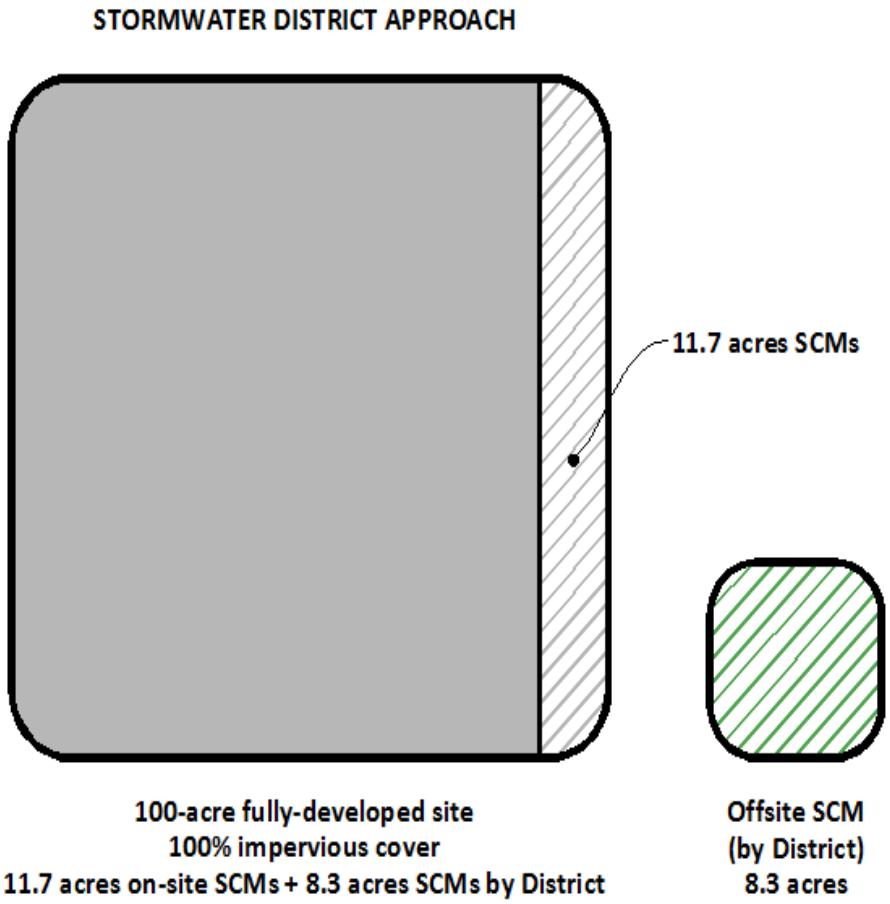
IMPROVE ENVIRONMENTAL CONDITIONS

PIDC PCPC

INNOVATIVE STORMWATER MANAGEMENT

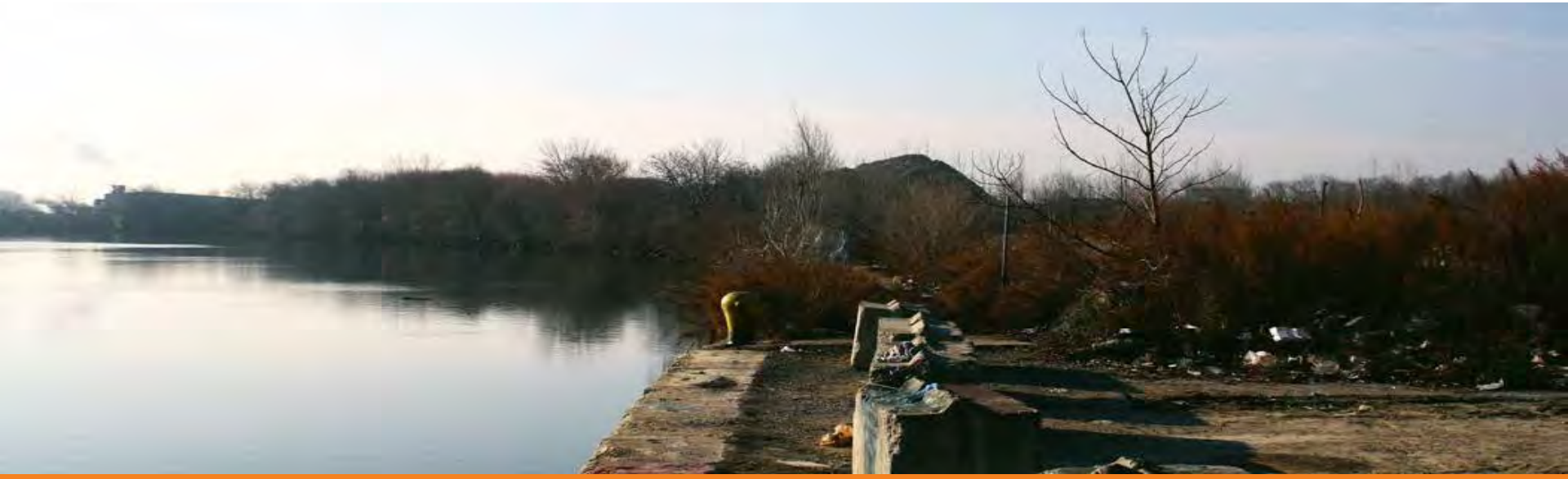
- **80+ acres dedicated to district-wide stormwater management**
  - Efficiently handles runoff
  - Beautifies the campuses
  - Incentivizes redevelopment by handling roughly 50% of a new development's stormwater obligation





RECYCLE BROWNFIELDS TO REVITALIZE THE LOWER SCHUYLKILL

- **Supporting brownfield remediation throughout the Lower Schuylkill is key to achieving 6M SF of new development**
  - Develop package of brownfield resources for property owners
  - Lead the way by remediating PIDC-owned early action sites



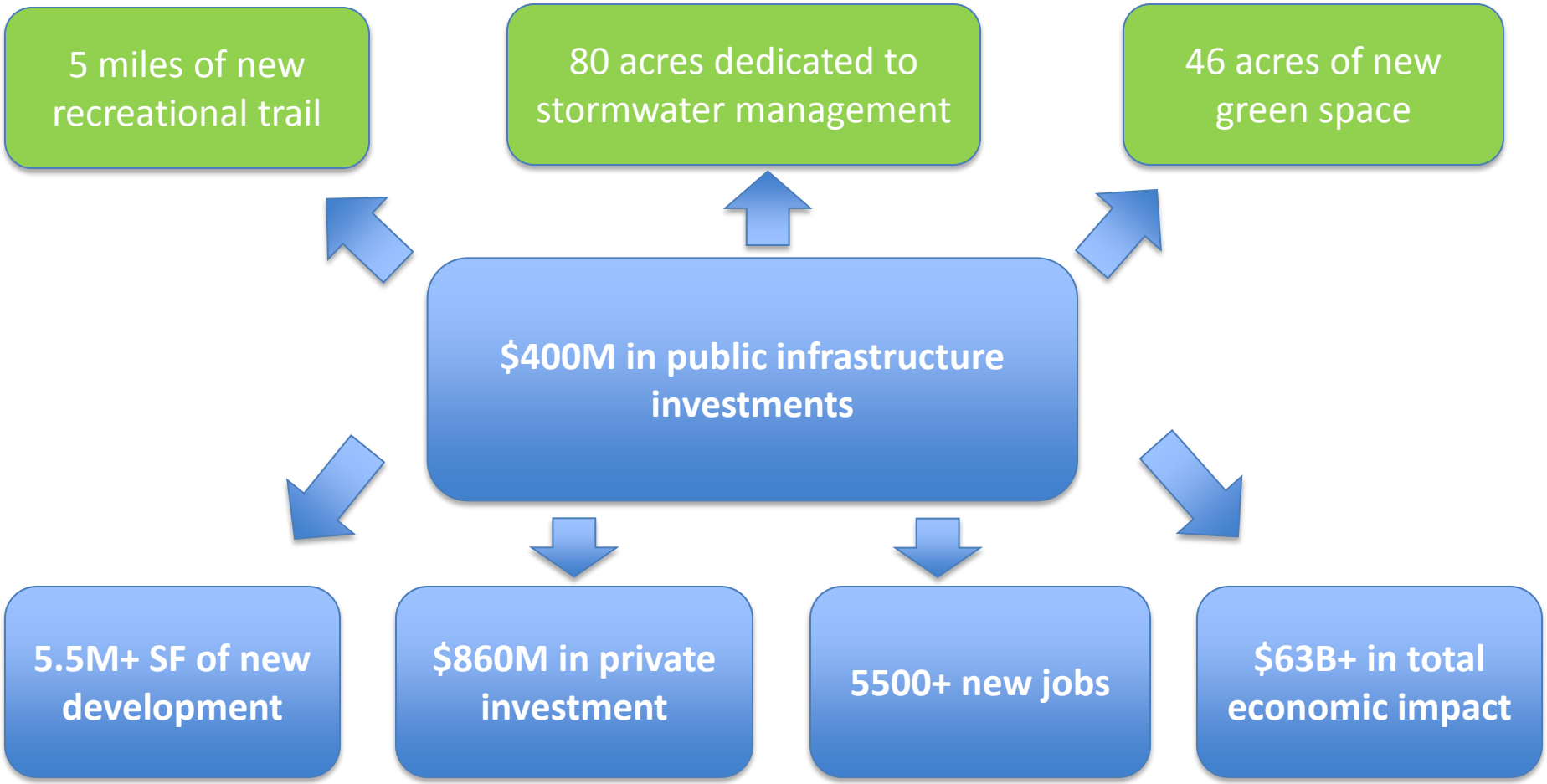
EARLY ACTION PROJECTS

PIDC PCPC

EARLY ACTION PROJECTS

- Remediation of PIDC's Bartram's North & South properties – 2013/2014
- Extension of Schuylkill River Trail– 2013/2014
- Pilot stormwater agreement with PWD – 2013/2014
- 34th & Grays Ferry gateway – targeted for 2014
- Grays Ferry Bridge upgrades – 2015/2016

