



National Freight Fluidity Monitoring Program Implementation

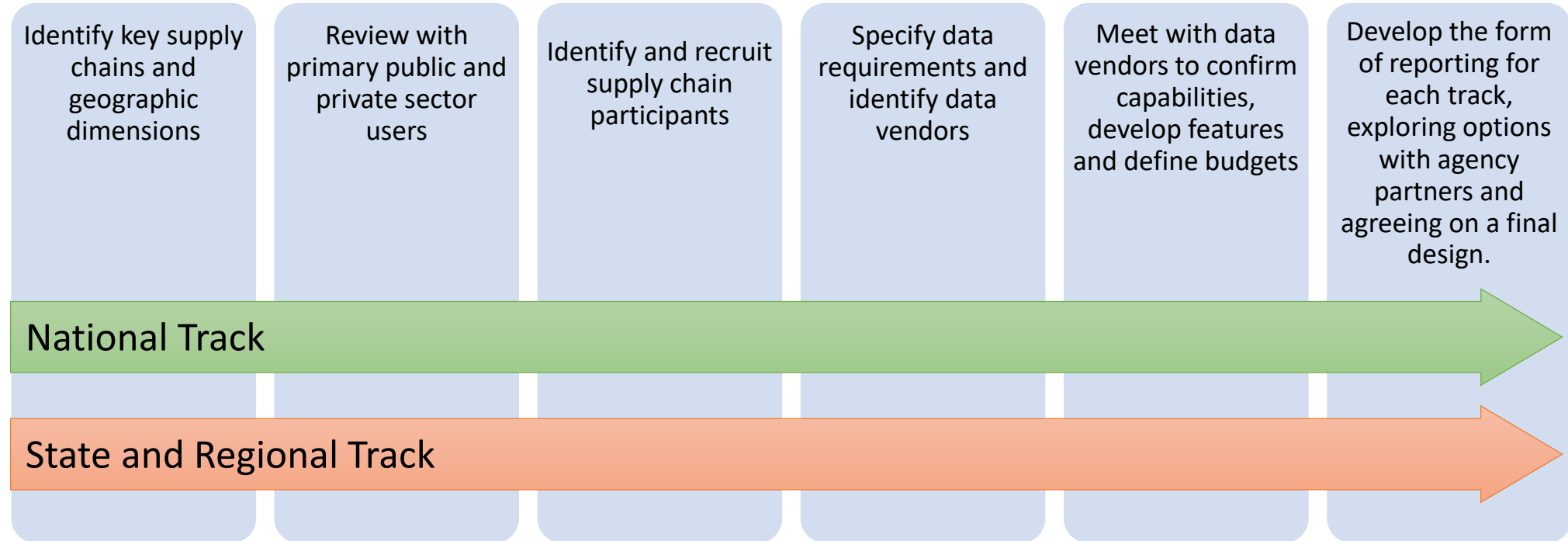
Fluidity Team
Program Design Overview

Briefing for Freight Fluidity Interested Parties
June 2018

I-95 CC staff, WSP, CS, TTI



Program Design Steps



- Fluidity is a tool working with other tools in FHWA's suite, improving efficacy of the whole
- The suite supports diagnosis of supply chain performance trends



National Track

Program Design



Industry Sectors

- Sectors were selected based on six factors:
 - Contribution to national GDP and projected growth among freight-dependent industries
 - Geographic coverage of US: regions, urban centers, rural areas, gateways, corridors, direction of travel
 - Contribution to regional GDP and projected growth among freight-dependent industries
 - Industry importance to resilience of other supply chains and of population
 - Industry importance in US trade
 - Modal and travel distance diversity

#	Industry Sector
1	Oilseed & Grain Farming and Production
2	Oil & Gas Extraction
3	Coal, Metal Ores, and Nonmetallic Minerals
4	Food Products Manufacturing
5	Dairy Products Manufacturing
6	Paper Manufacturing
7	Petroleum and Coal Products Manufacturing
8	Organic Chemicals Manufacturing
9	Resins and Synthetics Manufacturing
10	Pharmaceuticals Manufacturing
11	Plastics & Rubber Manufacturing
12	Nonmetallic Minerals Manufacturing
13	Steel & Fabricated Metals Manufacturing
14	Construction/Industrial Machinery Manufacturing
15	Computers/Electronic Products Manufacturing
16	Motor Vehicles & Parts Manufacturing
17	Aircraft/Other Transportation Manufacturing
18	Medical Instruments Manufacturing
19	Food Service & Wholesale
20	Retail: Home Furniture Stores
21	Retail: Electronics and Appliance Stores
22	Retail: Building Materials Stores
23	Retail: Grocery, Food, Beverage Stores
24	Retail: Drug Stores
25	Retail: Apparel Stores
26	Retail: Consumer Goods (FAK) Stores
27	Service: Hospitals
28	Service: E-Commerce (Package Delivery)



Supply Chain Flows

- Recruited companies asked to describe one to three typical lanes, incl. stages and modes
- Information to be compiled in Tableau
- Two considerations:
 - Lanes should be stable for a number of years
 - Participants will expect to see output, an opportunity to maintain relationship

Manufacturing Plant: Napoleon, OH

Product Type: Pasta sauce

Inbound Supply: Glass jars from Middletown, NY

First Flow Sequence, 5 links total plus rail interchange:

1. Jars from Middletown, NY to Napoleon, OH. Mode: full TL in dry vans
2. Outbound product delivery via DC: Napoleon OH to Campbell's DC in Fort Worth, TX. Mode: Intermodal Rail routed as follows:
 - a. Napoleon, OH to Toledo, OH: dry van container TL dray to NS Toledo ramp
 - b. Toledo OH to Chicago IL: NS to interchange with BNSF in Chicago
 - c. Chicago, IL to Haslet, TX: BNSF to BNSF Alliance ramp
 - d. Haslet, TX to Fort Worth, TX: dry van container TL dray from BNSF Alliance ramp to Fort Worth DC
3. DC delivery: Fort Worth TX to customer grocery DC in Houston, TX. Mode: full TL in dry vans

Second Flow Sequence, 2 links total:

1. Jars from Middletown, NY to Napoleon, OH. Mode: full TL in dry vans (same as above)
2. Outbound direct product delivery: Napoleon OH to customer grocery DC in Breinigsville, PA. Mode: full TL in dry vans.

Performance Measurement

- Travel time, 95% reliability and cost will be collected for each flow.
- Flows will be summed by link.
- The *input* for performance measurement will vary in form by vendor, according to how their process of calculation works. This raises two points for automation of the collection process:
 - The first time set-up for a vendor will be a manual process of entering geographic and modal data into the vendor's format. Thereafter, the vendor should be able to repeat the process without further data entry.
 - The data received from vendors will follow their format, but can be expected to arrive in a form compatible with Tableau (such as Excel) and to do so consistently, so that each receipt from a vendor looks like the last.
- Two important considerations about link-level data:
 - It is desirable to track trucks that travel the length of the link – instead of compiling transit time and reliability by road segment within the link, as would be required from raw NPMRDS data.
 - Performance needs to be associated with specific roadways so that delays can be diagnosed and addressed.

