

Port of Portland Commodity Flow Forecast

Final Project Presentation

presented to

Port of Portland and Stakeholders

presented

by Cambridge Systematics, Inc.

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Transportation leadership you can trust.



Agenda

- Macro-Economic Context
- Data Methodology
- Summary of Base Year Data
- Summary of Future Year Data
- Summary of Written Tasks

Macro-economic Context

Portland's Economy is Supported by Three Goods Movement Functions



International Trade. This is done primarily through the Port of Portland and Port of Vancouver, including marine terminals and the Portland International Airport. It provides access to Pacific Rim trading partners.



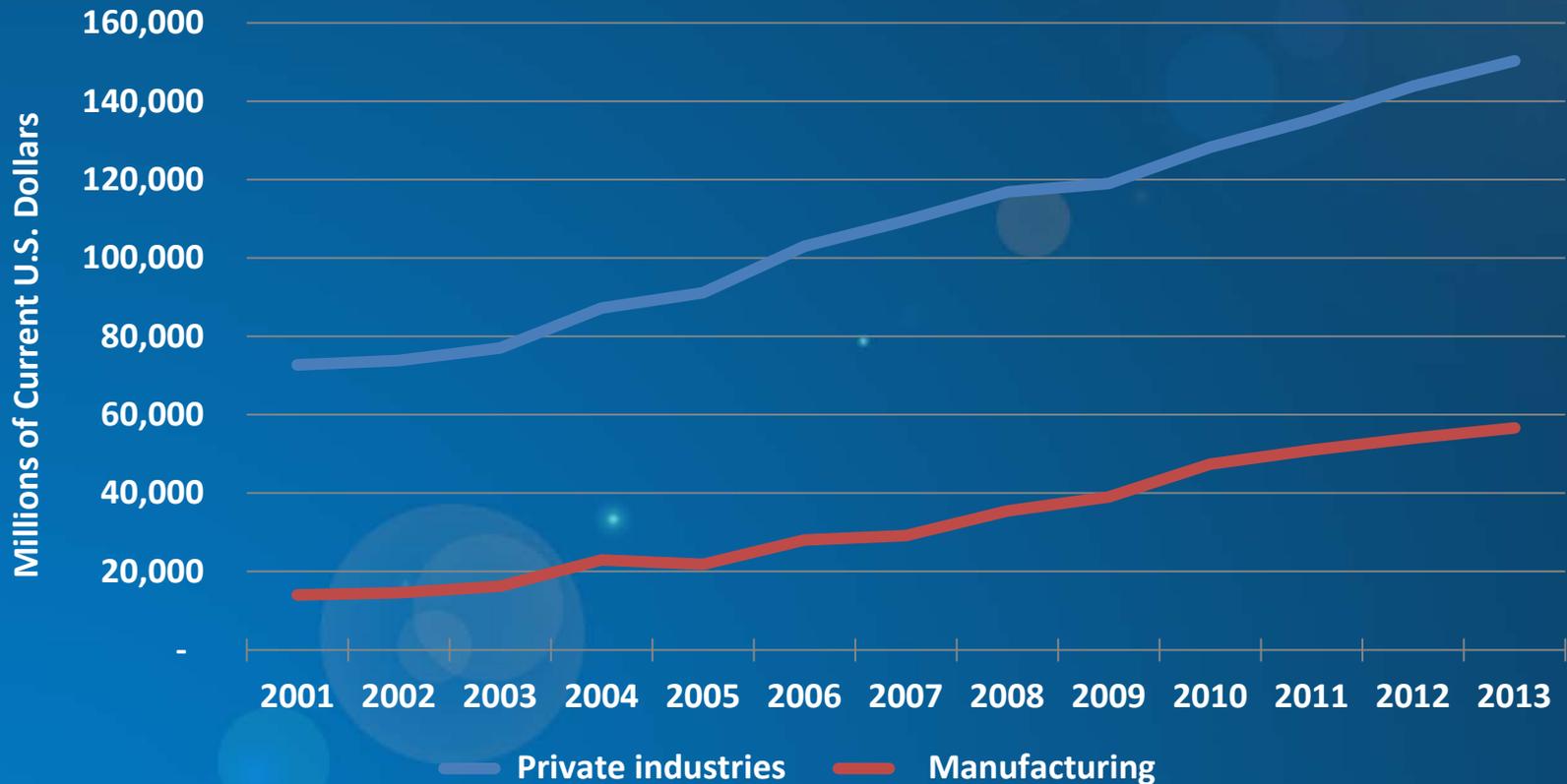
Domestic Trade. Local consumer base relies on industries across the country. The region also supports population centers in other domestic regions. Warehouse and DCs support this function.



Local Deliveries. As a large population center, the region relies on local goods movement to provide consumer products, food, and parcels to residents and businesses.

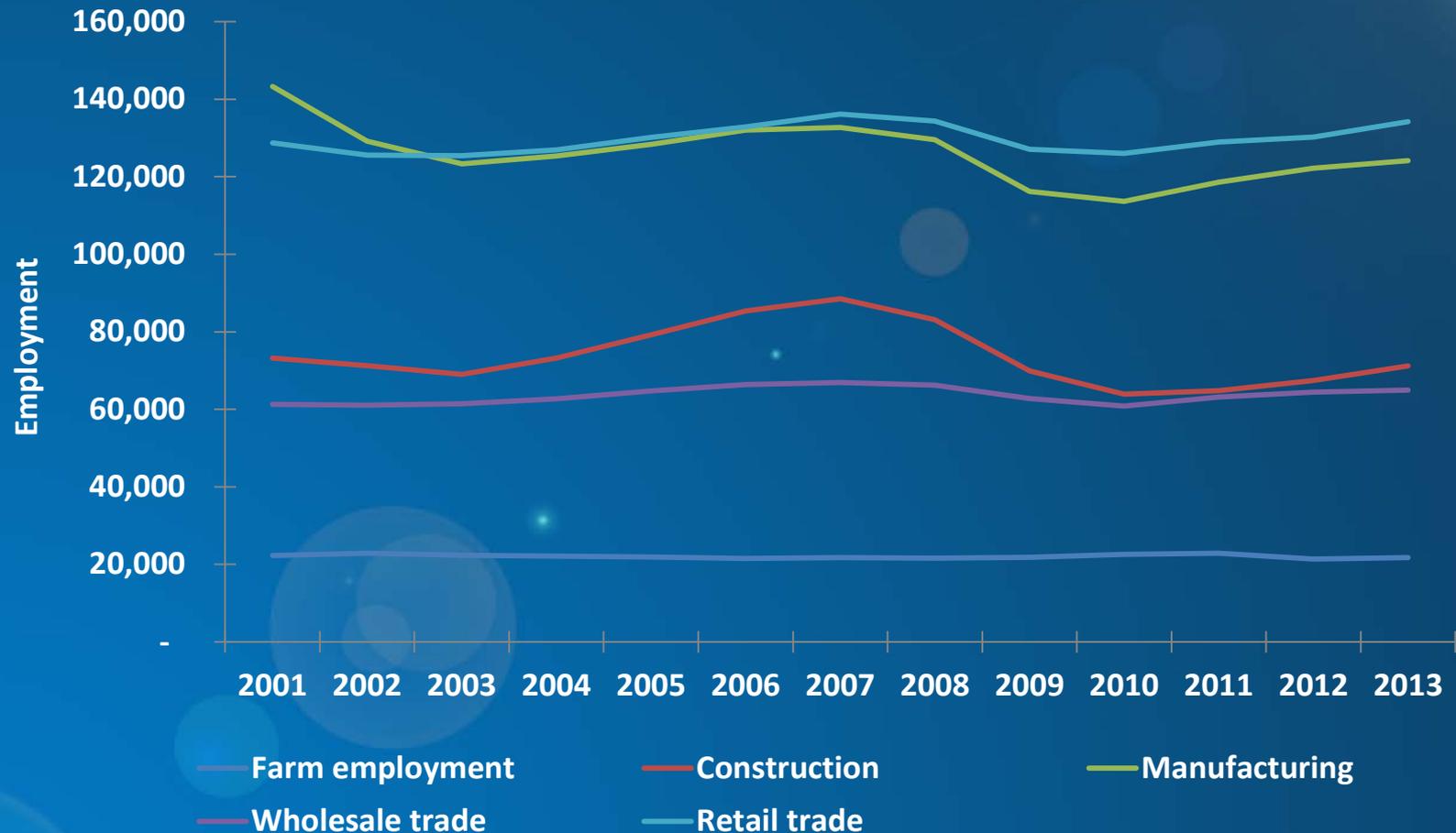
Commodity flows associated with the study area reflect all three goods movement functions.

GDP of Industries in Portland Region



Source: Bureau of Economic Analysis.

Employment of Industries in Portland Region



Source: Bureau of Economic Analysis.

Portland's Key Industries Have Changed Overtime

1. **Forest Products.** Traditionally most important in the region. Currently experiencing domestic declines, but increased overseas import.
2. **Manufacturing.** High-tech electronics is becoming a highly significant sector.
3. **Agriculture.** Traditionally a very important industry in the region. Significant shares of agriculture products are exported to Asia.
4. **Energy.** Energy dependence in the region is shifting from hydroelectric power to other renewable energy sources and natural gas, which creates changes in demand in the future both in terms of commodities and mode.
5. **Waste and Scrap.** Dramatic increases of exports to China in past decade. Waste and scrap is believed to be the most important industry in the U.S. currently.