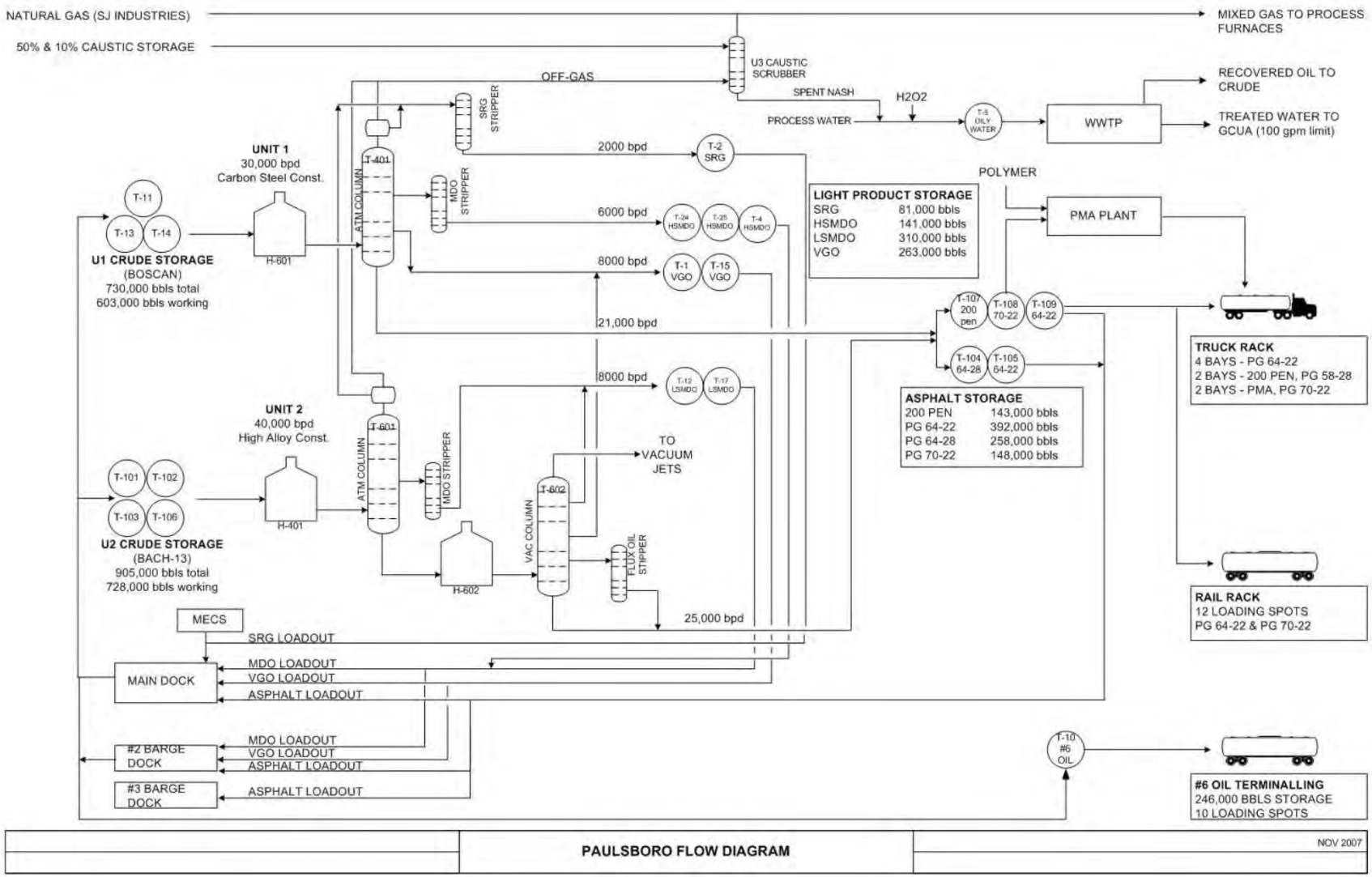
PROJECT SUMMARY



Paulsboro Refinery - History

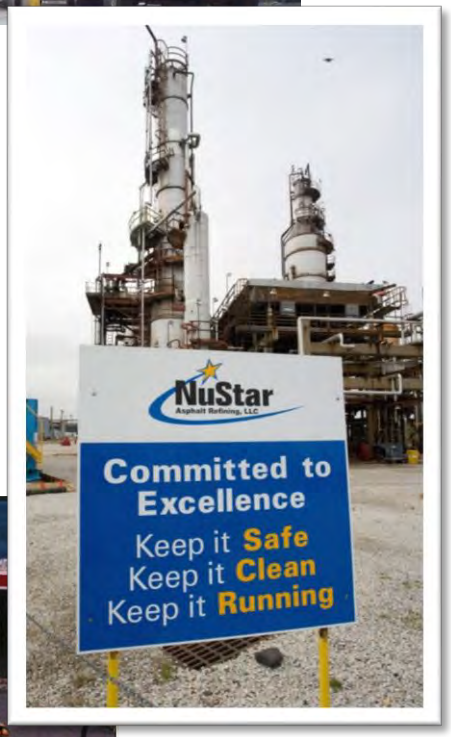
- 133 Acres, bounded by Mantua Creek & Delaware River
- 1972 - Began operations as Chemical Terminal
- 1978 - Unit 1 Constructed
- 1980 - Unit 2 Constructed
- 1991 - Acquired by CITGO
- 1996 - Fuel Gas Unit Installed
- 1998 - Citerco PMA Joint Venture
- 2008 - Acquired by NuStar
- 2010 - New DCS project
- 2011 - New Rail Offloading Rack
- 2012 – WWTP Expansion Project

Paulsboro Refinery - Flow Diagram



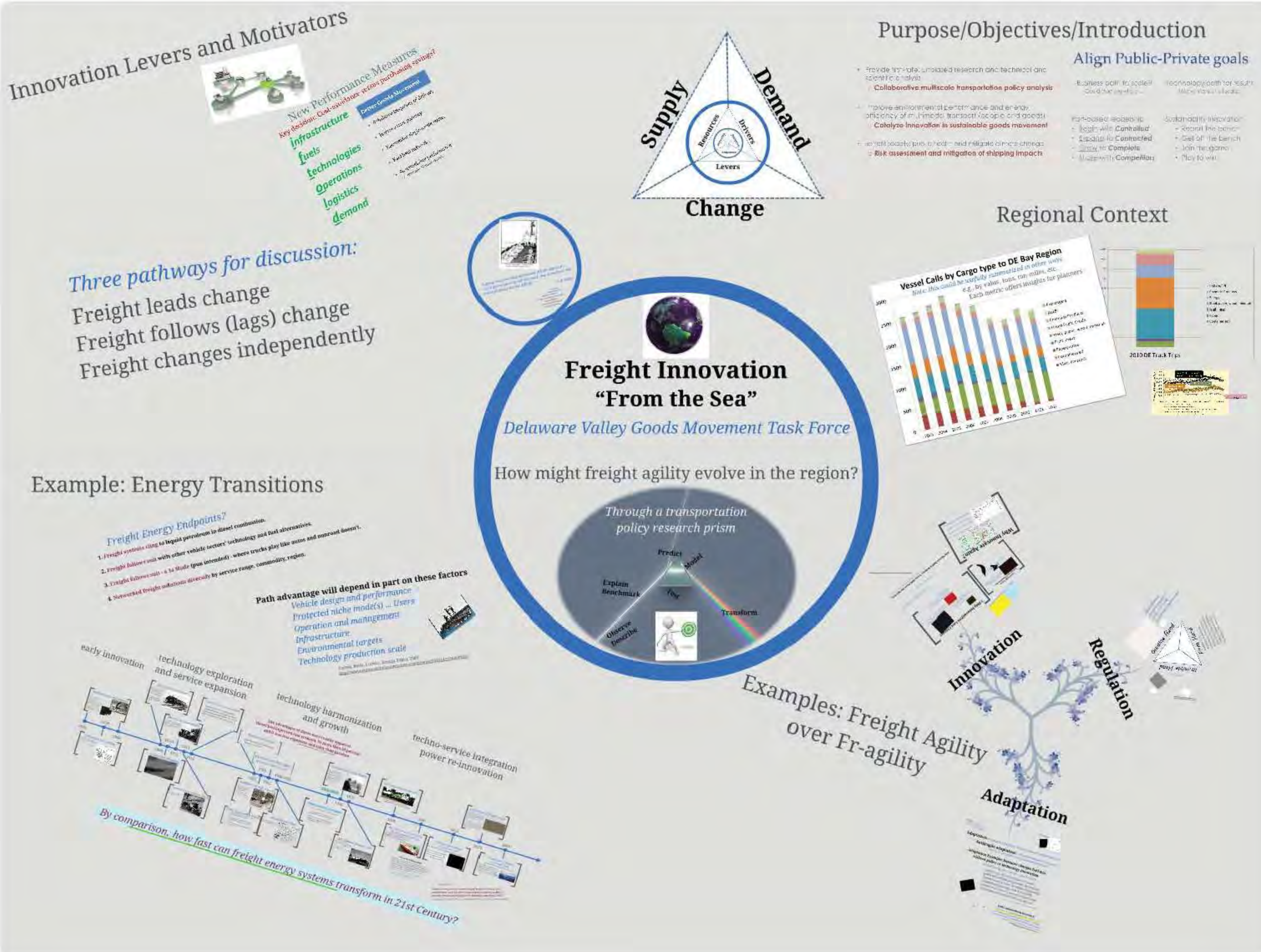
Paulsboro Refinery- Capacity

- Crude Oil Storage - 7 Tanks
  - Total Shell Capacity 1,644,000 BBLs
- Asphalt Storage – 5 Tanks - Total Shell Capacity
  - 934,000 BBLs.
- Asphalt Truck Loading –
  - 4-PG 64-22 Dedicated Bays
  - 2-200 Pen Bays
  - 2-PMA Bays Shared With PG 70-22
  - Blending System For PG 58-28
  - PMA Blending System
  - Fully Automated
- Marine Distribution
  - Deliver Neat Asphalt To East Coast Distribution Terminals
  - Paulsboro Area - New York To North Carolina
  - Savannah Area - North Carolina To Florida

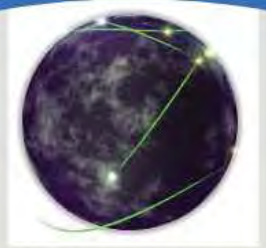


Unload Capability and Expansion Plans

- **Current Unload Facilities**
  - Paulsboro
    - 18 to 20 Cars per day or 9,000 to 10,000 BBLs
- **Expansion**
  - Paulsboro 27 – 30 cars
    - Capital = $4 Million - $8 Million
    - In Service = 1st Qtr. 2014
  - Paulsboro 50 cars
    - Capital = $17.5 Million
    - In Service = 2nd Qtr. 2014



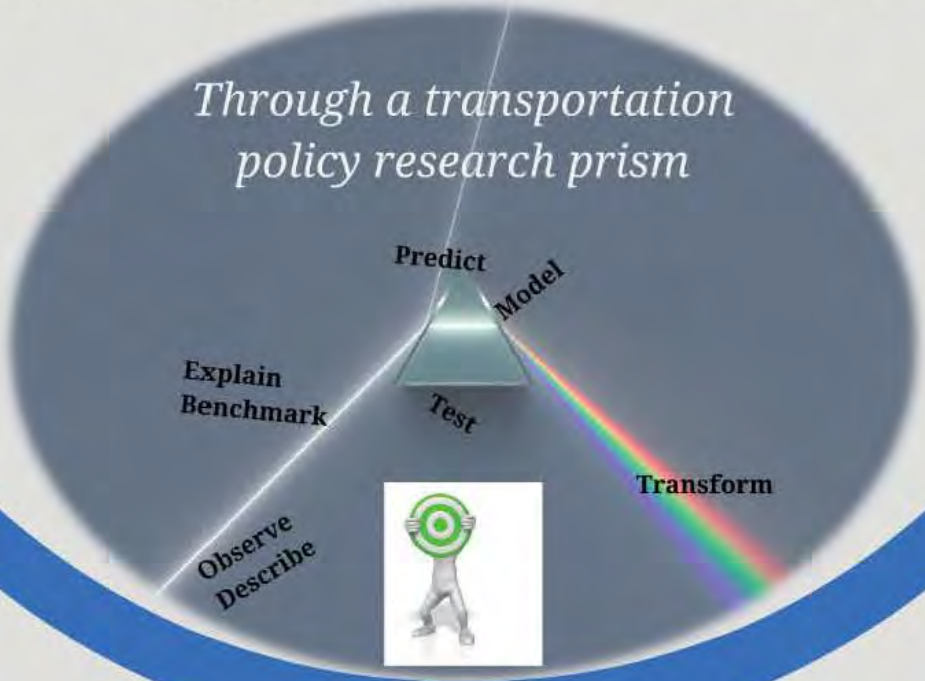
Innovation Levers and Motivators
New Performance Measures
Key decision: Cost-avoidance versus purchasing savings?
Better Goods Movement
infrastructure
fuels
technologies
operations
logistics
demand
Supply
Demand
Change
Resources
Drivers
Levers
Purpose/Objectives/Introduction
Align Public-Private goals
Collaborative multiscale transportation policy analysis
Catalyze innovation in sustainable goods movement
Risk assessment and mitigation of shipping impacts
Regional Context
Vessel Calls by Cargo type to DE Bay Region
Three pathways for discussion:
Freight leads change
Freight follows (lags) change
Freight changes independently
Freight Innovation
"From the Sea"
Delaware Valley Goods Movement Task Force
How might freight agility evolve in the region?
Through a transportation policy research prism
Predict
Model
Explain
Benchmark
Test
Transform
Observe
Describe
Example: Energy Transitions
Freight Energy Endpoints?
Path advantage will depend in part on these factors
Vehicle design and performance
Protected niche mode(s) ... Users
Operation and management
Infrastructure
Environmental targets
Technology production scale
early innovation
technology exploration and service expansion
technology harmonization and growth
techno-service integration power re-innovation
By comparison, how fast can freight energy systems transform in 21st Century?
Innovation
Regulation
Adaptation
Examples: Freight Agility over Fr-agility