FIGURE 1 - SEATTLE TO NEW YORK RETAIL FLOW

Links and Nodes	Transit Time/Dwell Time (Hours)	Reliability (95% travel time)	Cost (2014 \$'s)
West Coast port (Seattle)	36	86	
Dray move	1.0	1.4	\$299
<i>Transload or Consolidation Center</i>			
Dray move	1.0	2.25	\$308
West Coast rail intermodal terminal	20		
Rail move	104	154	\$3,178
Midwest rail intermodal interchange	71	160	
Rail move			
East Coast rail intermodal terminal			
Dray move	1.1	1.4	\$318
<i>East Coast Regional Distribution Center</i>			
Truck P&D move	6.0	9.5	\$775
<i>Retail Store</i>			
Totals			\$4,878



Performance Report

- Performance will be collected and reported quarterly,
- Output will be in the form of chart displays of data, and maps:
 - We will also compose an overall index of speed, reliability and cost, with the first quarter (and ultimately the first year) as the base line for all flows and by sector.
 - Interactive maps for will be produced for each sector



Performance Report

Example 1: Data Array Table

Data Array (Showing Chains 1-5, 2019 Q1 Only)

Chain	Commodity	Industry Cluster	Mode	Trade Type	Average US Distance (miles)	2019 Q1 Cost/Ton (2018 \$)	2019 Q1 Travel Time (hrs)	2019 Q1 Reliability Index
1	17 Gasoline, Aviation Turbine Fuel, and Et...	Petroleum and Coal Products ..	Truck	Domestic	100.0	200.0	2.0	1.3
2	17 Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel ..	Petroleum and Coal Products Manufacturing	Rail	Domestic	250.0	300.0	10.0	1.0
			Truck	Domestic	50.0	100.0	1.0	1.3
3	17 Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel ..	Petroleum and Coal Products Manufacturing	Truck	Domestic	50.0	100.0	1.0	1.3
			Water	Domestic	400.0	160.0	80.0	1.0
4	17 Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel ..	Petroleum and Coal Products Manufacturing	Pipeline	Domestic	800.0	80.0	160.0	1.0
			Truck	Domestic	50.0	100.0	1.0	1.3
5	17 Gasoline, Aviation Turbine Fuel, and Et...	Petroleum and Coal Products ..	Rail	Export	100.0	120.0	4.0	1.0

Sheet1 Sheet2

Performance Report

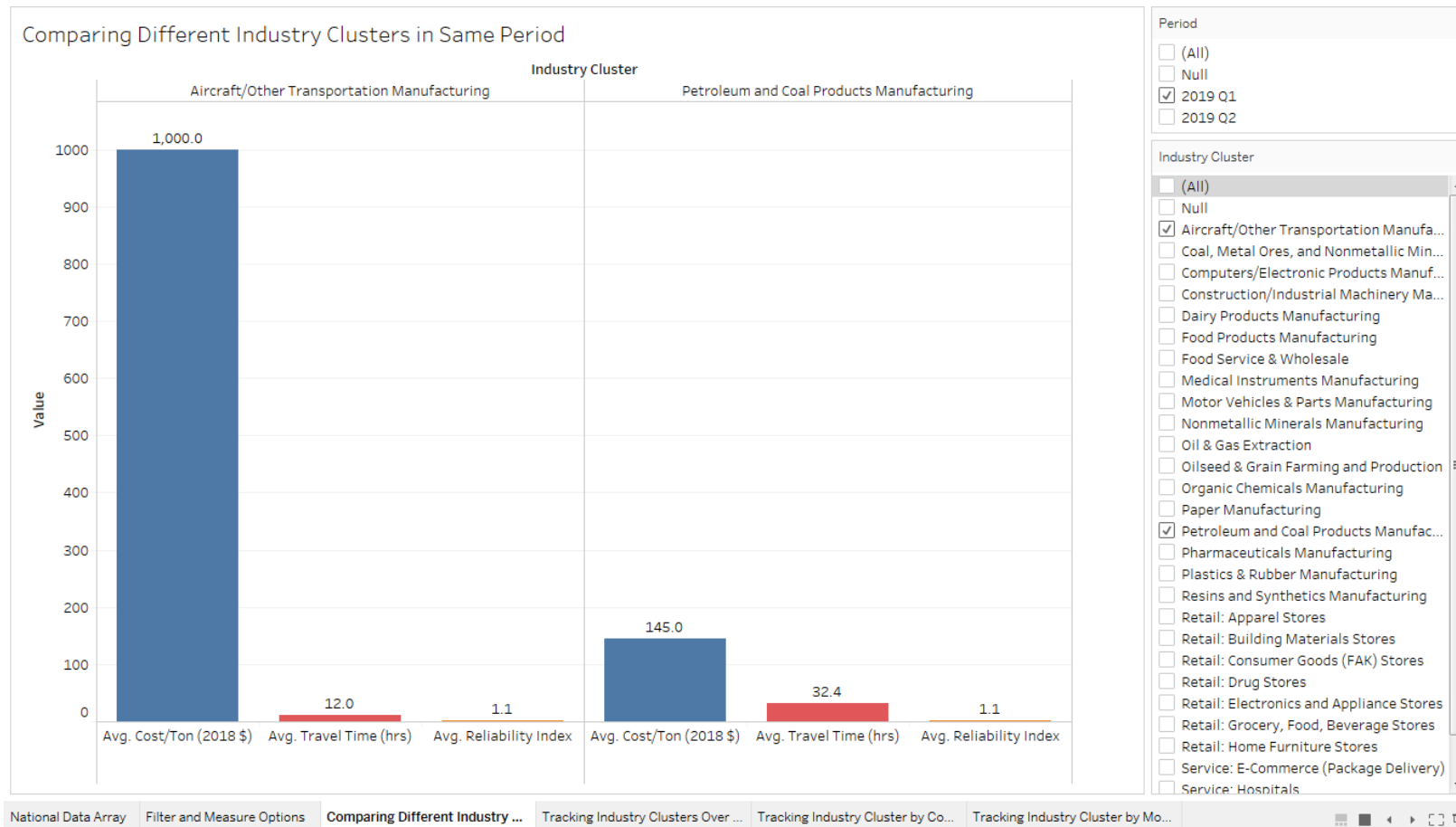
Example 2: Query Filter and Output Measure Options Available via Pull-Down Menus