Forest Products Industry

- In 2010, Oregon lumber and wood production is the highest in the country. It also is a mid-ranking state in terms of paper production.
- Most forest products comes from West Oregon (Lane and Davis Counties).
- Timber production and jobs in these industries has declined, due to reduction of logging on Federal lands.
- The movement of forest products is dependent on U.S. housing and construction markets, and increasingly on exports to China.

Statewide and Westside/Eastside Harvests



Source: Oregon Department of Forestry.

Manufacturing – Hi-Tech

- Hi-tech manufacturing drives growth in manufacturing activities in Portland, especially from Intel's semi-conductor production.
- Oregon has the highest concentration of manufacturing in the country based on relative contribution to GDP
- Large recent capital investments means even more high-tech manufacturing activity in the future.

Oregon GDP in Computers and Electronics and Oregon's Share of the U.S. Total in Billions of Dollars



Source: Bureau of Economic Analysis.

Agriculture

- Oregon's main crops include wheat, hay, nursery products, apples. Wheat farms are concentrated in Umatilla County.
- Oregon agriculture has been rising steadily, but is eroding in terms of total U.S. shares.
- Oregon-origin exports account for 4% total U.S. exports, mostly destined to Asia.
- Food production also is important in Oregon, growing by 17 percent between 2000 and 2010. However, It remained stagnant since 2005.

Value of Oregon-Origin Agricultural Exports, 2000-2012, and Oregon's Share of the U.S. Total in Billions of Dollars

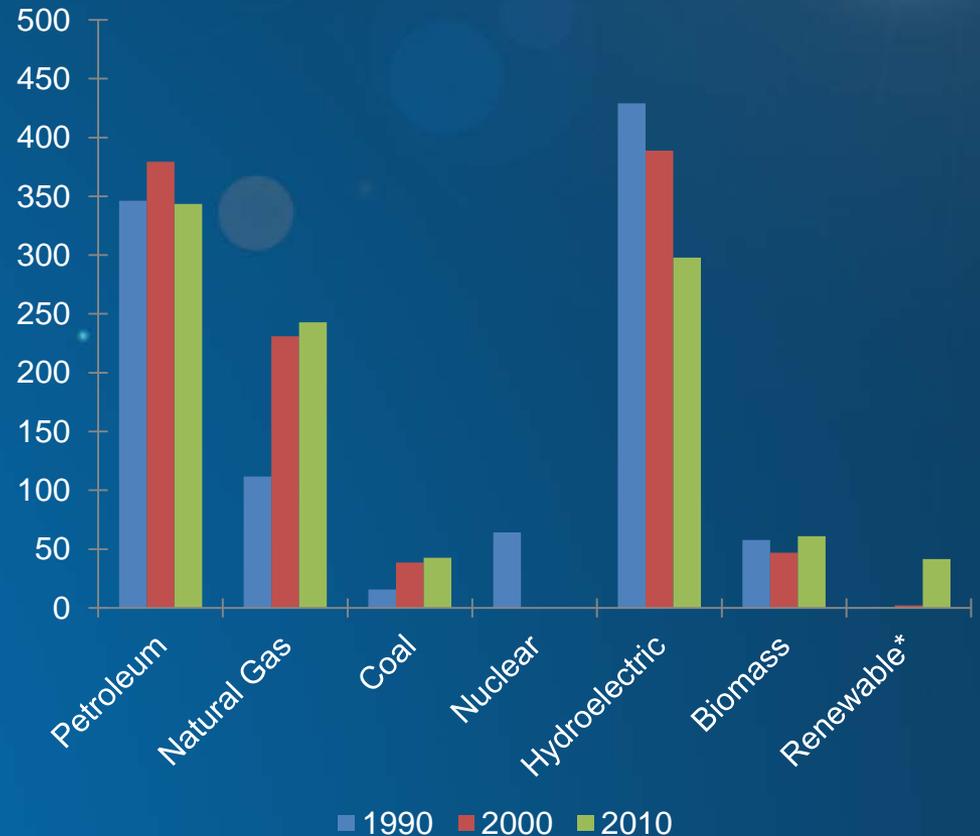


Source: WISERTrade.

Energy

- Oregon energy consumption changed considerably since 2000, where energy consumption actually declined even though population increased.
- About one-third of electricity comes from hydro power, and as the hydroelectricity has declined in use, it is replaced by renewable and natural gas.

Oregon Energy Consumption by Source, 1990, 2000, and 2010 in Trillions of BTUs



Source: U.S.
EIA.

Waste and Scrap

- A fast growing export sector in recent decades due to demand in China for:
 - » Waste scrap metal
 - » Waste paper/cardboard
 - » Waste plastics
- Shredded scrap material comes via rail and truck to the Port of Vancouver. The tonnage of the shredded scrap material has increase dramatically in recent years.
- In the future, though continued demand are expected from China, the market can be volatile.

Data Methodology

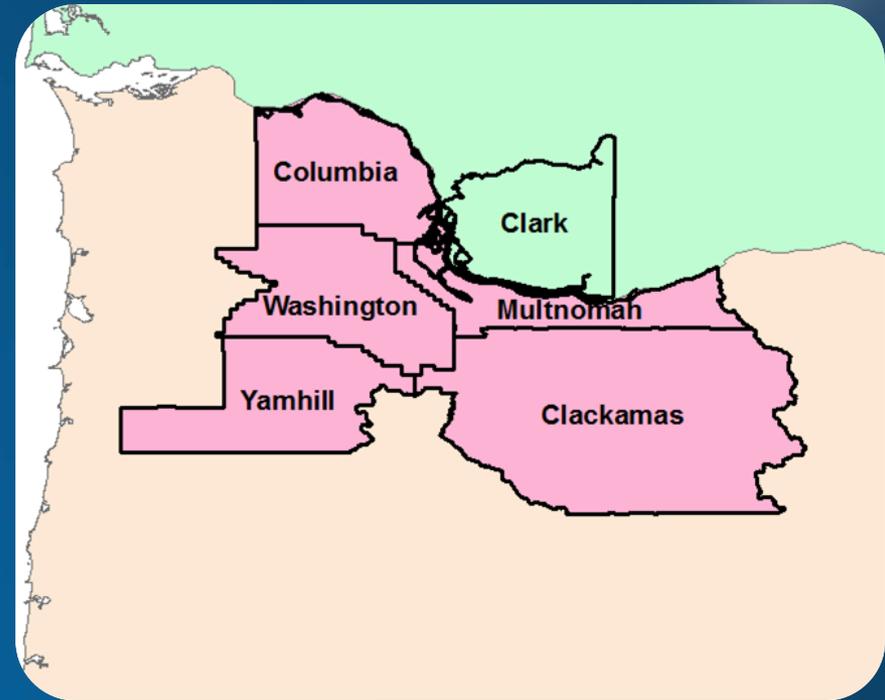
Overview of the Project

Overall Purpose

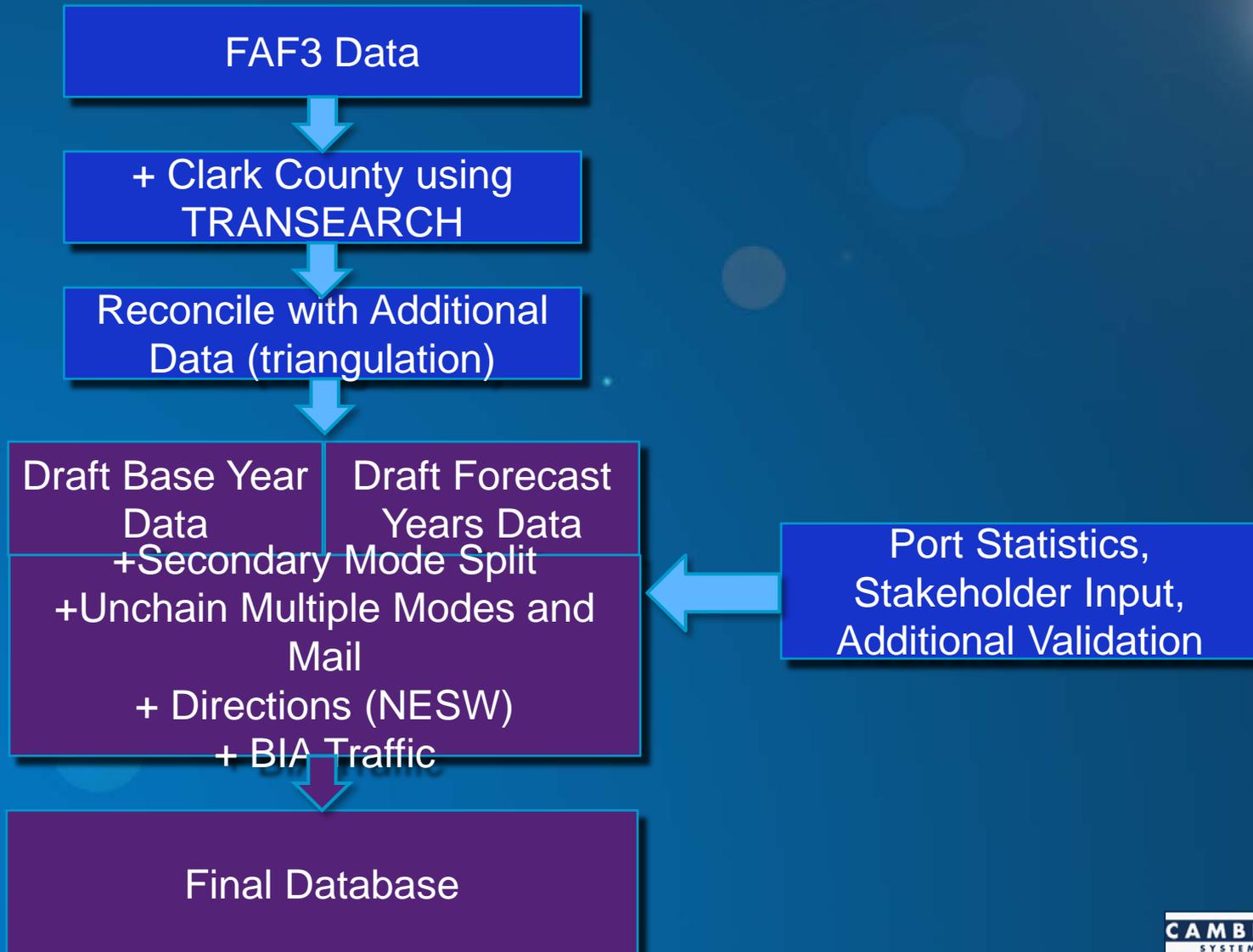
Develop a commodity flow database with future forecast for the Portland-Vancouver Region using baseline FAF data.