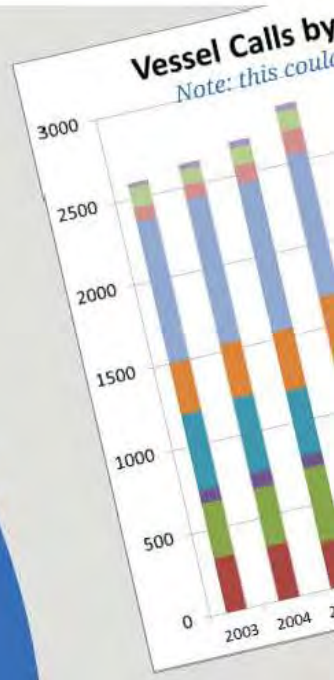


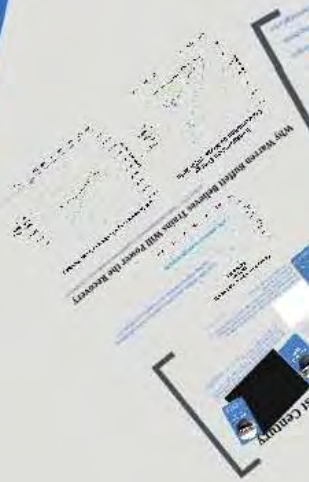
Freight Innovation
"From the Sea"

Delaware Valley Goods Movement Task Force

How might freight agility evolve in the region?







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- Provide first-rate, unbiased research and technical and scientific analysis
  - **Collaborative multiscale transportation policy analysis**
- Improve environmental performance and energy efficiency of multimodal transport (people and goods)
  - **Catalyze innovation in sustainable goods movement**
- Benefit society: public health and mitigate climate change
  - **Risk assessment and mitigation of shipping impacts**

Align Public-Private goals

Business path to scale?

Could start anywhere …

Technology path for results

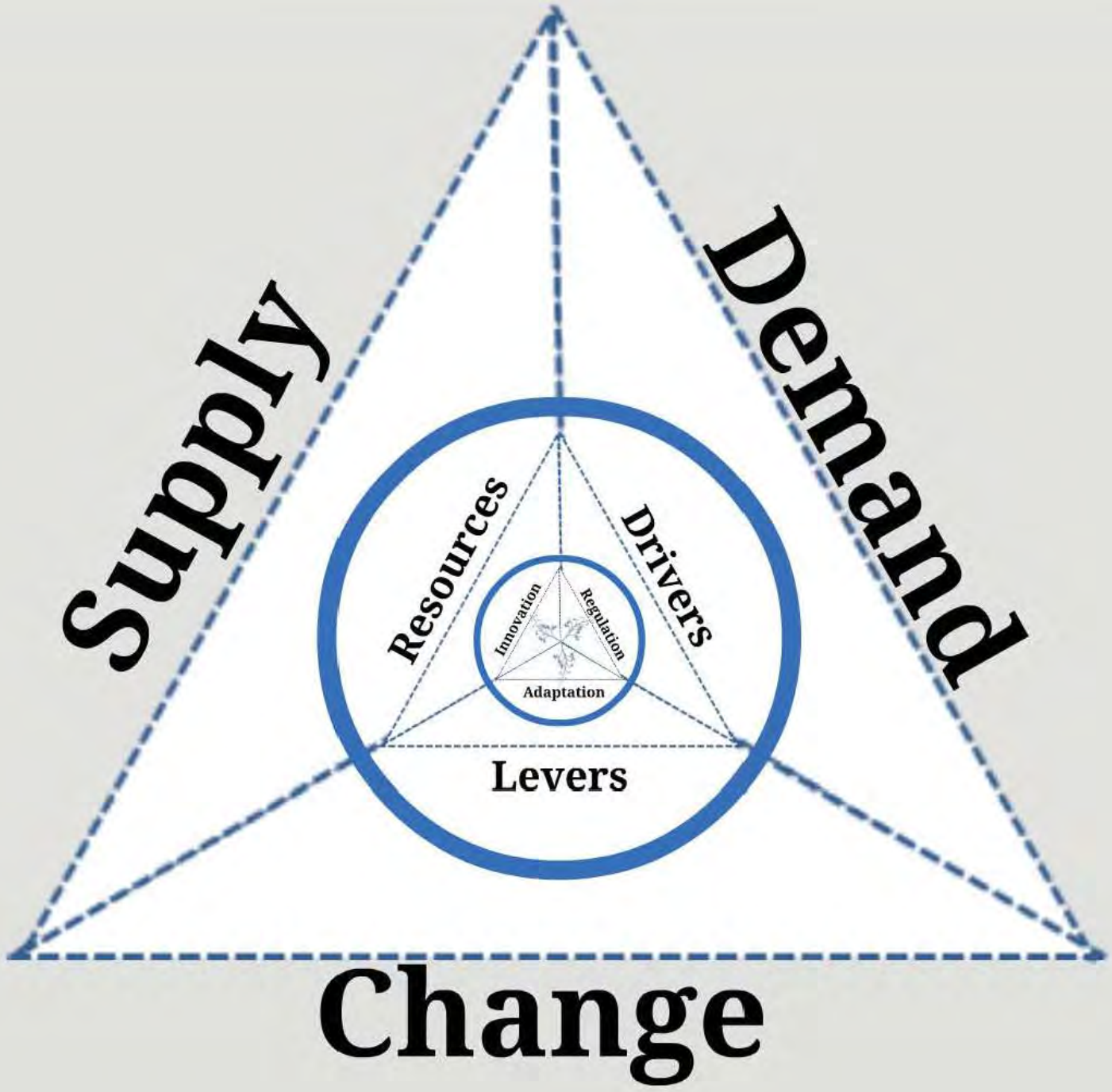
Interventions at all scales

Port-based leadership

- Begin with ***Controlled***
- Expand to ***Contracted***
- Grow to ***Complete***
- Share with ***Competitors***