All Query Fields		Chain	Industry Cluster	Commodity	Mode	Trade Type
Avg. 2019 Q1 Cost/Ton (2018 \$)	145.0	<input checked="" type="checkbox"/> (All)	<input checked="" type="checkbox"/> (All)	<input checked="" type="checkbox"/> (All)	<input checked="" type="checkbox"/> (All)	<input checked="" type="checkbox"/> (All)
Avg. 2019 Q2 Cost/Ton (2018 \$)	139.0	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> Null	<input checked="" type="checkbox"/> Null	<input checked="" type="checkbox"/> Null	<input checked="" type="checkbox"/> Null
Avg. 2019 Q1 Travel Time (hrs)	32.4	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> Aircraft/Other Tran...	<input checked="" type="checkbox"/> 01 Animals and...	<input checked="" type="checkbox"/> Air	<input checked="" type="checkbox"/> Domestic
Avg. 2019 Q2 Travel Time (hrs)	34.6	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> Coal, Metal Ores, an...	<input checked="" type="checkbox"/> 02 Cereal Grain...	<input checked="" type="checkbox"/> Multiple Modes	<input checked="" type="checkbox"/> Export
Avg. 2019 Q1 Reliability Index	1.1	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Computers/Electron...	<input checked="" type="checkbox"/> 03 Agricultural...	<input checked="" type="checkbox"/> Other and Unkn...	<input checked="" type="checkbox"/> Import
Avg. 2019 Q2 Reliability Index	1.2	<input checked="" type="checkbox"/> 5	<input checked="" type="checkbox"/> Construction/Indust...	<input checked="" type="checkbox"/> 04 Animal Feed...	<input checked="" type="checkbox"/> Pipeline	
		<input checked="" type="checkbox"/> 6	<input checked="" type="checkbox"/> Dairy Products Man...	<input checked="" type="checkbox"/> 05 Meat, Poul...	<input checked="" type="checkbox"/> Rail	
		<input checked="" type="checkbox"/> 7	<input checked="" type="checkbox"/> Food Products Man...	<input checked="" type="checkbox"/> 06 Milled Grain...	<input checked="" type="checkbox"/> Truck	
		<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> Food Service & Whol...	<input checked="" type="checkbox"/> 07 Other Prepa...	<input checked="" type="checkbox"/> Water	
		<input checked="" type="checkbox"/> 9	<input checked="" type="checkbox"/> Medical Instrument...	<input checked="" type="checkbox"/> 08 Alcoholic Be...		
		<input checked="" type="checkbox"/> 10	<input checked="" type="checkbox"/> Motor Vehicles & Pa...	<input checked="" type="checkbox"/> 09 Tobacco Pro...		
		<input checked="" type="checkbox"/> 11	<input checked="" type="checkbox"/> Nonmetallic Mineral...	<input checked="" type="checkbox"/> 10 Monumenta...		
		<input checked="" type="checkbox"/> 12	<input checked="" type="checkbox"/> Oil & Gas Extraction	<input checked="" type="checkbox"/> 11 Natural San...		
		<input checked="" type="checkbox"/> 13	<input checked="" type="checkbox"/> Oilseed & Grain Far...	<input checked="" type="checkbox"/> 12 Gravel and ...		
		<input checked="" type="checkbox"/> 14	<input checked="" type="checkbox"/> Organic Chemicals ...	<input checked="" type="checkbox"/> 13 Other Non-...		
		<input checked="" type="checkbox"/> 15	<input checked="" type="checkbox"/> Paper Manufacturing	<input checked="" type="checkbox"/> 14 Metallic Ore...		
		<input checked="" type="checkbox"/> 16	<input checked="" type="checkbox"/> Petroleum and Coal ...	<input checked="" type="checkbox"/> 15 Coal		
		<input checked="" type="checkbox"/> 17	<input checked="" type="checkbox"/> Pharmaceuticals Ma...	<input checked="" type="checkbox"/> 16 Crude Petro...		
		<input checked="" type="checkbox"/> 18	<input checked="" type="checkbox"/> Plastics & Rubber M...	<input checked="" type="checkbox"/> 17 Gasoline, Av...		
		<input checked="" type="checkbox"/> 19	<input checked="" type="checkbox"/> Resins and Syntheti...	<input checked="" type="checkbox"/> 18 Fuel Oils (in...		
		<input checked="" type="checkbox"/> 20	<input checked="" type="checkbox"/> Retail: Apparel Stores	<input checked="" type="checkbox"/> 19 Other Coal a...		
		<input checked="" type="checkbox"/> 21	<input checked="" type="checkbox"/> Retail: Building Mat...	<input checked="" type="checkbox"/> 20 Basic Chemi...		
		<input checked="" type="checkbox"/> 22	<input checked="" type="checkbox"/> Retail: Consumer Go...	<input checked="" type="checkbox"/> 21 Pharmaceut...		
		<input checked="" type="checkbox"/> 23	<input checked="" type="checkbox"/> Retail: Drug Stores	<input checked="" type="checkbox"/> 22 Fertilizers		
		<input checked="" type="checkbox"/> 24	<input checked="" type="checkbox"/> Retail: Electronics a...	<input checked="" type="checkbox"/> 23 Other Chem...		
		<input checked="" type="checkbox"/> 25	<input checked="" type="checkbox"/> Retail: Grocery, Foo...	<input checked="" type="checkbox"/> 24 Plastics and...		
		<input checked="" type="checkbox"/> 26	<input checked="" type="checkbox"/> Retail: Home Furnit...	<input checked="" type="checkbox"/> 25 Logs and Ot...		
		<input checked="" type="checkbox"/> 27	<input checked="" type="checkbox"/> Service: E-Commerc...	<input checked="" type="checkbox"/> 26 Wood Produ...		
		<input checked="" type="checkbox"/> 28	<input checked="" type="checkbox"/> Service: Hospitals	<input checked="" type="checkbox"/> 27 Pulp, Newsp...		
		<input checked="" type="checkbox"/> 29	<input checked="" type="checkbox"/> Steel & Fabricated ...	<input checked="" type="checkbox"/> 28 Paper or Pa...		
		<input checked="" type="checkbox"/> 30		<input checked="" type="checkbox"/> 29 Printed Pro...		
		<input checked="" type="checkbox"/> 31		<input checked="" type="checkbox"/> 30 Textiles, Le...		
		<input checked="" type="checkbox"/> 32		<input checked="" type="checkbox"/> 31 Non-Metalli...		
		<input checked="" type="checkbox"/> 33		<input checked="" type="checkbox"/> 32 Base Metal i...		
		<input checked="" type="checkbox"/> 34		<input checked="" type="checkbox"/> 33 Articles of B...		