Study Area

Consists of the Counties of Columbia, Washington, Multnomah, Yamhill and Clackamas in Oregon, and Clark in Washington.



Overall Methodology



Secondary Mode Split (for International Movements)

Goal: Split foreign ocean modes and air modes into domestic modes.
 - Results in double-counting, but can toggle on/off depending on purpose.



FAF
Database

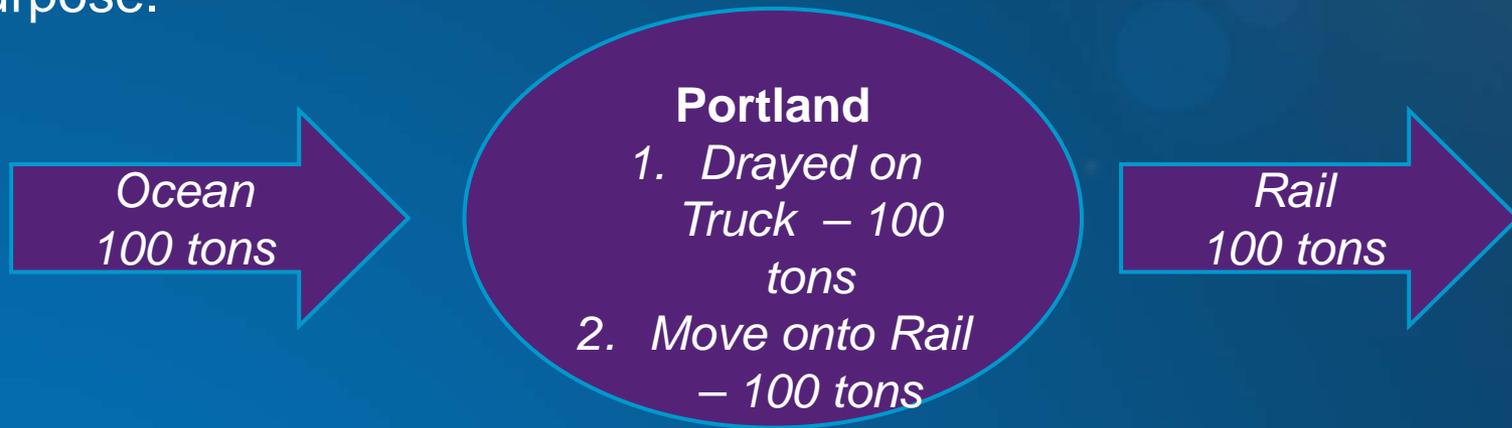
Foreign Mode	Domestic Mode	Inbound	Outbound	Intra	Total
Water	Truck		100		100
Total			100		100

Our
Database

Mode	Inbound	Outbound	Intra	Total
Ocean	100			100
Truck		100		100
Total	100	100		200

Secondary Mode Split (for International Movements) – Cont'd

Goal: Split foreign ocean modes and air modes into domestic modes.
 - Results in double-counting, but can toggle on/off depending on purpose.



FAF Database

Foreign Mode	Domestic Mode	Inbound	Outbound	Intra	Total
Water	Multiple Modes		100		100
Total			100		100

Our Database

Mode	Inbound	Outbound	Intra	Total
Ocean	100			100
Truck			100	100
Rail		100		100
Total	100	100	100	300

Unchaining Multiple Modes and Mail

- Data used:
 - » Barge – USACE
 - » Intermodal and Drayage – TRANSEARCH and STB Waybill
 - » Air – FAA

Unchain Multiple Modes and Mail

Goal: Split multiple modes in study area into its sub-modes.
 - Results in double-counting in some cases. Hard coded in database.



FAF Database

Mode	Intra	Inbound	Outbound	Through	Total
Mixed Mode				20	20
Total				20	20

Our Database

Mode	Intra	Inbound	Outbound	Through	Total
Truck		20			20
Rail			20		20
Total		20	20		40

Unchain Multiple Modes and Mail – Cont'd

Goal: Split multiple modes in study area into its sub-modes.
 - Results in double-counting in some cases. Hard coded in database.



FAF Database

Mode	Intra	Inbound	Outbound	Through	Total
Mixed Mode		30			30
Total		30			30

Our Database

Mode	Intra	Inbound	Outbound	Through	Total
Water		30			30
Total		30			30

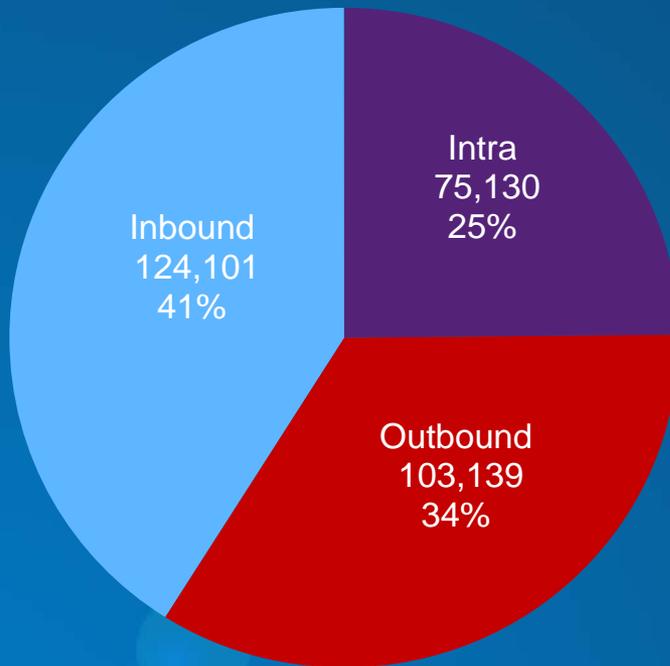
Summary of Base Year Data (2007)

Adjustments to Base Year Volumes

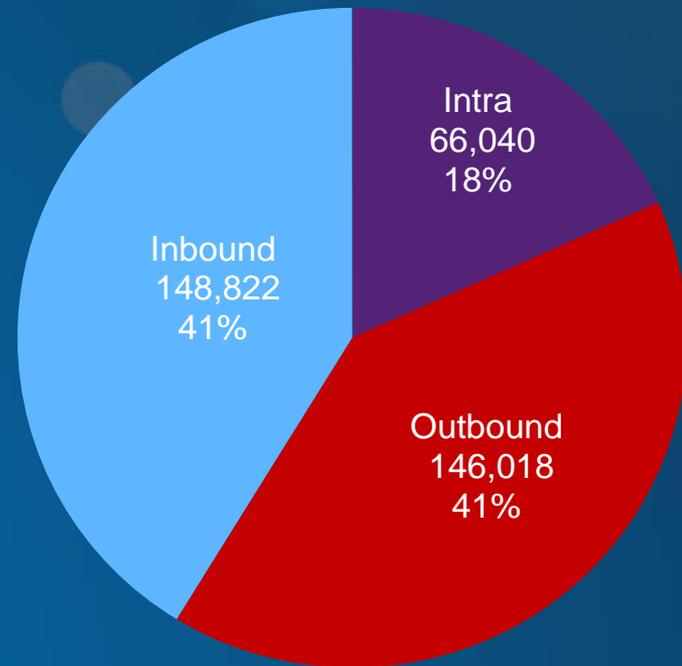
- Auto imports. Flows were reassigned so that total rail volumes matched the ports' statistics, with destination assigned in proportion to the volumes in the 2007 Carload Waybill Sample.
- Waste/Scrap. Base year calculated and adjusted using local municipal and industrial waste and scrap material volumes.
- Multiple other commodity groups checked with calculations from local data sources (such as pipeline flows using Kinder Morgan data). Original FAF3 volumes retains after comparison.