Sustainability innovation

- Report the bench
- Get off the bench
- Join the game
- Play to win



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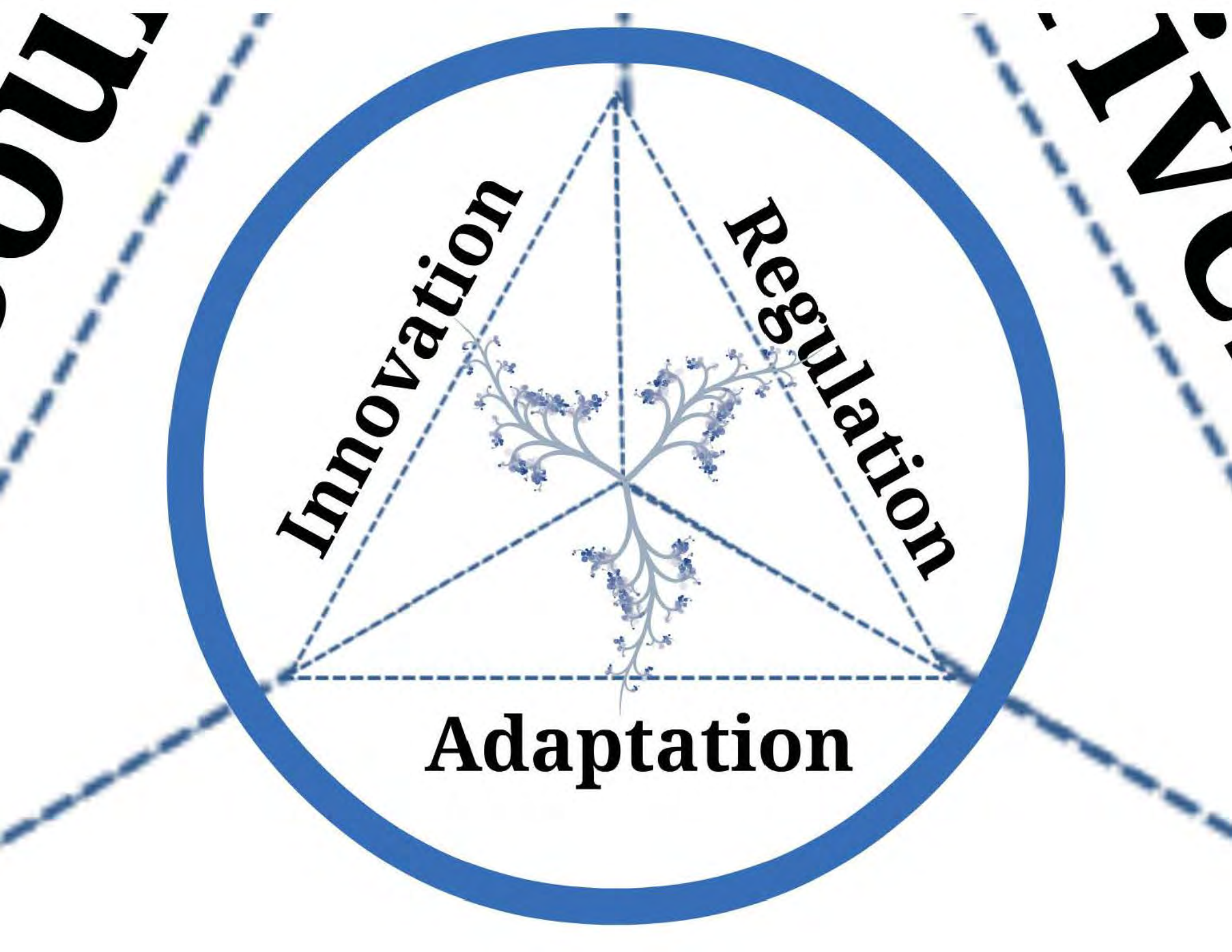
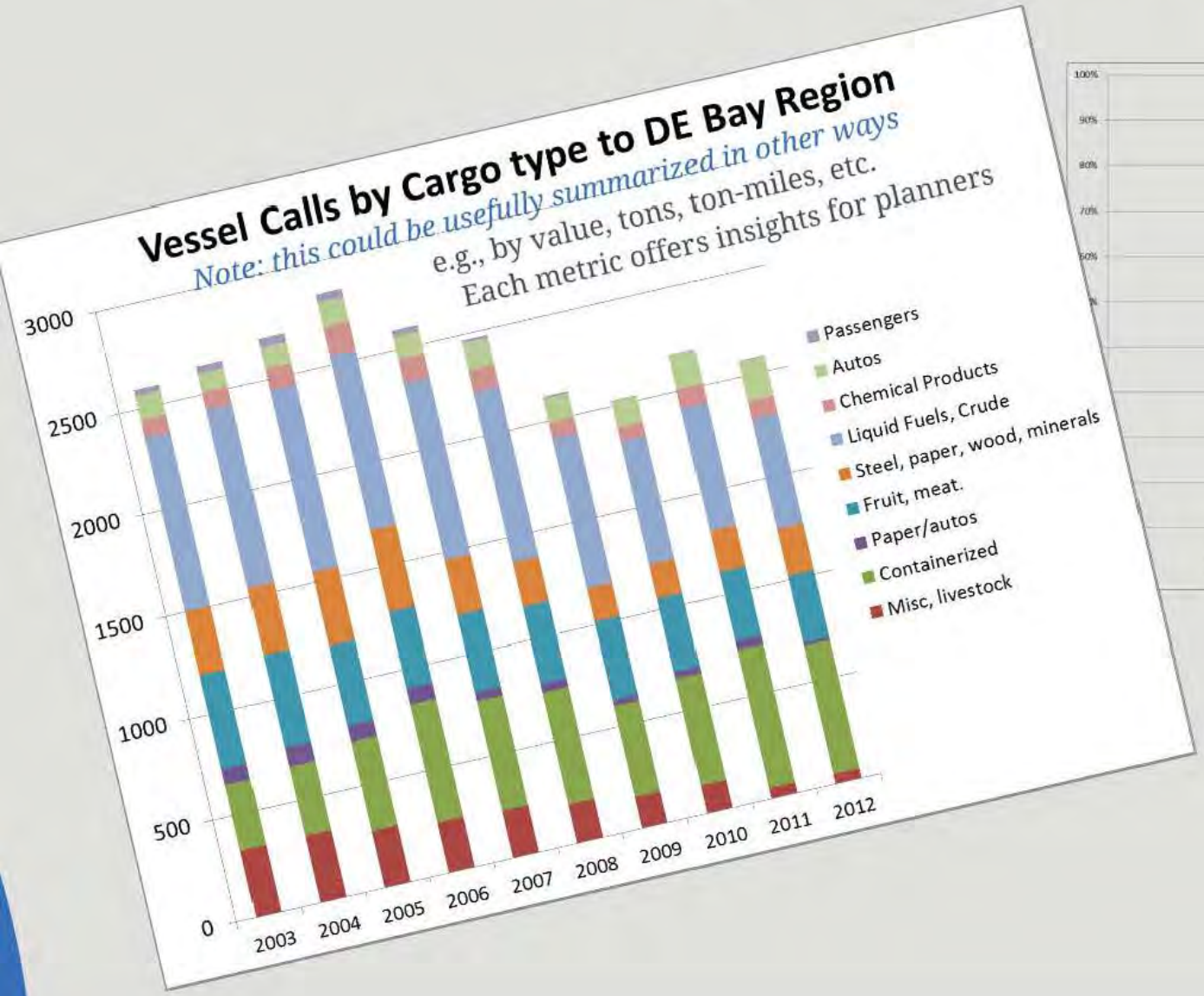
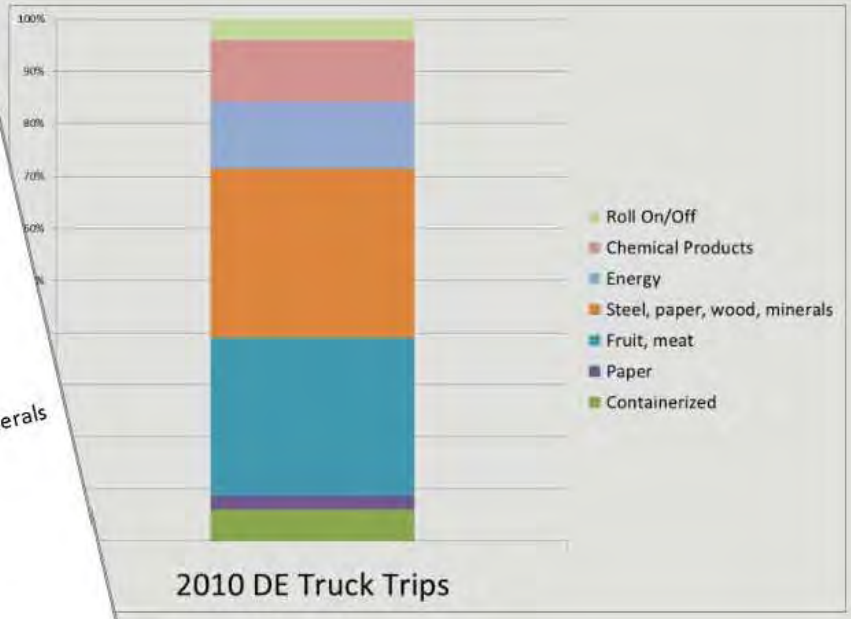
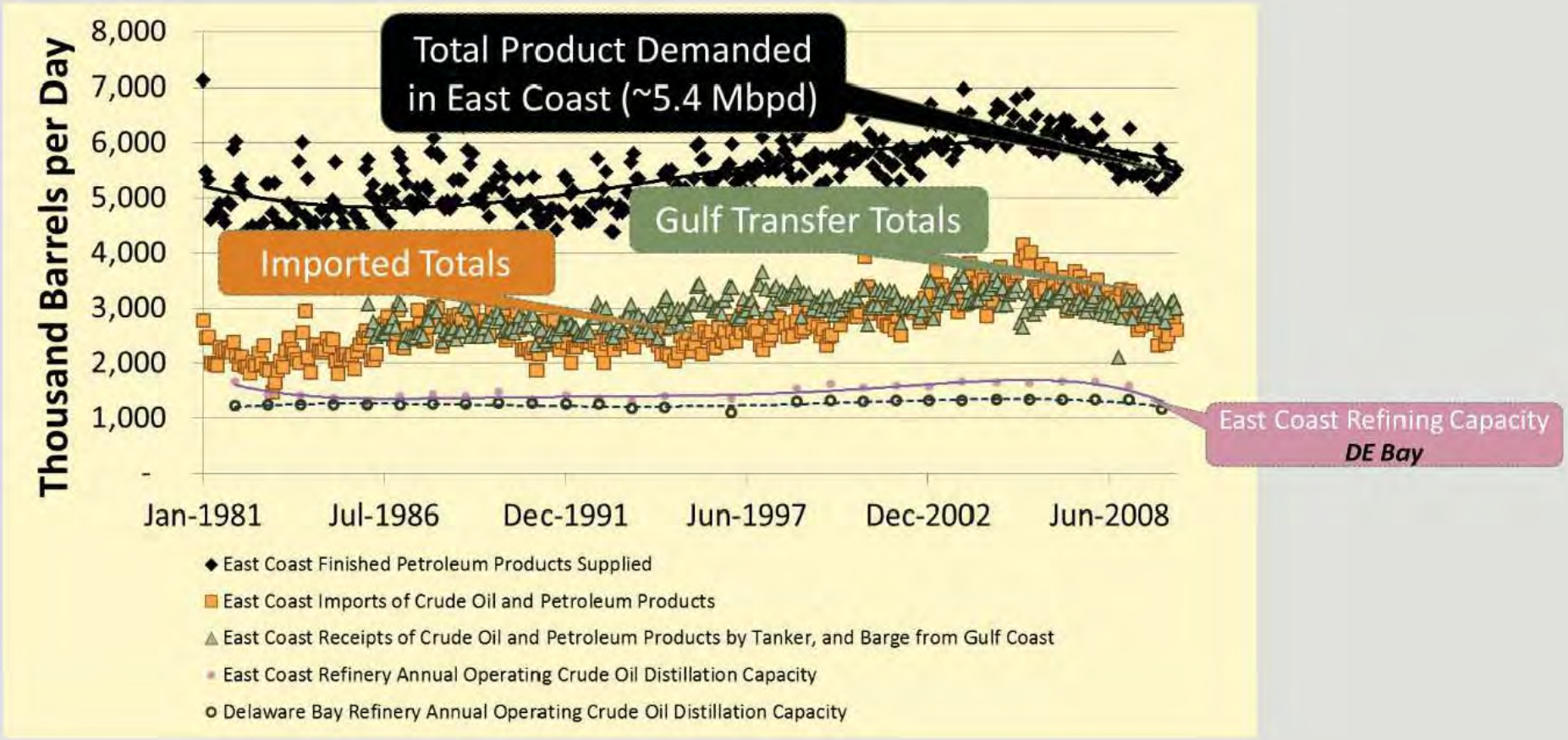

Innovation
Regulation
Adaptation

Regional Context





DE Truck Trips



Three pathways for discussion:

Freight leads change

Freight follows (lags) change

Freight changes independently

mple: Energy Transitions

Freight Energy Endpoints?

1. **Freight systems cling to liquid petroleum in diesel combustion.**

2. **Freight follows suit with other vehicle sectors' technology and fuel alternatives.**

3. **Freight follows suit - a la Mode (pun intended) - where trucks play like autos and nonroad doesn't.**

4. **Networked freight solutions diversify by service range, commodity, region.**

Path advantage will depend in pa

Vehicle design and perform

Protected niche mode(s) ...

Operation and managemen

nnovation techn

Freight E

1. Freight systems cling to liq
2. Freight follows suit with other vehi
3. Freight follows suit - a la Mode (pun intended)
4. Networked freight solutions diversify by service range,

Path advantage wi

Vehicle design and
Protected niche mode(s)
Operation and management
Infrastructure
Environmental targets
Technology production scale

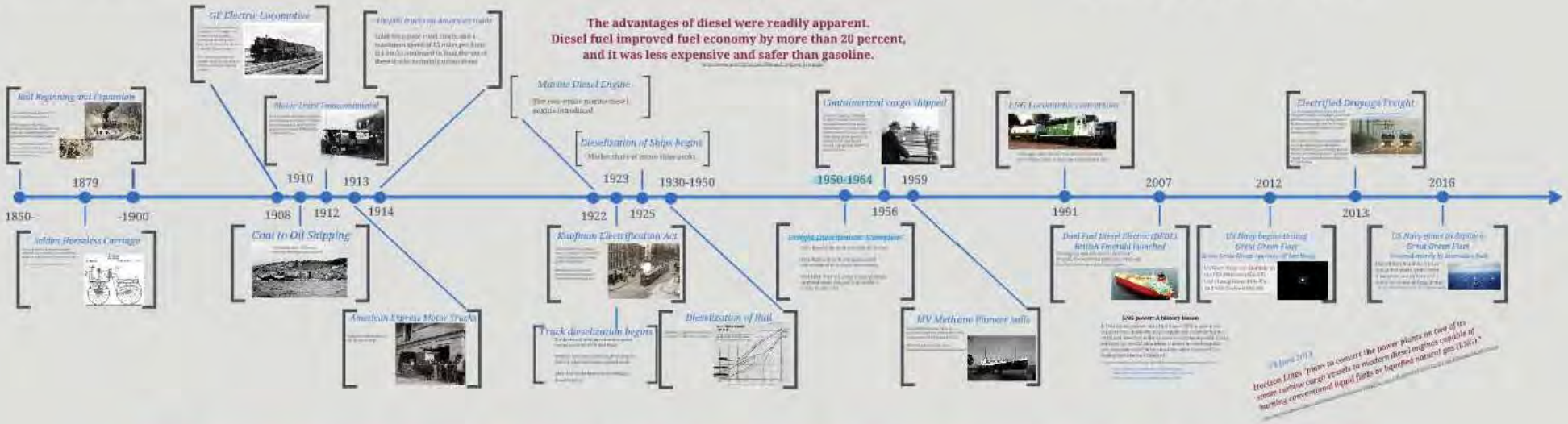
Farrell, Keith, Corbett, Energy Policy, 2003
http://www.sciencedirect.com/science/article/pii/S0301421502001957

early innovation

technology exploration and service expansion

technology harmonization and growth

techno-service integration power re-innovation



The advantages of diesel were readily apparent. Diesel fuel improved fuel economy by more than 20 percent, and it was less expensive and safer than gasoline.

By comparison, how fast can freight energy systems transform in 21st Century?

GE Electric Locomotive

An early pioneer in electric locomotives, GE supplies 30 of these 94-ton gearless electric locomotives to the New York Central R.R. for use in Grand Central Station.

Two 2800 hp locomotives, coupled together, are able to haul the heaviest loads yet handled.