Sheet 1 Sheet 2 Sheet 3

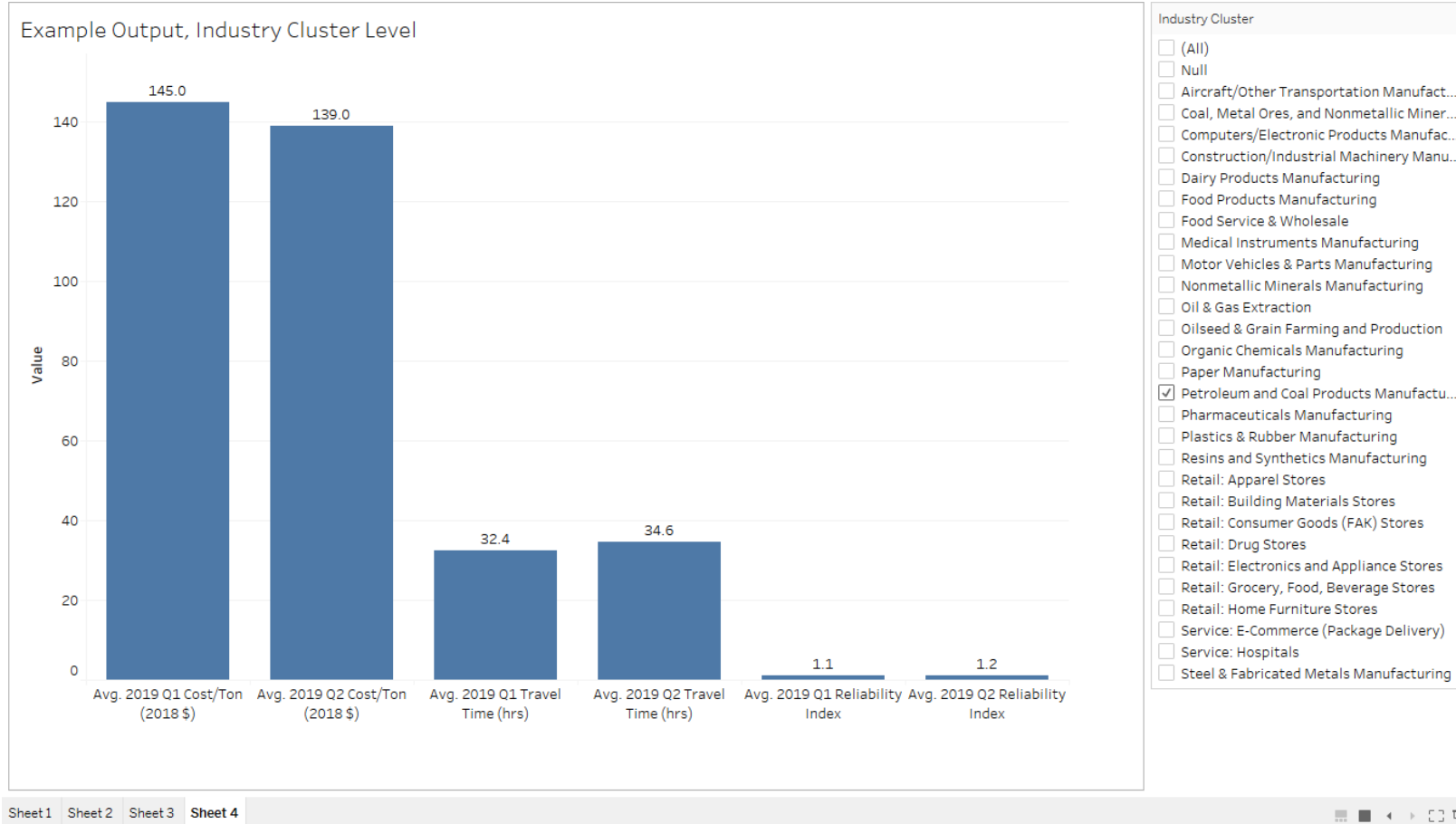
Performance Report

Example 3: Comparing Different Industry Clusters in a Single Period



Performance Report

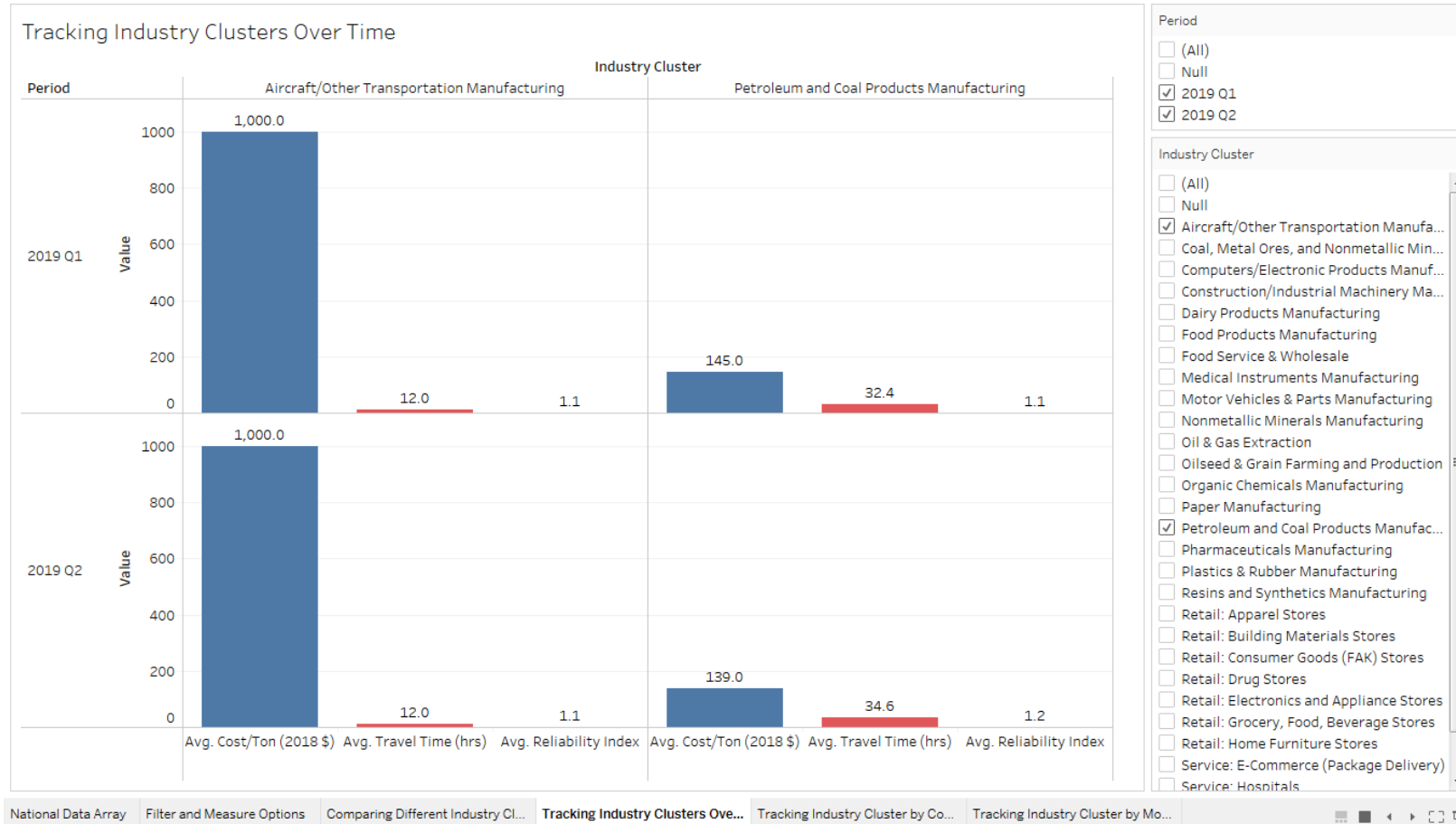
Example 3: Comparing Different Industry Clusters in a Single Period, continued