Flows by Direction*

Tonnage (Thousand of Tons)

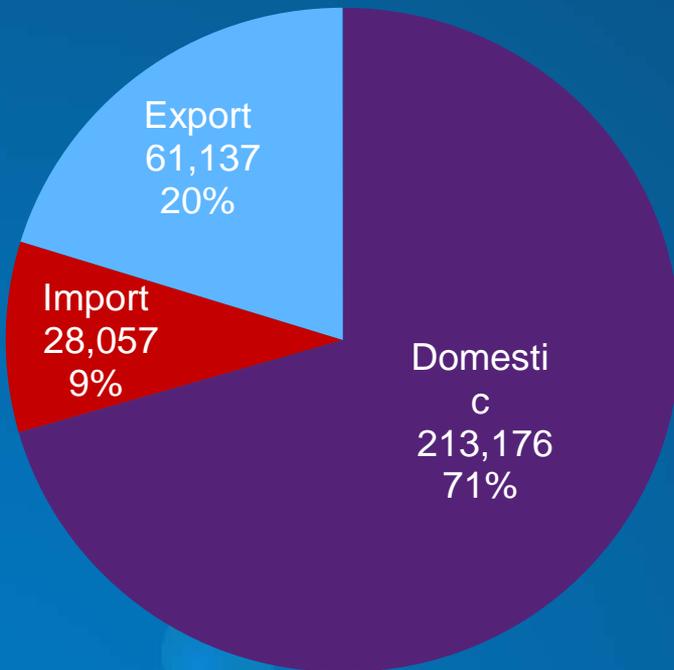


Value (Million of Dollars)

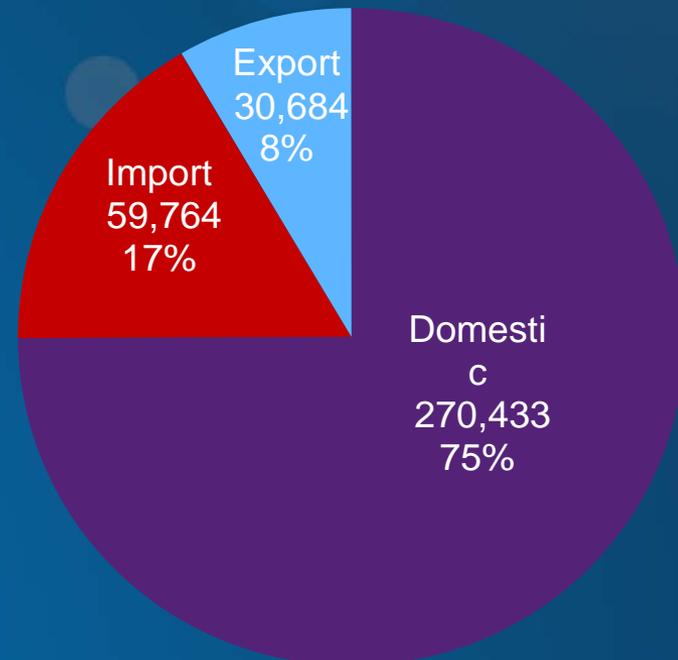


Flows by Trade Type

Tonnage (Thousands of Tons)

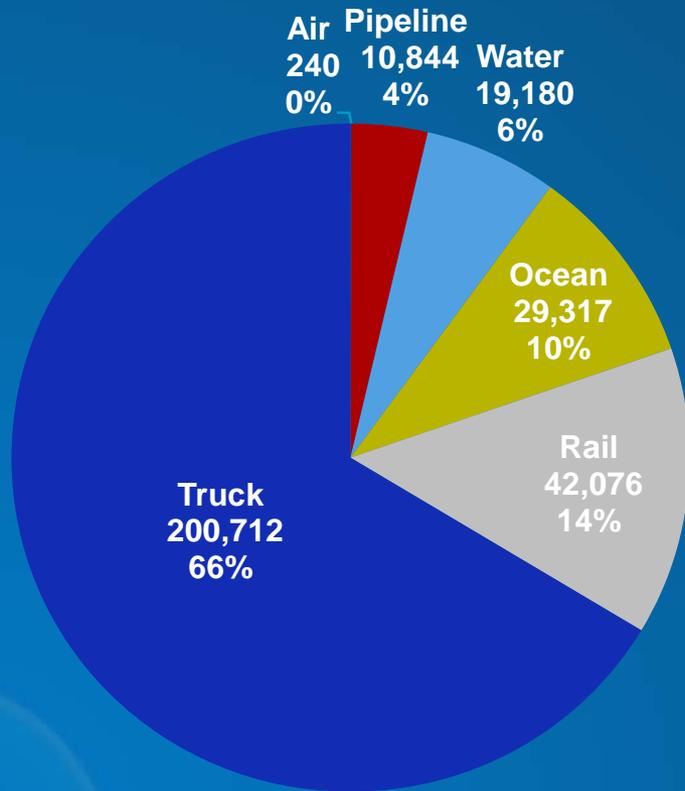


Value (Million of Dollars)

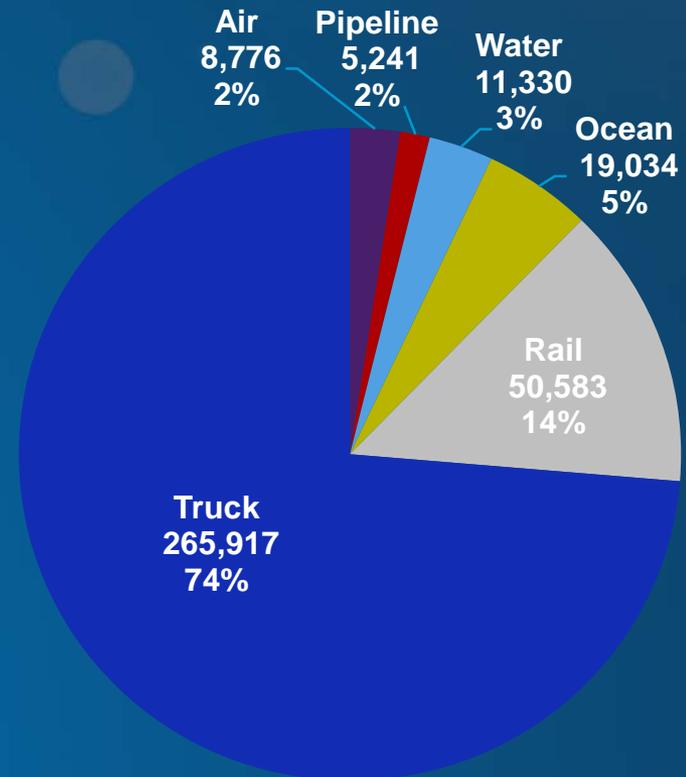


Flows by Mode

Tonnage (Thousands of Tons)

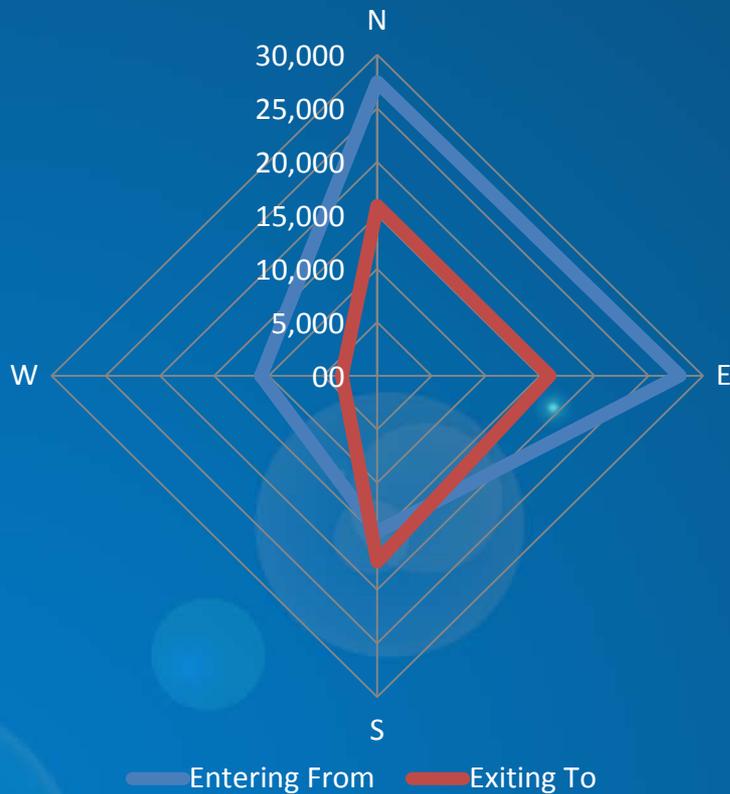


Value (Million of Dollars)