~100,000 trucks on America's roads

Solid tires, poor rural roads, and a maximum speed of 15 miles per hour (24 km/h) continued to limit the use of these trucks to mainly urban areas

The Diesel fue and

eginning and Expansion

Motor Truck Transcontinental

Five Teamster members complete the first transcontinental delivery by motor truck. It takes them 90 days to travel from Philadelphia to San Francisco.

Marine Diesel E

The two-stroke marine engine introduced

Dieseli

Marke

1879

-1900

1908

1910

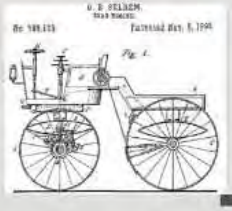
1912

1913

1914

1922

elden Horseless Carriage



Coal to Oil Shipping

USS Paulding, first oil-burning American destroyer commissioned

American Express Motor Trucks

American Express begins to use the new vehicles

Kaufman El

1923 Kaufman Act banned steam locomotives from New York City because of severe pollution problems.

Diesel locomotives were permitted as an acceptable alternative to steam power.

Truck dieselizat

The first truck with pre-cha engine made by MAN and

Daimler-Motoren-Gesellsch first air-injection diesel-eng

1924: Fairbanks-Morse star diesel engines.

The advantages of diesel were readily apparent.
Diesel fuel improved fuel economy by more than 20 percent,
and it was less expensive and safer than gasoline.

http://www.maxxforce.com/Home/Company_Heritage

erica's roads

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les per hour
mit the use of
ban areas

Marine Diesel Engine

The two-stroke marine diesel engine introduced

Dieselization of Ships begins

Market share of steam ships peaks

Containerized cargo shipped

Malcom McLean, a trucking magnate, loaded trailers onto a ship and sent them by sea for less than the cost of trucking them overland. He was credited with shipping the first load of containers (truck trailers) aboard a cargo ship, from New Jersey to Texas.

1923 | 1930-1950 | 1950-1964 | 1959

1922 | 1925 | 1956

Kaufman Electrification Act

1923 Kaufman Act banned steam locomotives from New York City because of severe pollution problems.

Diesel locomotives were permitted as an acceptable alternative to steam power.

Freight Dieselization "Complete"

1950: Diesel ships hold over 50% of market

1955: Railroads in North America had retired 90% of their steam locomotives

1954-1964: Total U.S. factory sales of diesel-equipped trucks jumped from 10,000 to nearly 65,000 units

Trucks

Truck dieselization begins

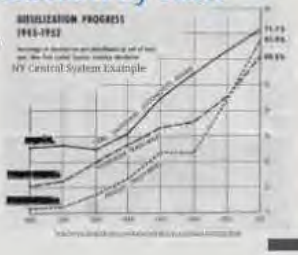
The first truck with pre-chamber diesel engine made by MAN and Benz.

Daimler-Motoren-Gesellschaft testing the first air-injection diesel-engined truck.

1924: Fairbanks-Morse starts building diesel engines.

Dieselization of Rail

1930-1950: Replacement of steam locomotives with diesel engines



MV Methane Pioneer

Ship left the Calcasieu River on Louisiana Gulf Coast with world's first ocean cargo of LNG bound for UK

NOT LNG powered, she was a converted diesel powered liberty vessel

rmonization

owth

techno-service integration

power re-innovation

eadily apparent.
more than 20 percent,
er than gasoline.
e/Company_Heritage

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LNG Locomotive conversion

Although some identify rail electrification as the solution, there is need for a transitional fuel.

Electrified Drayage Freight

For Immediate Release: June 21, 2013

SCAQMD awarded $1.8 million to retrofit five heavy duty electric trucks using a Siemens pantograph system, in which an overhead wire transmits electric power to a vehicle.

The trucks will be used to demonstrate a zero emissions goods movement system connecting local shipping ports for use on Alameda Street in the city of Carson (Los Angeles County) along the I-710 corridor.

1950-1964 | 1956 | 1959 | 1991 | 2007 | 2012 | 2013 | 2016

Freight Dieselization "Complete"

1950: Diesel ships hold over 50% of market

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MV Methane Pioneer sails

Ship left the Calcasieu River on Louisiana Gulf Coast with world's first ocean cargo of LNG bound for UK

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Dual Fuel Diesel Electric (DFDE) British Emerald launched

BP Shipping took delivery of the British Emerald, the world's largest LNG carrier and the first to run on a dual-fuel system

LNG power: A history lesson

Is LNG the locomotive fuel of the future? Will it, over time, replace diesel, much like diesel supplanted steam during the 1940s and 1950s? Or will it be used in combination with diesel, deployed on specific runs where it makes the best logistical and economic sense? What about the safety concerns? The fueling infrastructure required?

The economic case of recovery on an investment in LNG locomotives is highest on routes where locomotive utilization rates are highest, such as those that form the main haul

US Navy begins testing Great Green Fleet

Green Strike Group operates off San Diego

US Navy ships test Biofuels on the USS Princeton (CG-59), USS Chung-Hoon (DDG-93), and USS Chafee (DDG-90)

US Navy plans to deploy a Great Green Fleet

Powered entirely by alternative fuels

The military has done a lot of things that starts a tidal wave throughout our culture and I think this is one of those things."

Lt Commander Jason Fox, 45, a Hawkeye pilot

25 June 2013

Horizon Lines "plans to convert the power plants on two of its steam turbine cargo vessels to modern diesel engines capable of burning conventional liquid fuels or liquefied natural gas (LNG)."

http://www.horizonlines.com/News/Press-Releases/HORIZON-LINES-PLANS-TO-CONVERT-STEAM-POWERED-CARGO.aspx

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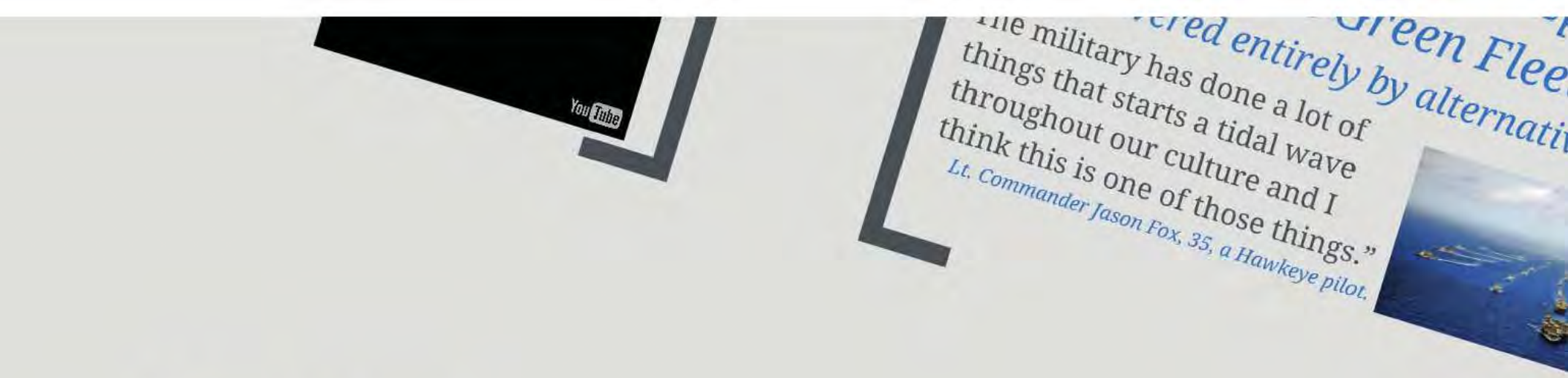

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Why Innovate Again?
3 Ship Innovations Last Century
Innovation
Regulation
Guiding Hand
Firm Hand
Invisible Hand
Adaptation
Adaptation:
Antifragile adaptation:
Adaptation Example: business changes fuel mix without policy or technology innovation
FedEx International Economics
Examples: Freight Agility over Fr-agility

Shipping has changed on decadal scales

When Freight led the Transportation Transformation

Enabled by Rail Expansion

During this time, the number of teamsters doubled, while number of carters declined

Name the transportation mode

Horse

- Remote Source to City
- Local Markets
- Commodifying Wastes
- Commodifying Salvage
- Sector as Consumer
- Regulation
- Labor and "Machine"

- "Mobility revolution"
- New Transport Technologies
- Public Transportation
- Combining Distance and Regularity
- Reduced fares and rates by minimizing price moves

3 Ship Innovations Last Century

Marine diesel

~1947-1960

Marine diesel engines are fuel-efficient combustion systems: this efficiency has been devoted to economic performance more than to environmental performance to date.

Coal-fired steam

Oil-fired Steam

~1911

The efficiency of a steamship cannot be so much in her engines as in the vessel she is carrying within herself. The taking off a modern steamship about the world through her would not minimize its responsibilities but not the same quality of dimension with nature.

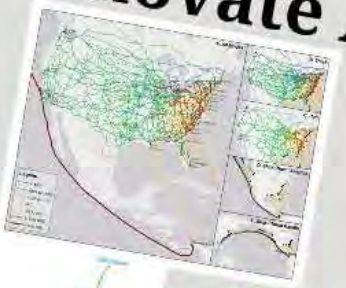
Containers

~1956-1975

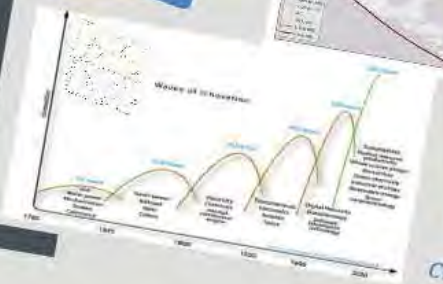
"In April 1956, a retired oil tanker carried fifty-eight shipping containers from Newark to Houston. From that modest beginning, container shipping developed into a huge industry that made the boom in global trade possible."

— No engine, No wheels, No rails

Why Innovate Again?



- *Infrastructure*
- *Fuels*
- *Technologies*
- *Operations*
- *Logistics*
- *Demand*



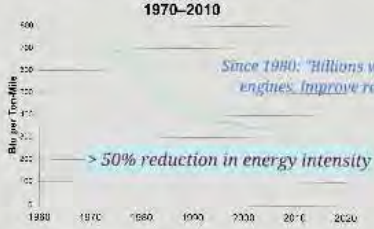
Projected growth in Freight

Higher Energy prices for transport

Health concerns regarding diesels

Climate change mitigation/adaptation

Energy Intensities Class I freight railroad: 1970–2010



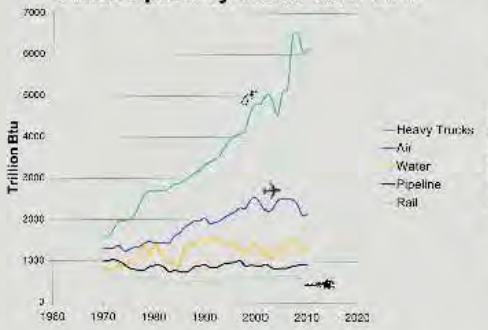
Since 1980: "Billions were spent to purchase better fuel efficient engines, improve rail lines, and maximize the efficiencies."