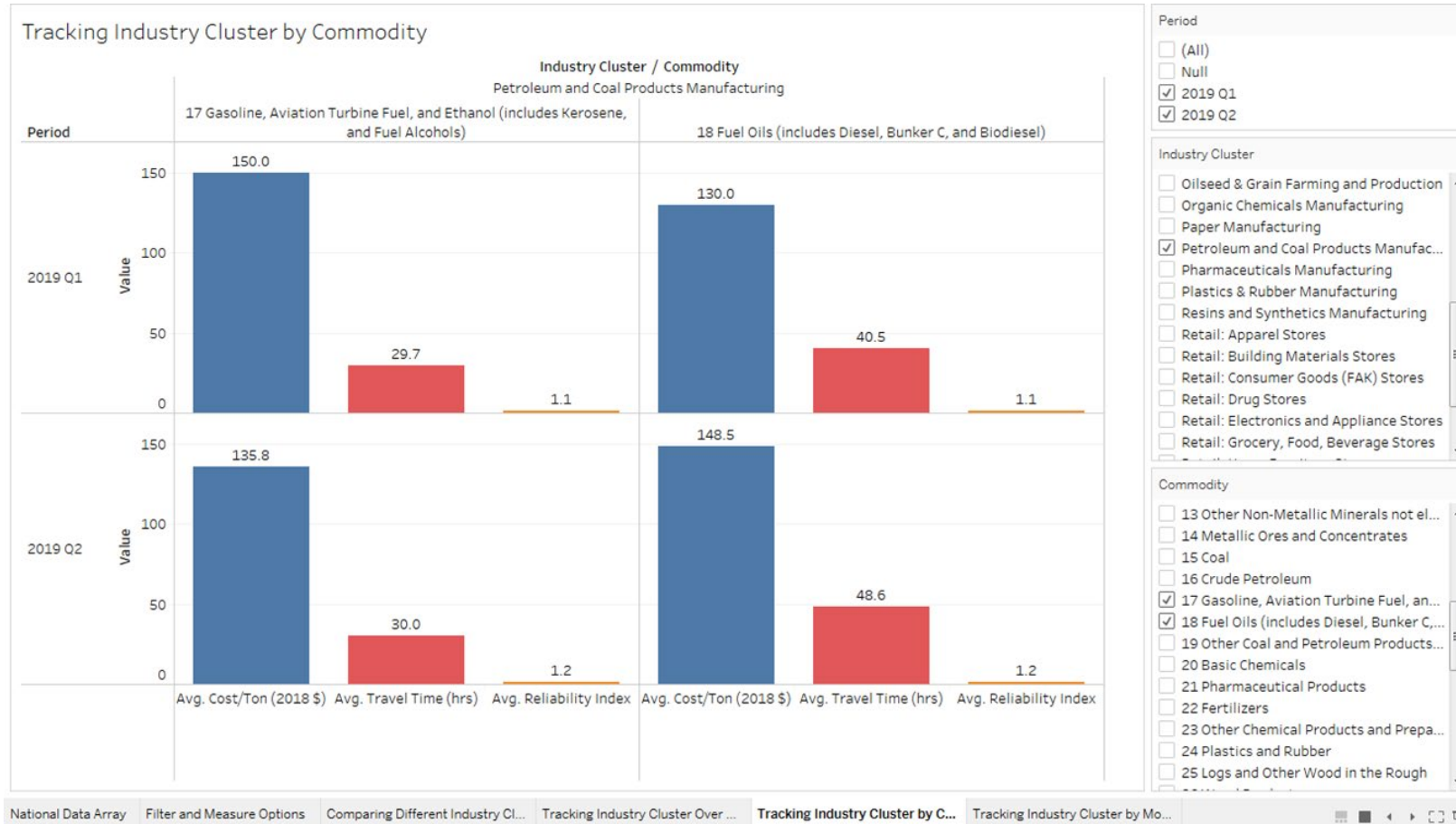
Performance Report

Example 4: Tracking Industry Cluster Performance over Multiple Periods



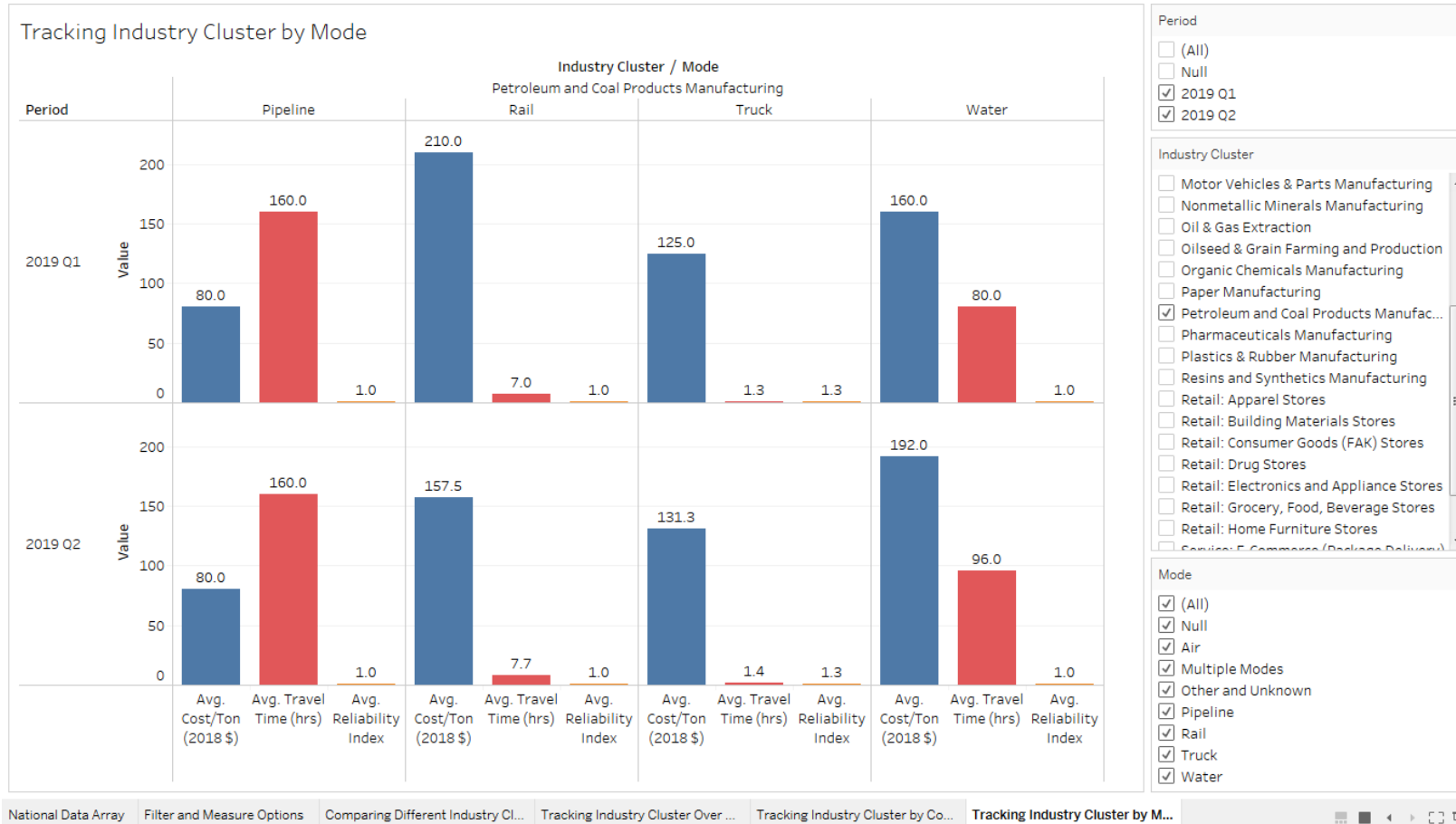
Performance Report

Example 5: Tracking Industry Cluster Performance by Commodity



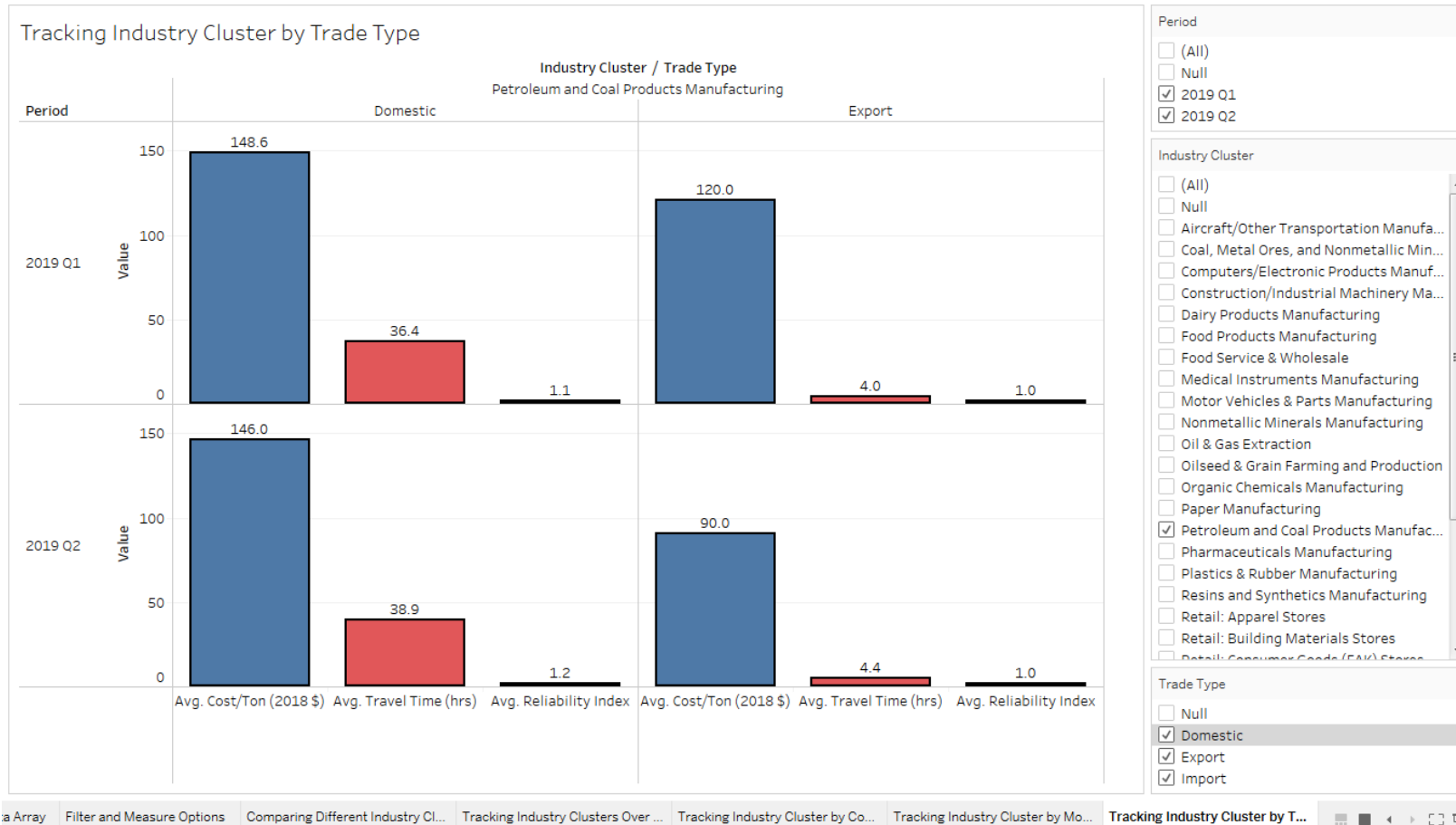
Performance Report

Example 6: Tracking Industry Cluster Performance by Mode



Performance Report

Example 7: Tracking Industry Cluster by Trade Type



Vendors

- Vendors must be able to:
 - **Provide dependable link-level performance data.** This means
 - a) modal travel or dwell time, and the distribution of time in order to calculate speed and reliability; or
 - b) current price information; and c) consistent quality of measurement, capable of accumulation in meaningful time series.
 - Supply data on a **quarterly basis** in a timely fashion
 - Provide data that **can be published** and is thus free of confidentiality limitations.
 - Supply data at a **fair and affordable cost** to the program.
- Other considerations:
 - **Cost Data:** there is a criteria-based reason to prefer Chainalytics to others for the data it offers. Alternative vendors may be needed for rail carload and barge traffic, but coverage, release currency and consistency issues are obstacles.
 - **Rail:** two vendors (RSI and TransCore) for rail travel time and reliability data cover different segments (carload and intermodal). This is a specialized market without much competition.
 - **Vessel:** port and waterborne dwell, travel time, and reliability data are generated by the Coast Guard NAIS system and accessed through the US Army Corps of Engineers (USACE).