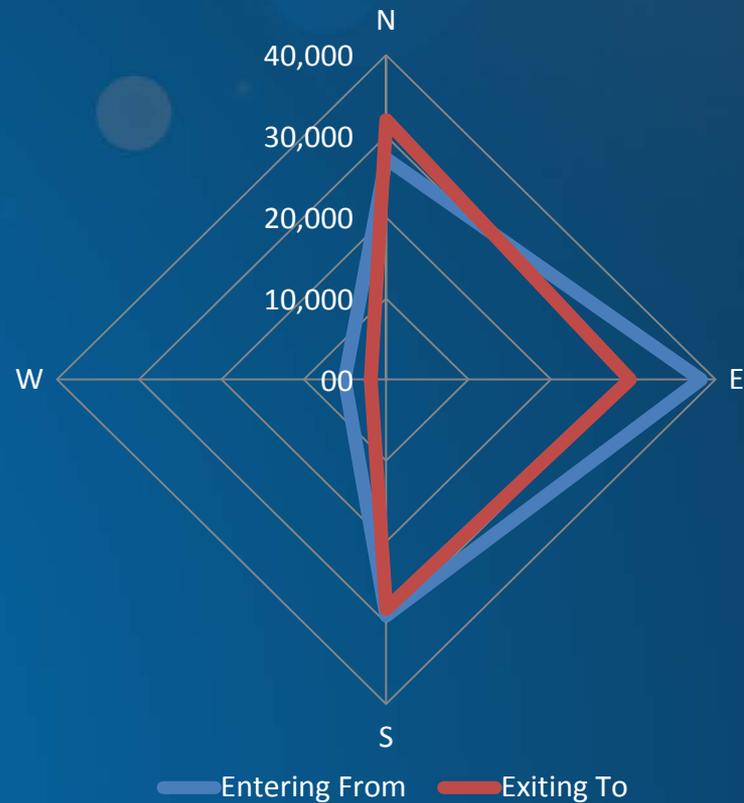


Domestic Flows by Direction (NESW)

Tonnage (Thousand of Tons)

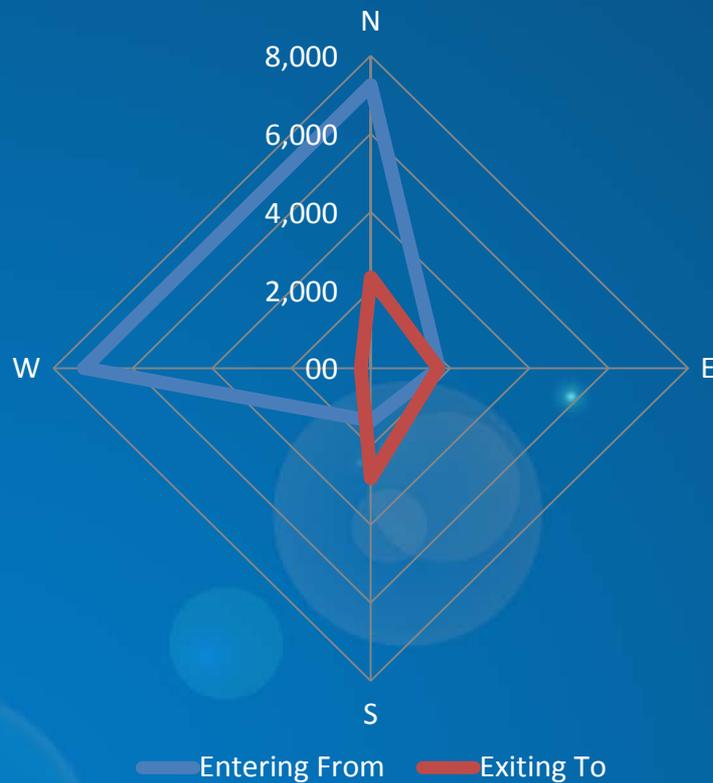


Value (Million of Dollars)

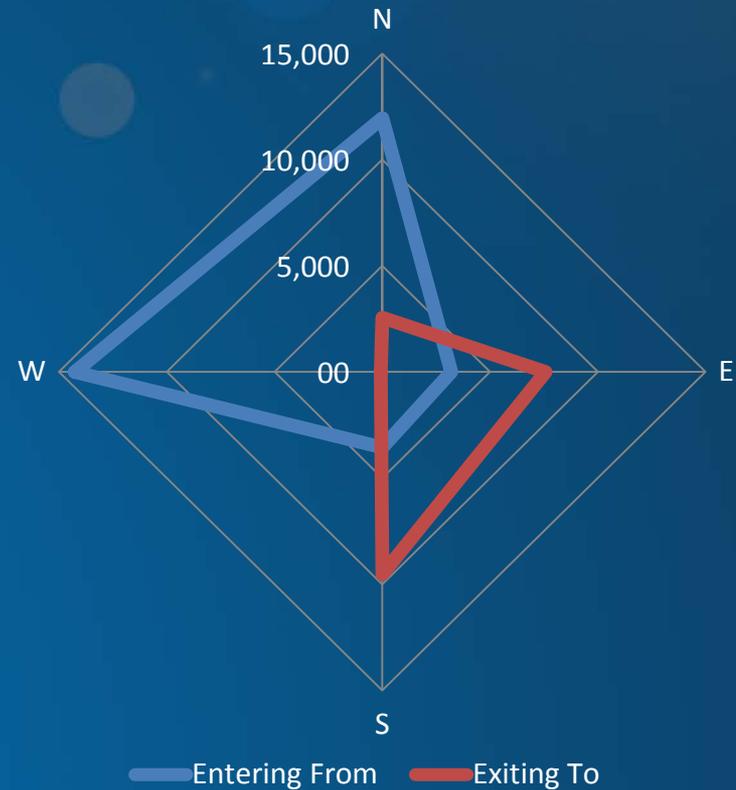


Import Flows by Direction (NESW)

Tonnage (Thousands of Tons)

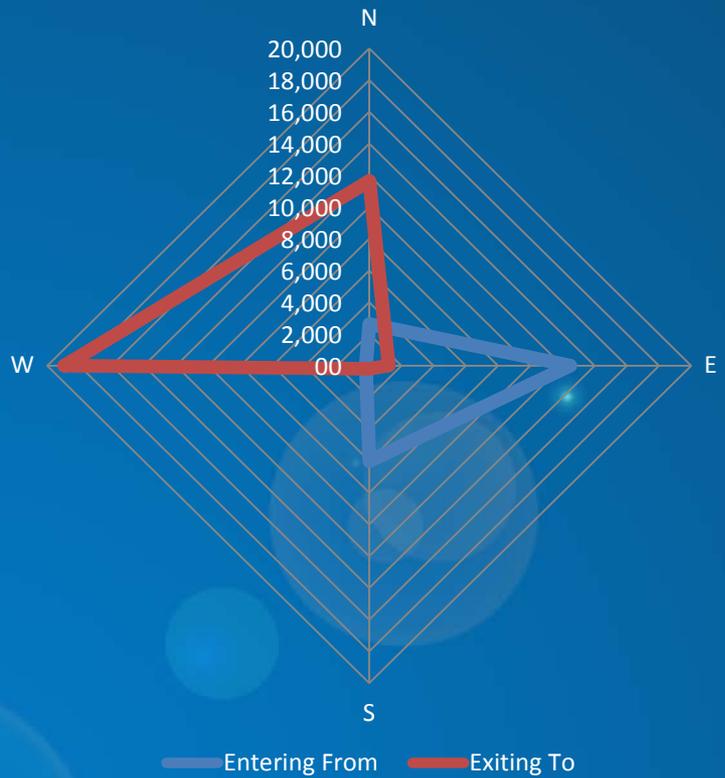


Value (Million of Dollars)

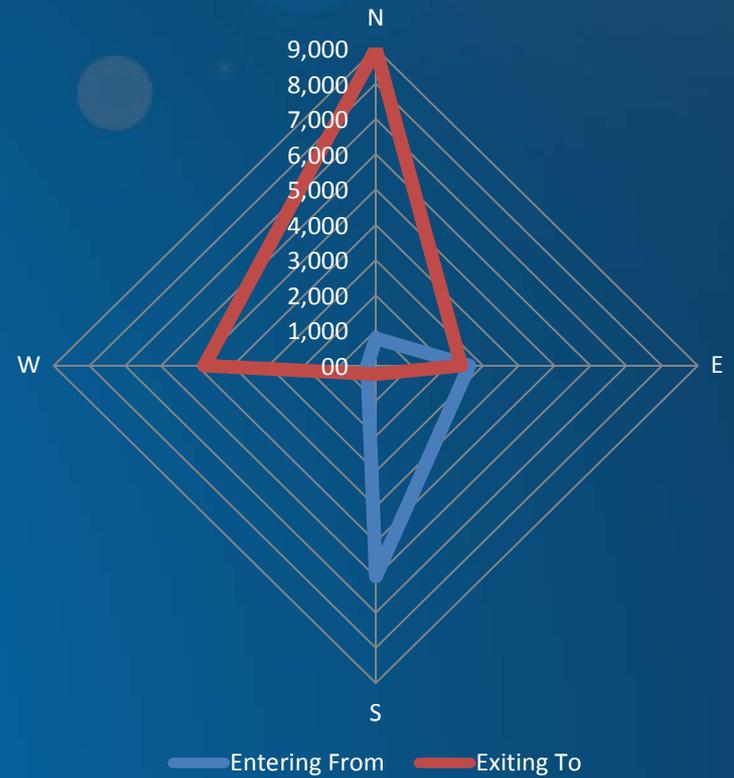


Export Flow by Direction (NESW)