> 50% reduction in energy intensity

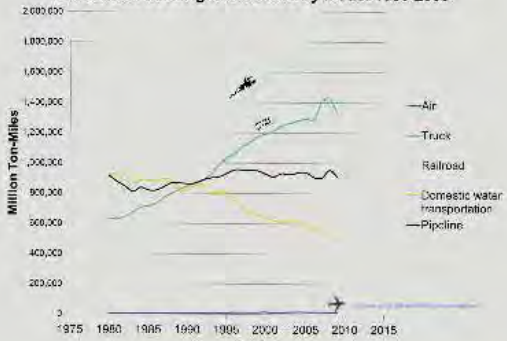
Why Warren Buffett Believes Trains Will Power the Recovery

... by Mary Buffett http://www.huffingtonpost.com/mary-buffett/warren-buffett-trains_b_2952284.html

Transportation Energy Consumption by Mode: 1970–2010



U.S. Domestic Freight Ton-Miles by Mode: 1980-2009



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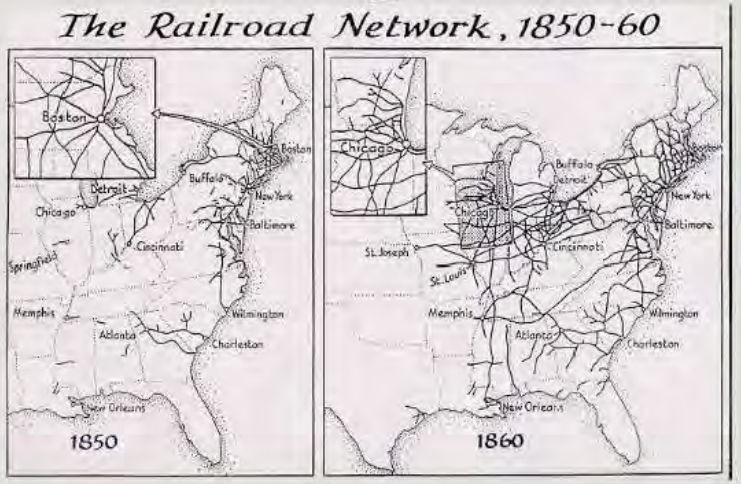

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- Sector as Consumer
- Regulation
- Labor and "Machine"

Powering Urban Transit

- "Mobility revolution"
- New Transport Technologies
- Public Transportation
- Combining Distance and Regularity
- Reduce fares and rates by minimizing prime movers

al scales

3 Ship Innovations Last Century

Marine diesel

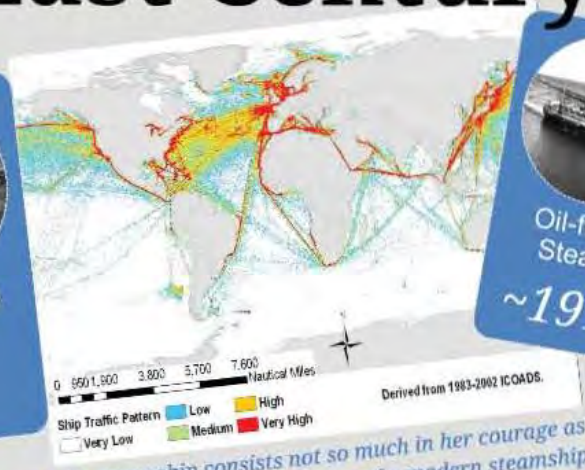
~1947-1960

Oil saved ~78% in fuel costs, gained ~30% in cargo space, and reduced crews

Vergin, The Prize, 1991

Marine diesel engines are fuel-efficient combustion systems; this efficiency has been devoted to economic performance more than to environmental performance to date.

Coal-fired steam



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Joseph Conrad 1904-06: http://www.gutenberg.org/dirs/etext97/tmots10h.htm

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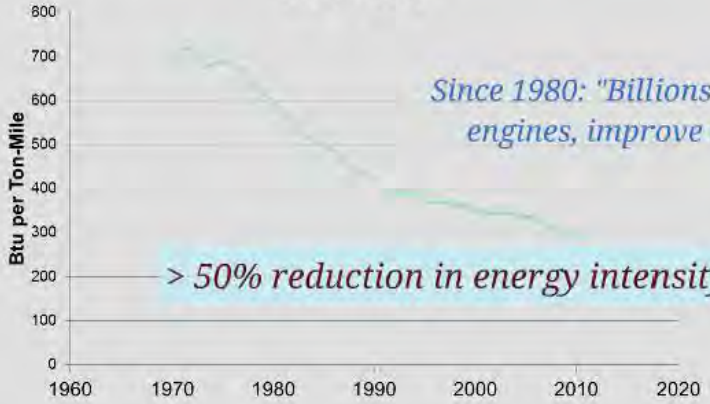
Marc Levinson, The Box, 2006

Energy Intensities Class I freight railroad: 1970–2010

800

Energy Intensities Class I freight railroad: 1970–2010



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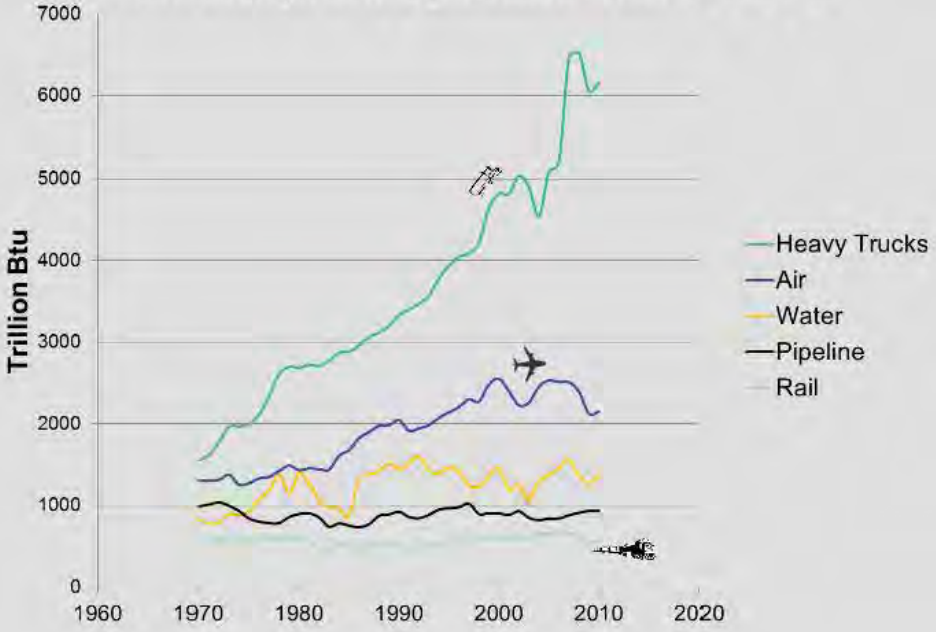

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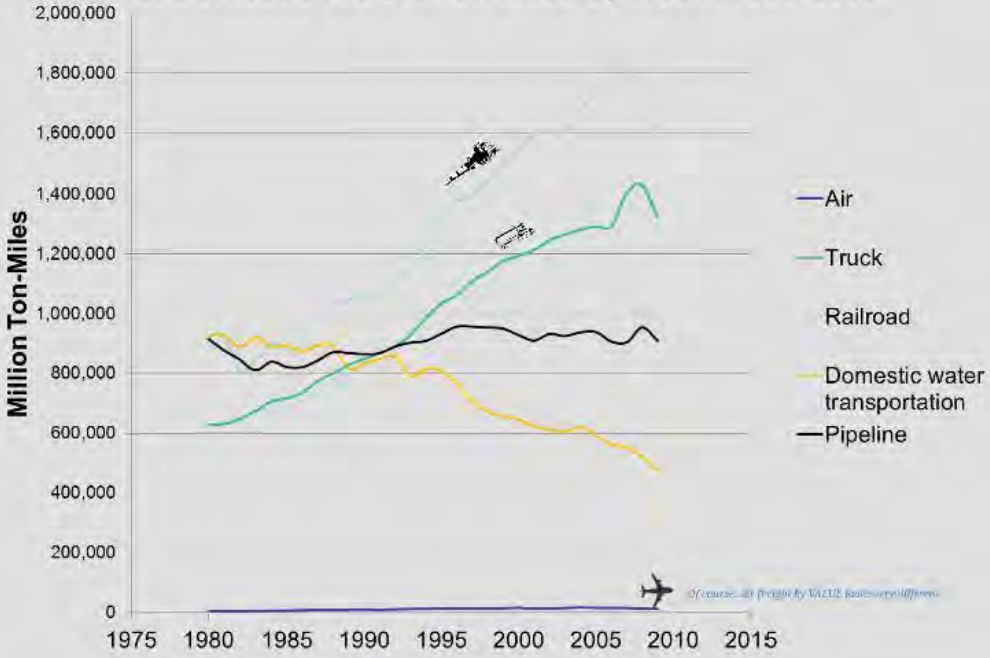
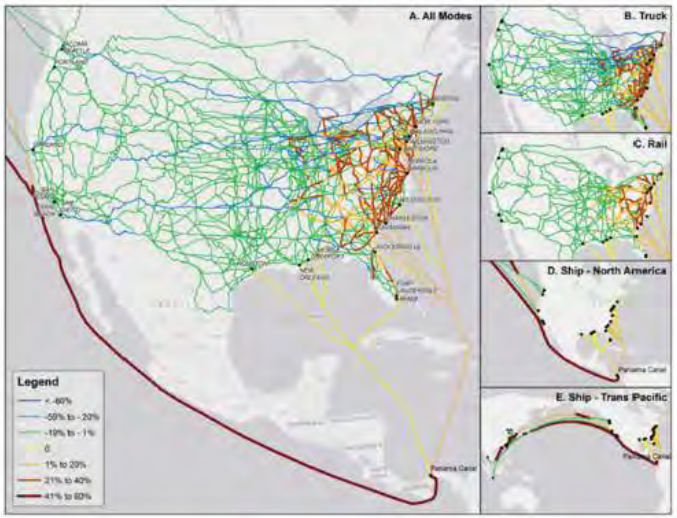


Why Innovate Again?