Software Platforms

- The software platforms should meet these criteria:
 - Ability to hold and process large data sets in time series, to easily accept updates, and to be versatile in use.
 - Accessibility of data to internal and external users, via export into common formats such as spreadsheet software, and directly on the platform without purchase of special tools.
 - Ability to restrict access to certain types or levels of data for certain groups of users.
 - Varied and high quality graphical and cartographical display must be provided, and the displays must be interactive with the data.
 - Stability as a dependable, tested tool.
- Platforms also should fit into the existing suite of FHWA freight measurements tools. Tableau and HEPGIS meet this requirement.



State and Metropolitan Regional Track

Program Design



Key Differences from National Track

- Monitor a set of regionally-significant supply chains in the New York-New Jersey-Pennsylvania region and the Chicago region.
 - Supply chain selection will relate to national but not be identical
- Focus is fundamentally more granular
 - Local networks
 - Reliance on trucks and truck connections
- Some local data will be needed to supplement performance data that is available on the National Highway System.
 - Need to make “last-mile” links off NHS
 - The local data could include regional travel demand model analysis, or other local data sources, if/where such sources are available.

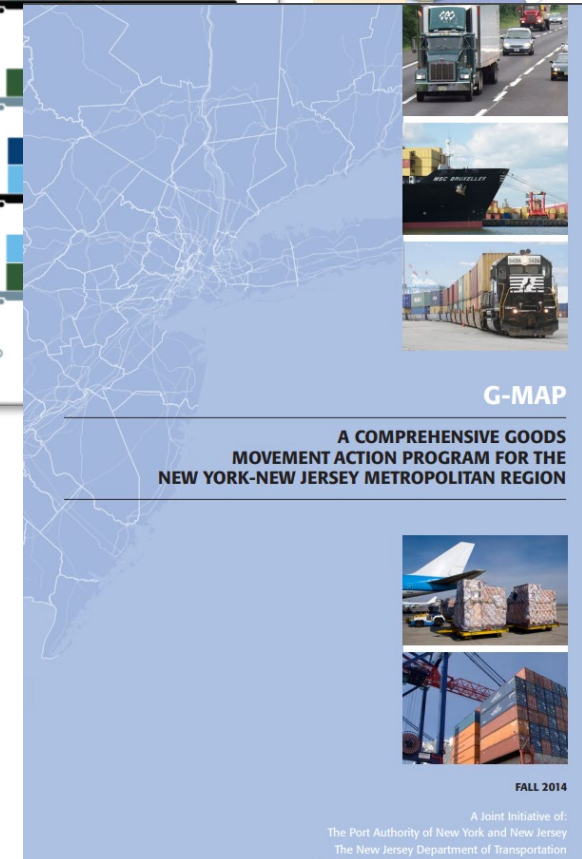
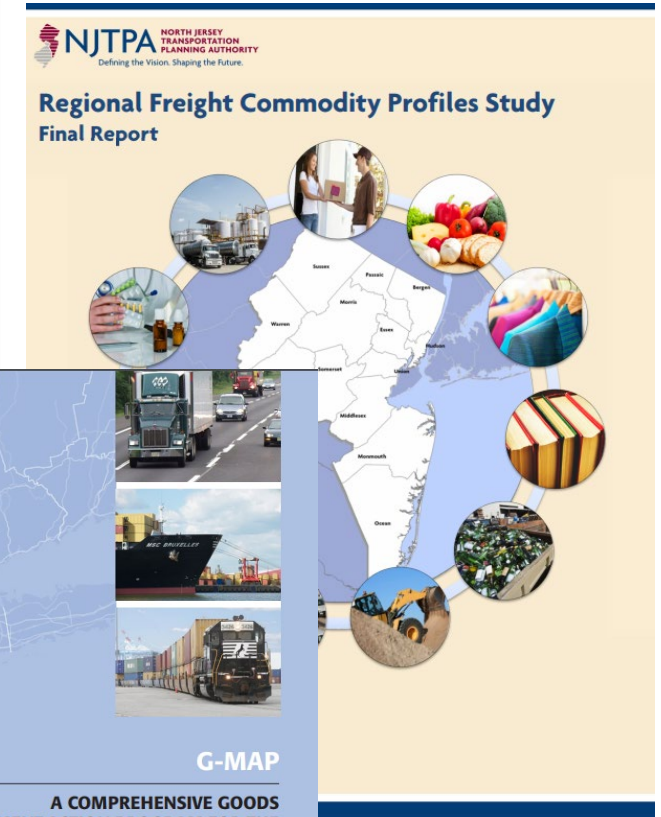
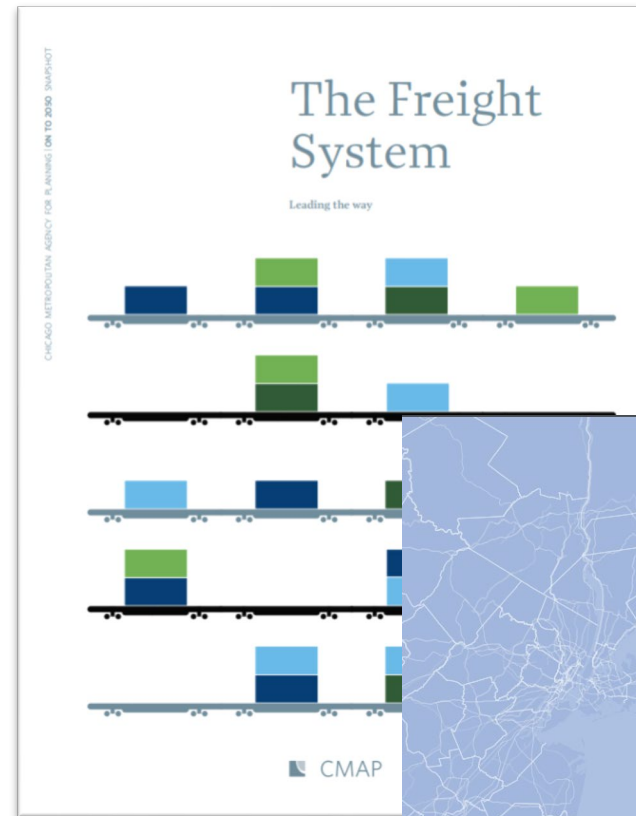


Challenges in the Regional Track

- Regional tools will differ from national - and from other regions
- Regions may have preferred data vendors
- Blends of NHS and local network data probably necessary but probably successful
- Caution required in use of model output data
- Turnover of supply chain facilities could be relatively frequent in Regional Track (e.g. due to shifts in retail)
- Cost data could be hard to obtain in local lanes, but truck reliability/productivity can be a proxy.