Tonnage (Thousands of Tons)

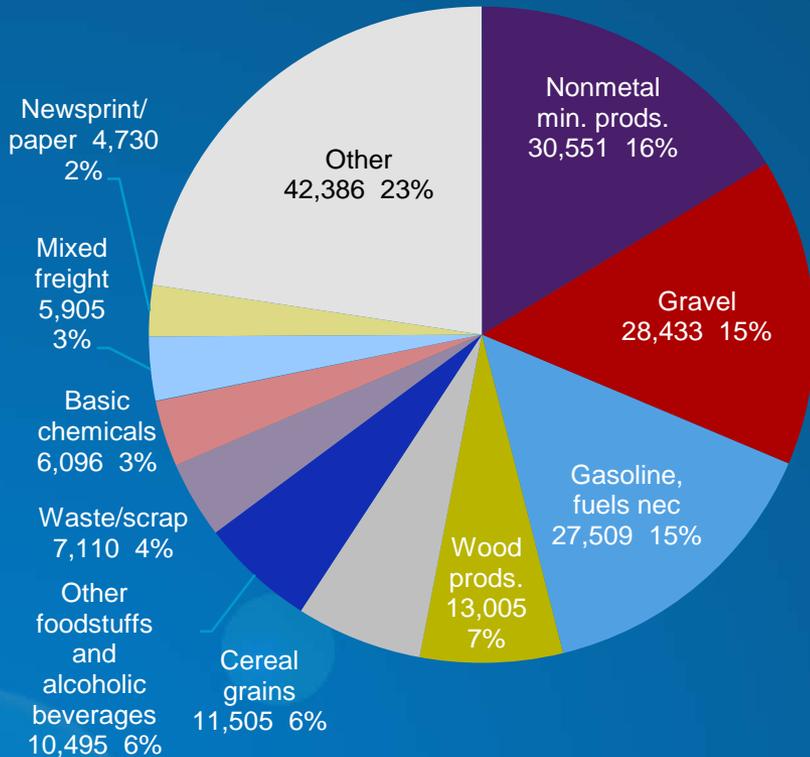


Value (Million of Dollars)

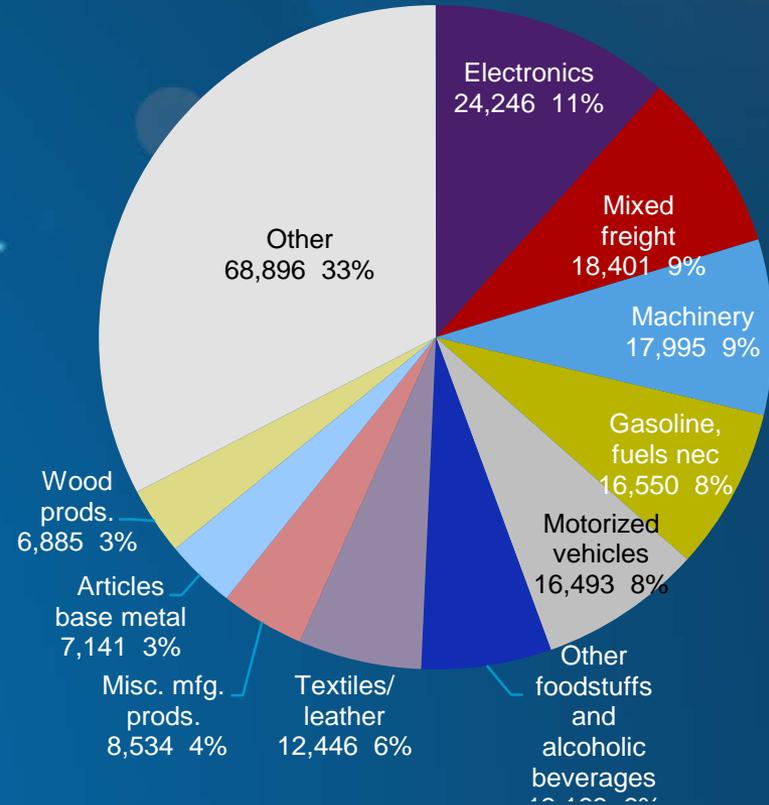


Top Domestic Commodities

Tonnage (Thousand of Tons)

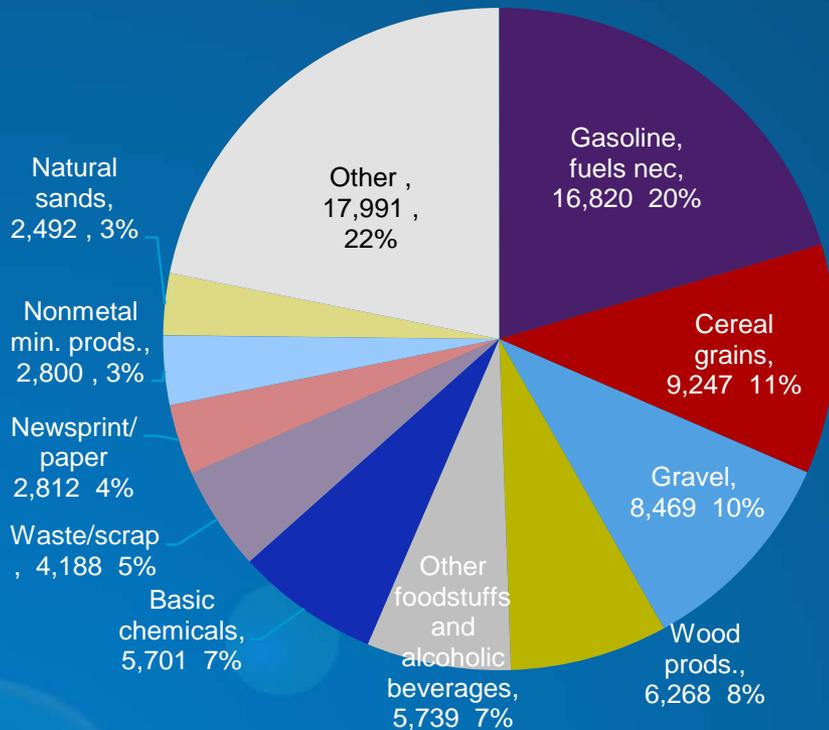


Value (Million Dollars)

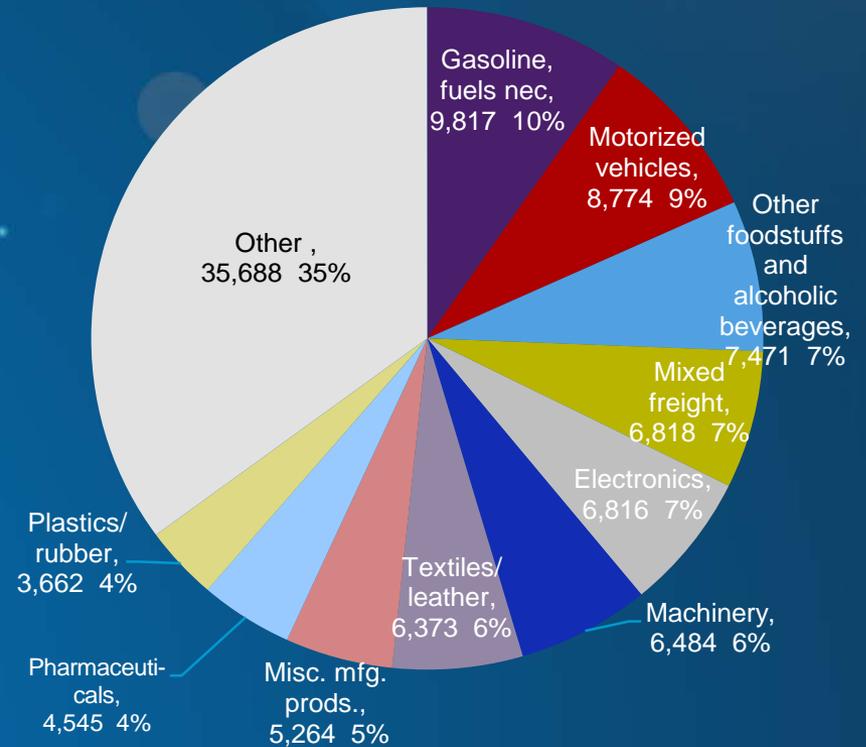


Top Domestic Commodities – Inbound

Tonnage (Thousand of Tons)