infrastructure

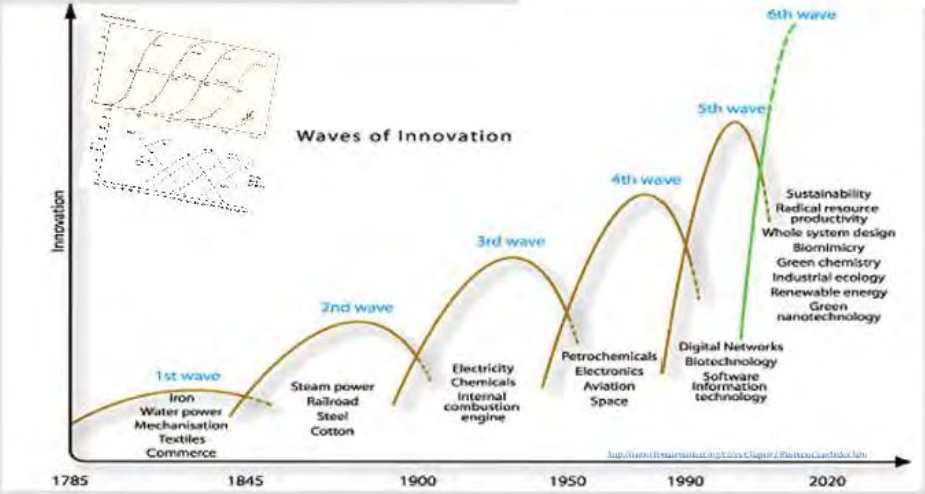
fuels

technologies

operations

logistics

demand



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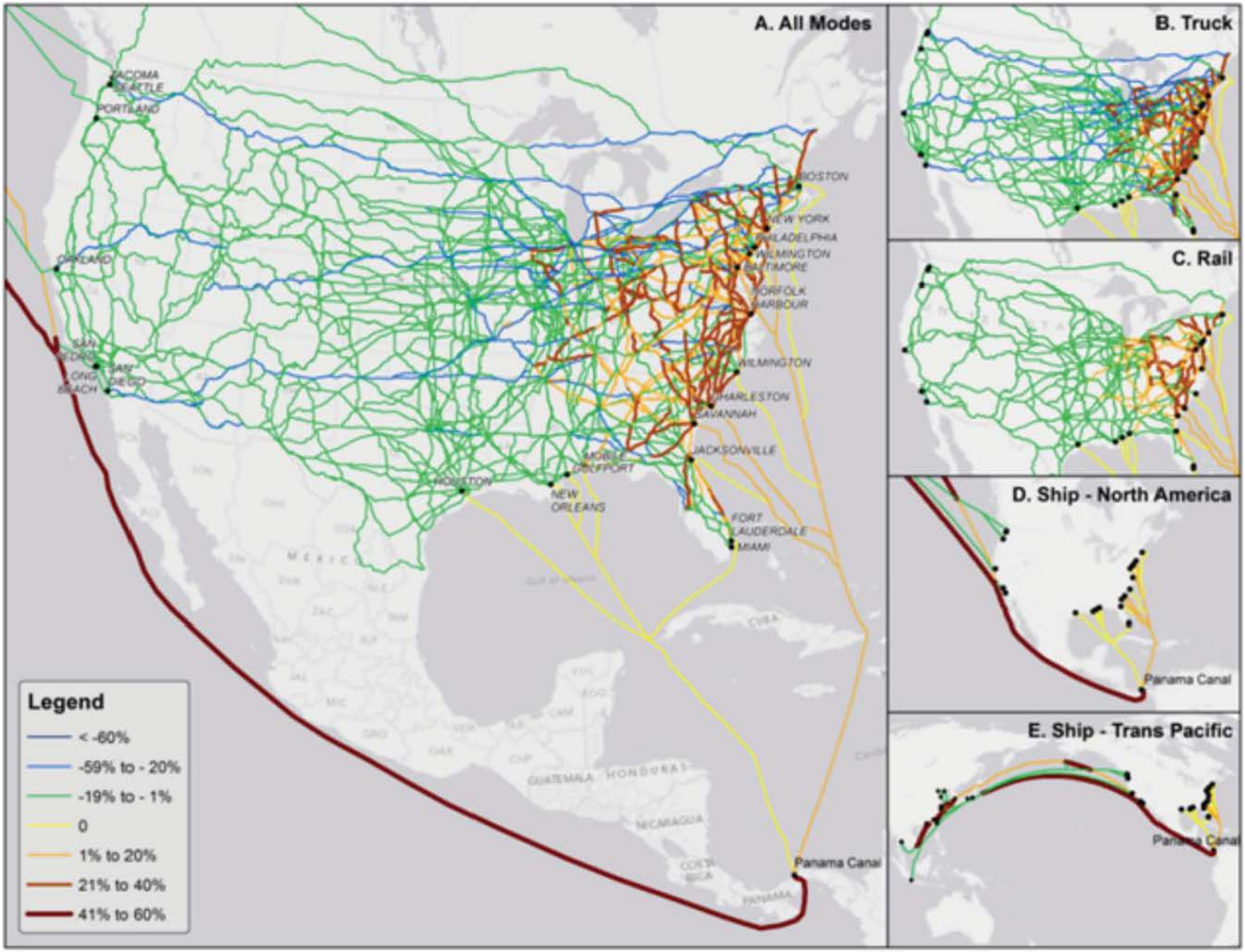
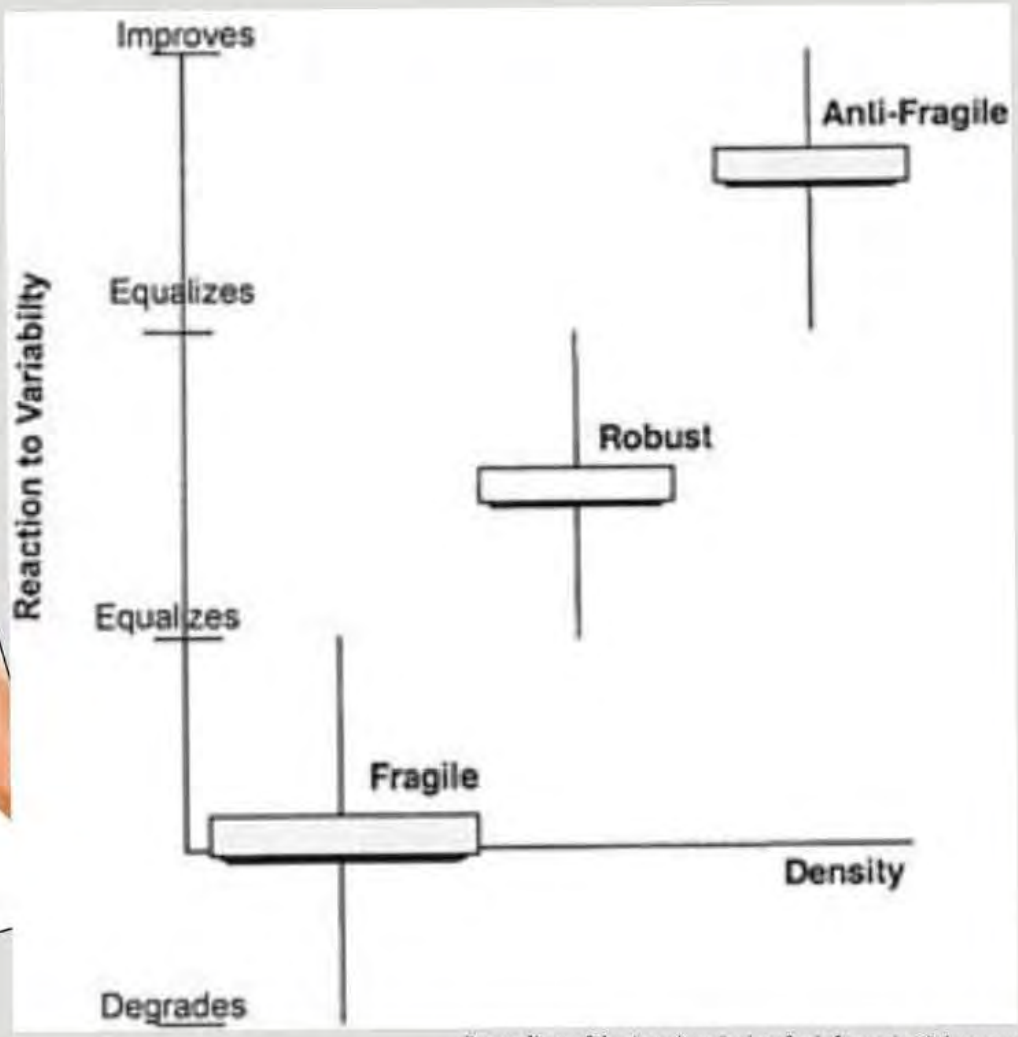

A. All Modes
B. Truck
C. Rail
D. Ship - North America
E. Ship - Trans Pacific
TACOMA
SEATTLE
PORTLAND
OAKLAND
SAN PEDRO
LONG BEACH
SAN DIEGO
BOSTON
NEW YORK
PHILADELPHIA
WILMINGTON
BALTIMORE
NORFOLK
HARBOUR
WILMINGTON
CHARLESTON
SAVANNAH
JACKSONVILLE
MOBILE
GULFPORT
HOUSTON
NEW ORLEANS
FORT LAUDERDALE
MIAMI
Panama Canal
MEXICO
CUBA
GUATEMALA
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
Legend
< -60%
-59% to - 20%
-19% to - 1%
0
1% to 20%
21% to 40%
41% to 60%

Concept of Antifragile

Nassim Nicholas Taleb

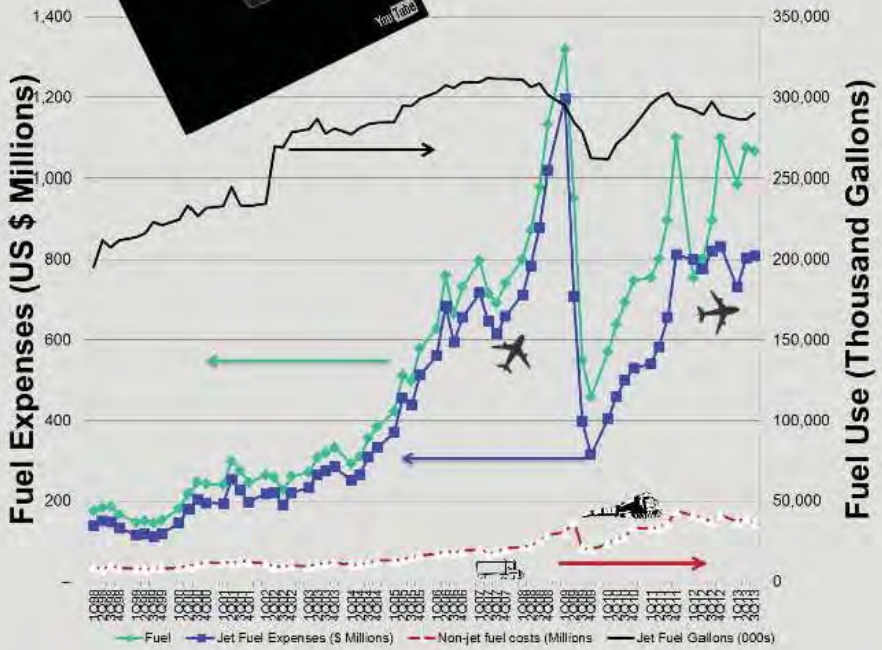


Proceedings of the American Society for Information Science and Technology
Volume 49, Issue 1, pages 1-10, 24 JAN 2013
DOI: 10.1002/meet.14504901168
http://onlinelibrary.wiley.com/doi/10.1002/meet.14504901168/full#fig1

Adaptation Example: business changes fuel mix without policy or technology innovation

Almost exactly one year ago ... Jun 19, 2012

FedEx Corp. Chief Executive Fred Smith predicted fundamental changes in the global freight business, with air carriers facing more competition from ships and the industry putting more focus on providing clients with customized, door-to-door delivery options.