Industry Sectors

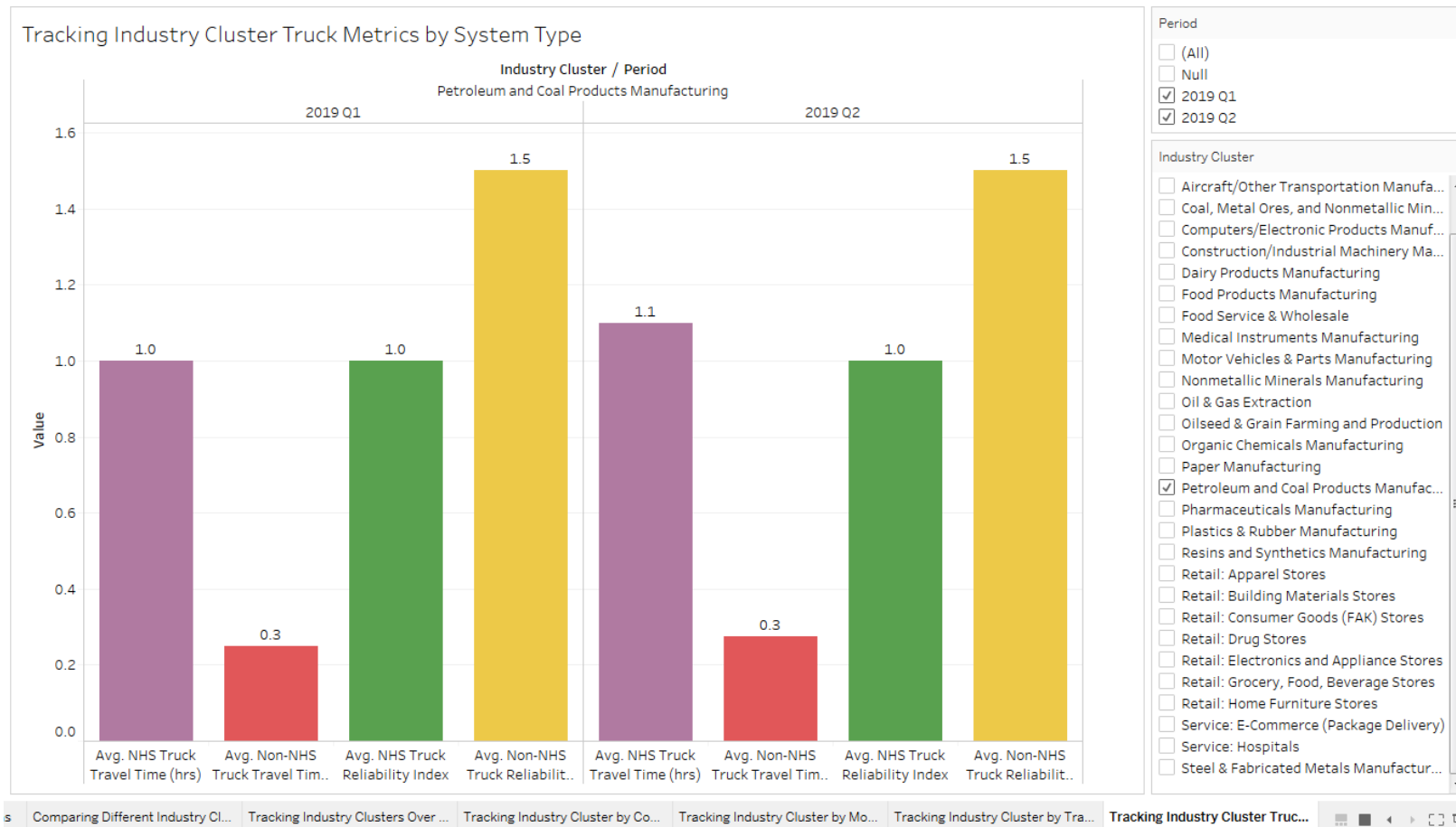
- Leverage:
 - National track analysis for chains in the pilot regions
 - State/regional supply chain research





Non-NHS Performance

Example 8: Tracking Industry Cluster Truck Metrics by System Type





National and Regional Track Freight Fluidity Workshops



National Workshop Format

- Location and Sponsor
 - Washington: FHWA
- Duration
 - One day
 - Morning, 10a-12p – Introductions and Study Framework Presentations
 - Luncheon (provided), option of guest speaker(s)
 - Afternoon, 1p-4p – Interactive/Participatory Workshops and Wrap-Up
- Participants
 - FHWA (Freight Office, others), Other USDOT - BTS, FRA, STB, MARAD, FAA, Office of the Secretary, Dept. of Commerce, Army Corps of Engineers, Dept. of Agriculture, Dept. of Energy, potentially ATA, ARA, AAPA



National Workshop Elements

- Principal content:
 - Purpose: what, why
 - Background: prior work, Canadian program
 - Coverage: supply chains, geography, modes, export/import
 - Data: types, vendors, limitations
 - Platform: tool and accessibility, fit in suite of tools
 - Findings: sectoral quarterly performance, national index
 - Applications: performance trends, “pain point” diagnosis, disruption response, needs of national/regional significance
- Deliverables
 - Workshop material and summary
 - Online guide and seminar



Regional Workshops Format

- Locations and Sponsors
 - New York: PANYNJ
 - Chicago: CMAP
- Duration
 - One day each
 - Morning, 10a-12p – Introductions and Study Framework Presentations
 - Luncheon (provided), option of guest speaker(s)
 - Afternoon, 1p-4p – Interactive/Participatory Workshops and Wrap-Up
- Participants
 - USDOT/FHWA, FHWA Division Office, I95 Corridor Coalition, State DOTs, State Economic Development, State/Local Port Authorities, MPO(s), City DOT(s), City Economic Development, Freight Advisory Committee(s) (shippers, carriers, etc.), Others, as desired



Regional Workshop Elements

- Principal content:
 - Purpose: what, why
 - Background: prior supply chain analysis, regional freight plans
 - Coverage: supply chains, network and geographic granularity, modes and facilities
 - Data: types, level of detail, vendors, limitations
 - Platform: tool and accessibility, suite of tools and interaction
 - Findings: sectoral quarterly performance, regional significance
 - Applications: performance trends, “pain point” diagnosis, disruption response, regional coordination, investment plans, grant applications
- Deliverables
 - Workshop materials and summaries
 - Guidance document (“how to”)



Next Steps

- Complete National Track recruiting of supply chain participants
 - 15-17 in process; target is ~24
- Complete data vendor agreements
 - Scope affected by specific supply chain components
 - Discussions have been held with Chainalytics, INRIX, ATRI
- Meet with regional partners
 - Local objectives, supply chain selection, data alternatives, interactive tools