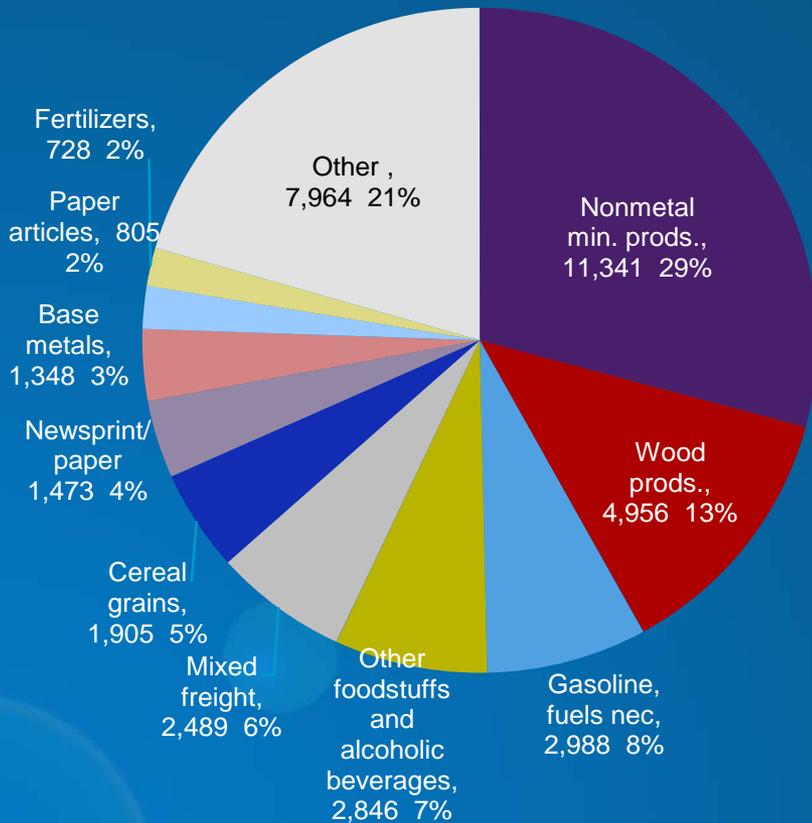


Value (Million of Dollars)

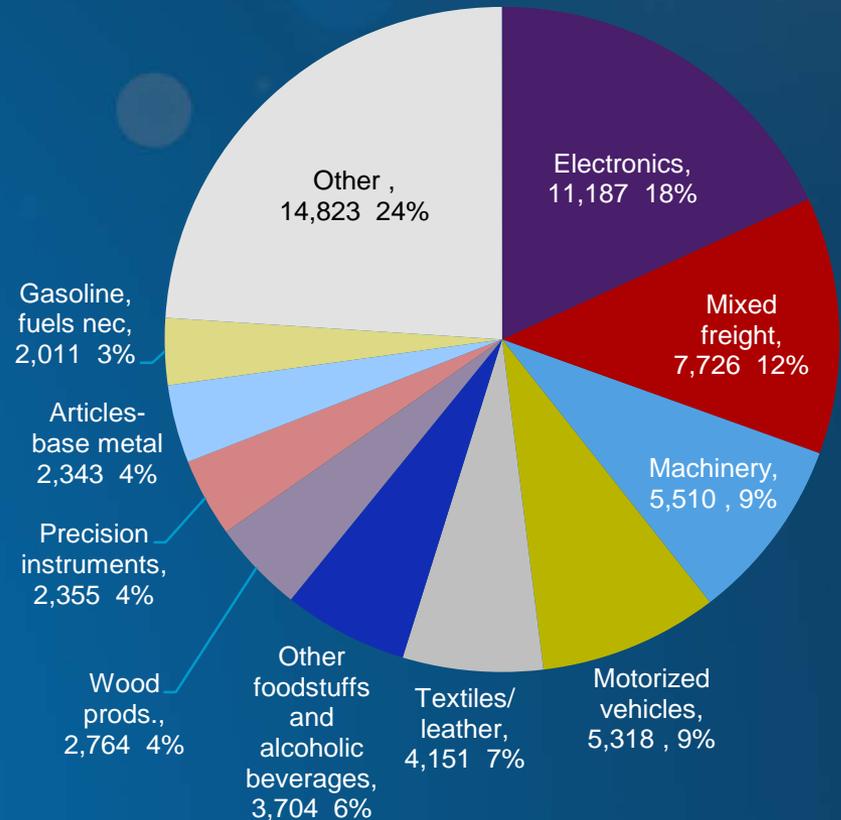


Top Domestic Commodities – Outbound

Tonnage (Thousands of Tons)

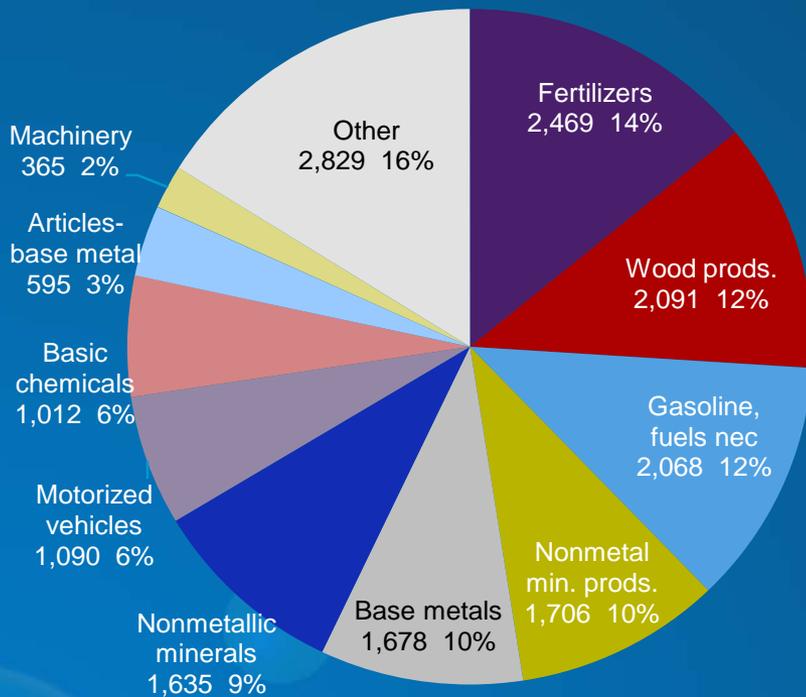


Value (Millions of Dollars)

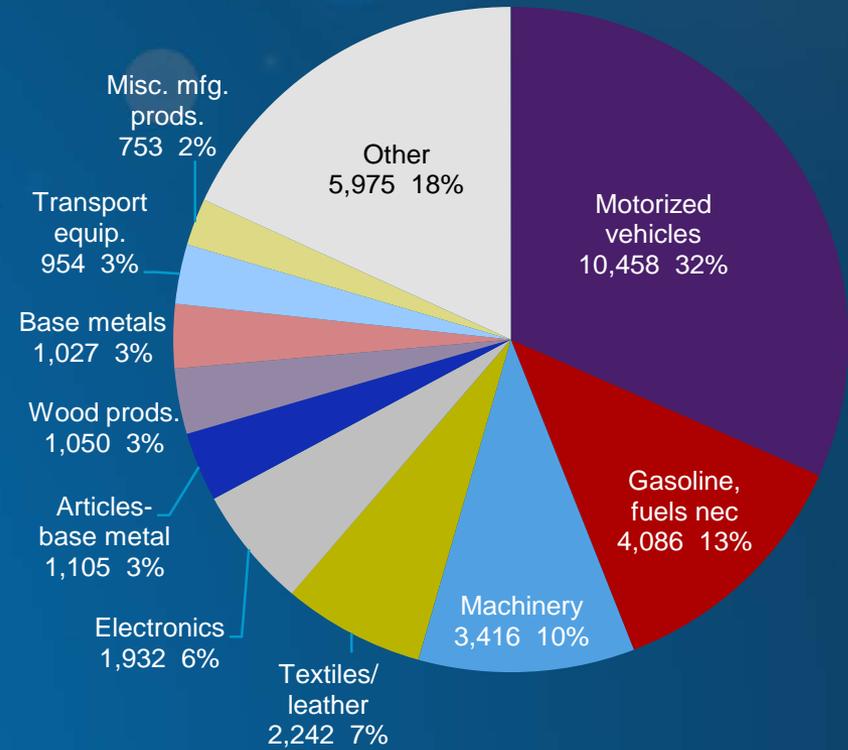


Top Import Commodities

Tonnage
(Thousands of Tons)

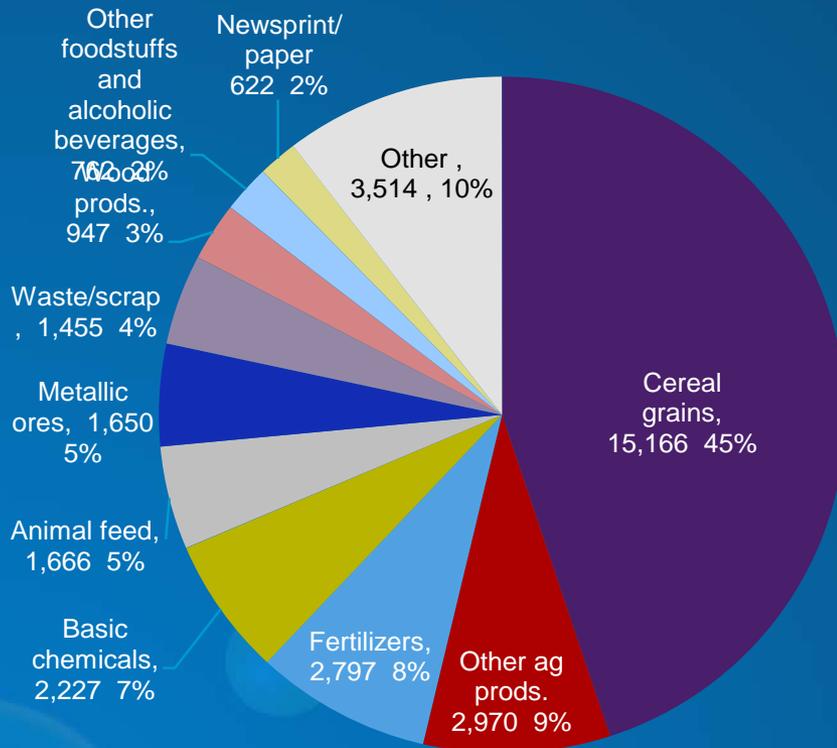


Value
(Millions of Dollars)