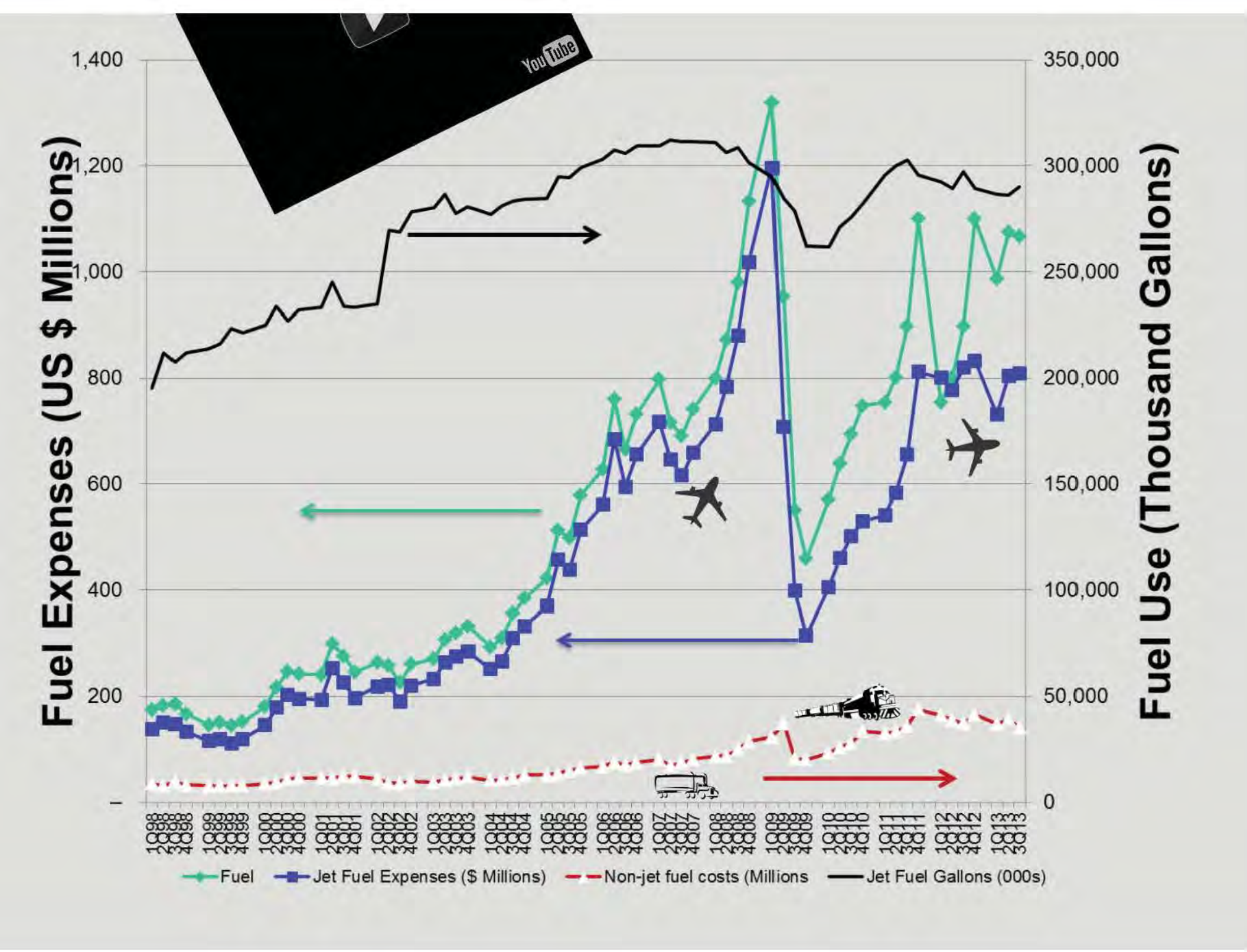


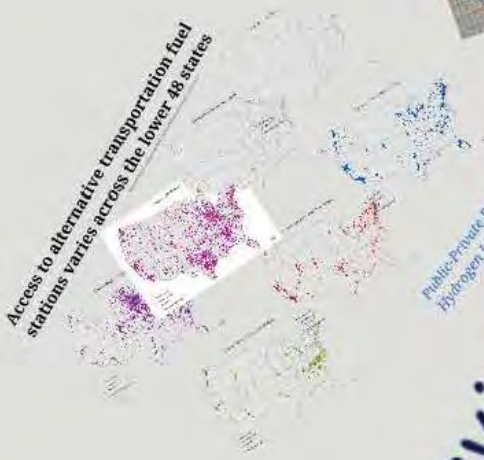
http://online.wsj.com/article/SB10001424052702303703004577476241416089720.html

FedEx International Economy®

"... door-to-door, customs-cleared, time-definite delivery ...
...an economical alternative for less urgent shipments ...
characterized by the same quality, service and reliability

Tested late 2007; intra-Asia service 2008; Introduced in Brazil in October 2009
http://www.fedex.com/cg/about/company-info/history.html


Fuel Expenses (US $ Millions)
Fuel Use (Thousand Gallons)
1,400
1,200
1,000
800
600
400
200
–
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Fuel
Jet Fuel Expenses ($ Millions)
Non-jet fuel costs (Millions
Jet Fuel Gallons (000s)



Public-Private Partnership to Deploy Hydrogen Infrastructure in the U.S.

Invisible Hand

Guiding Hand

Policy Options
may be part of the difference

Policy Options	I	F	T	O	L	D
Efficiency standards	•		•		•	
Taxes	•	•	•	•	•	•
Subsidies	•	•	•			
Technology mandates		•	•			
Infrastructure investment	•				•	
R&D investment		•	•			
Alternative/LC fuels		•	•			
Size/weight restrictions	•			•	•	
Demand management						•
Information/education	•	•	•	•	•	•

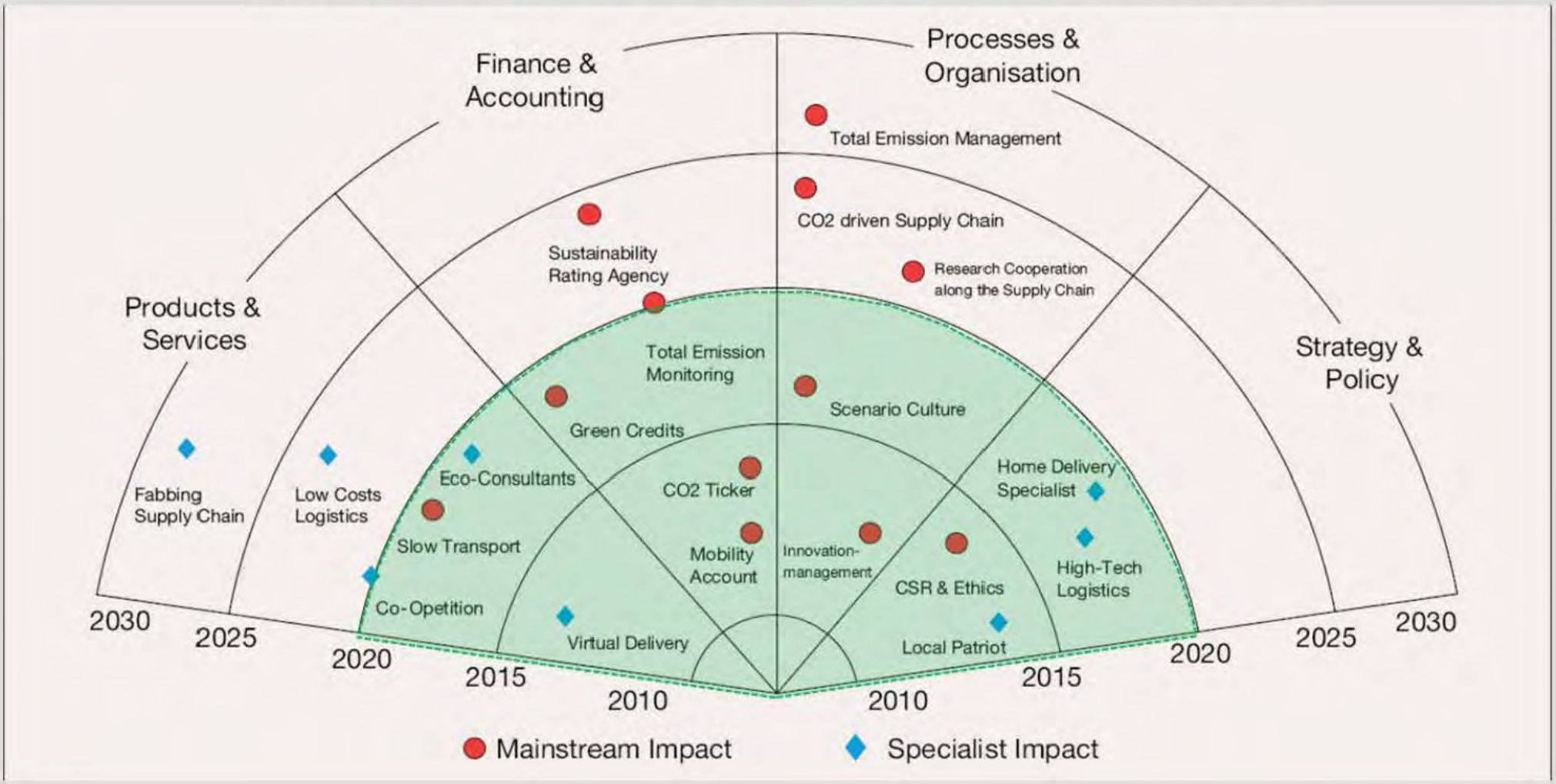
Slow Steaming
Denser packaging
Fuller LTL loads
Accelerated replacement

Firm Hand

Require LCFS
Promote renewables
Incentivize alternatives
Limit access to resources
Prioritize other resources
Refresh infrastructure
Redesign infrastructure

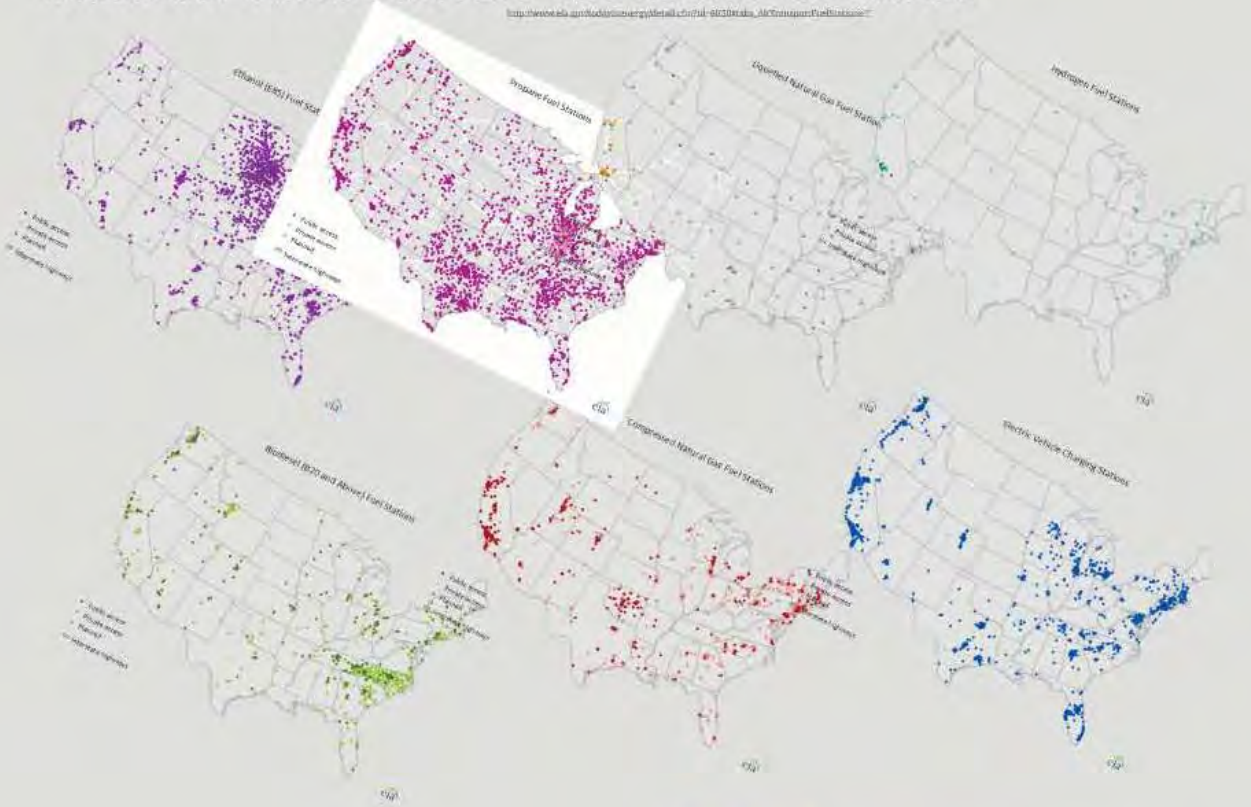
Transportation & Logistics 2030

How will supply chains evolve in an energy-constrained, low-carbon world?



Source: PriceWaterhouseCoopers, 2009

Access to alternative transportation fuel stations varies across the lower 48 states



Public-Private Partnership to Deploy Hydrogen Infrastructure in the U.S.

Invisible Hand

New Performance Measures

Key decision: Cost-avoidance versus purchasing savings?

infrastructure

fuels

technologies

Operations

logistics

demand

Better Goods Movement

- Rebalance frequency of delivery
- Improve transparency
- Reconsider single-mode routes
- Backhaul networks
- Sustainability performance
  - Example: Human Health

"I get up every morning determined to both change the world and to have one hell of a good time. Sometimes, this makes planning the day difficult."

E. B. White

Thank you...
discussion welcome

James J. Corbett
College of Earth, Ocean, and Environment
University of Delaware
jcorbett@udel.edu