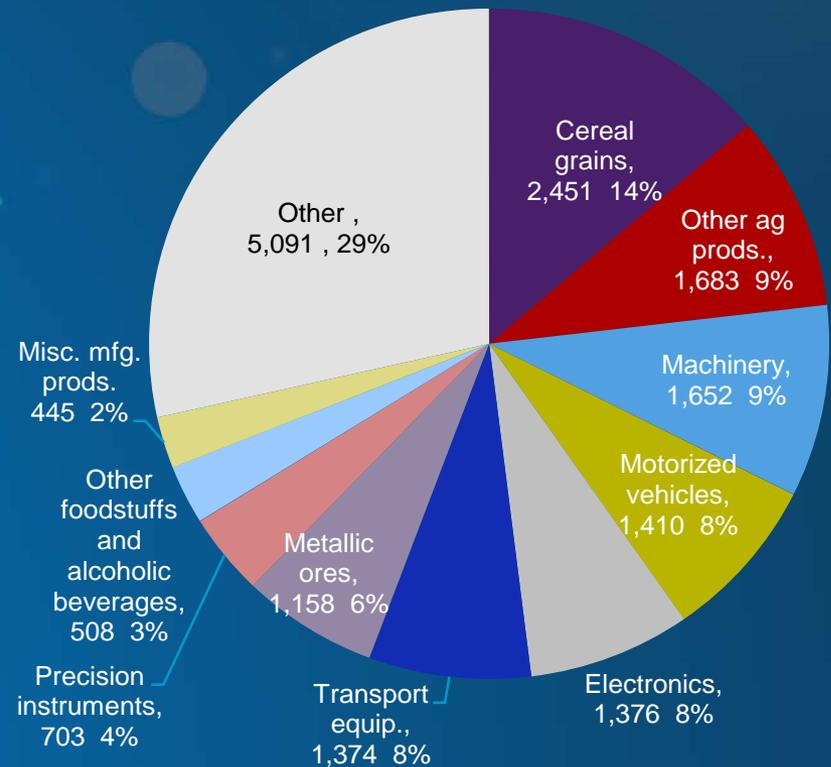


Top Export Commodities

Tonnage (Thousands of Tons)



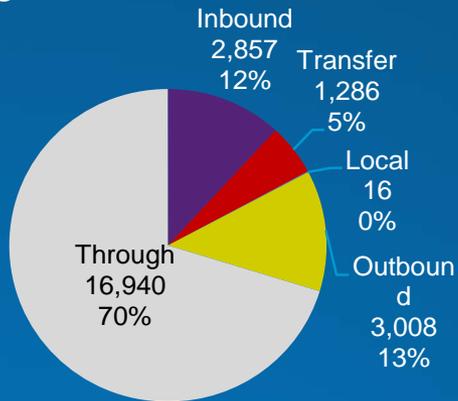
Value (Million Dollars)



Bridge Influence Area Flows

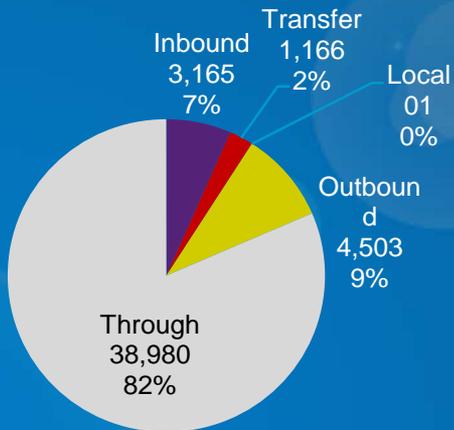
Tonnage (ktons)

I-5



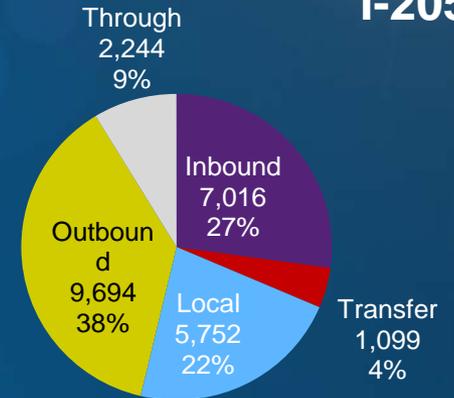
Value (\$M)

I-5



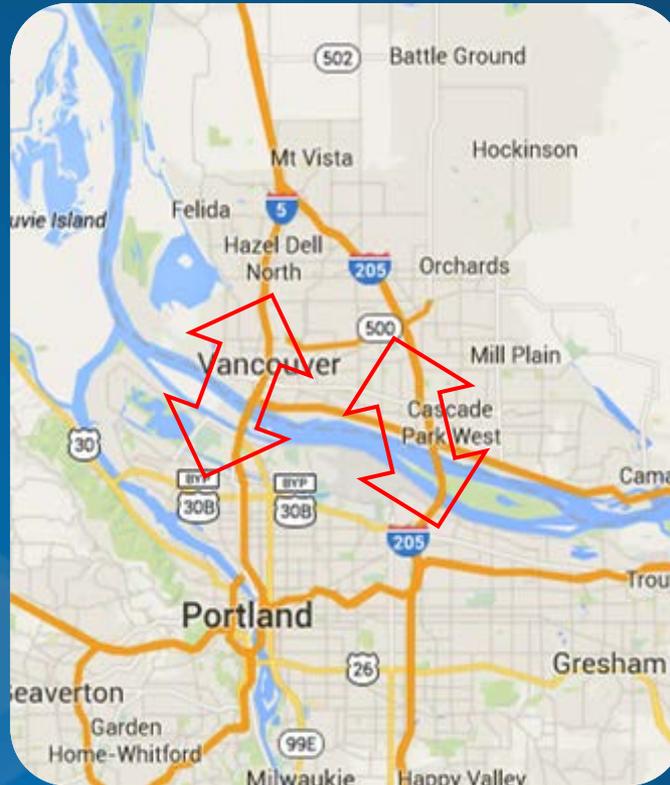
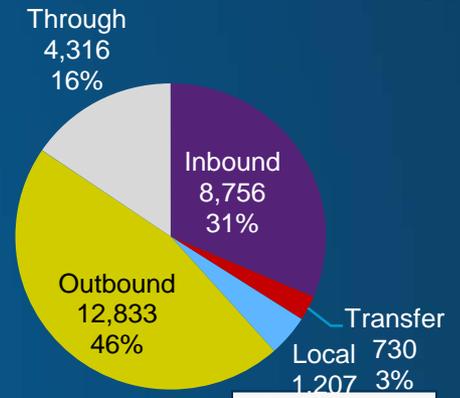
Tonnage (ktons)

I-205



Value (\$M)

I-205





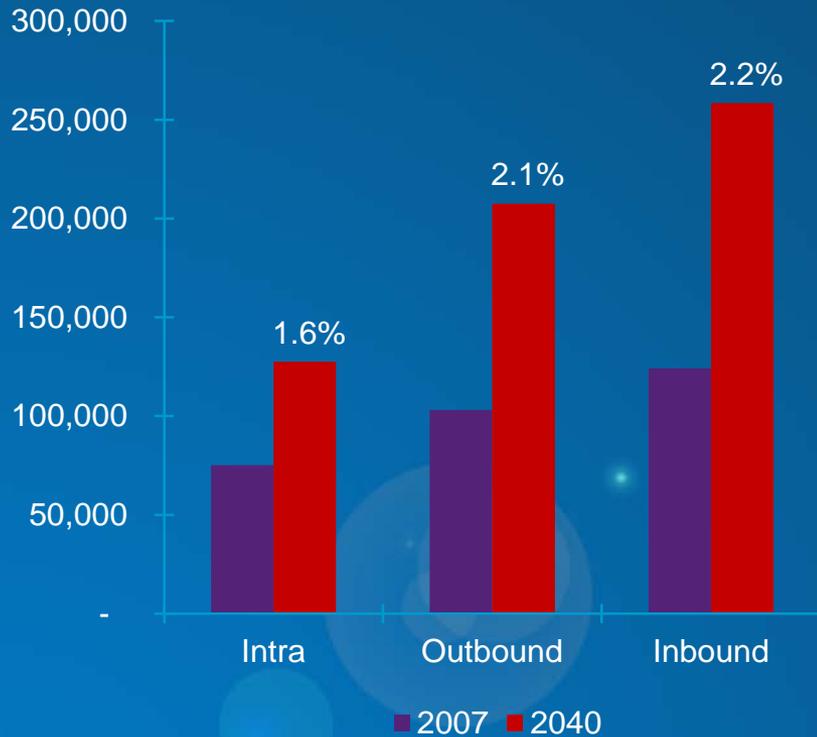
Future Year Data

Adjustments to Future Volumes

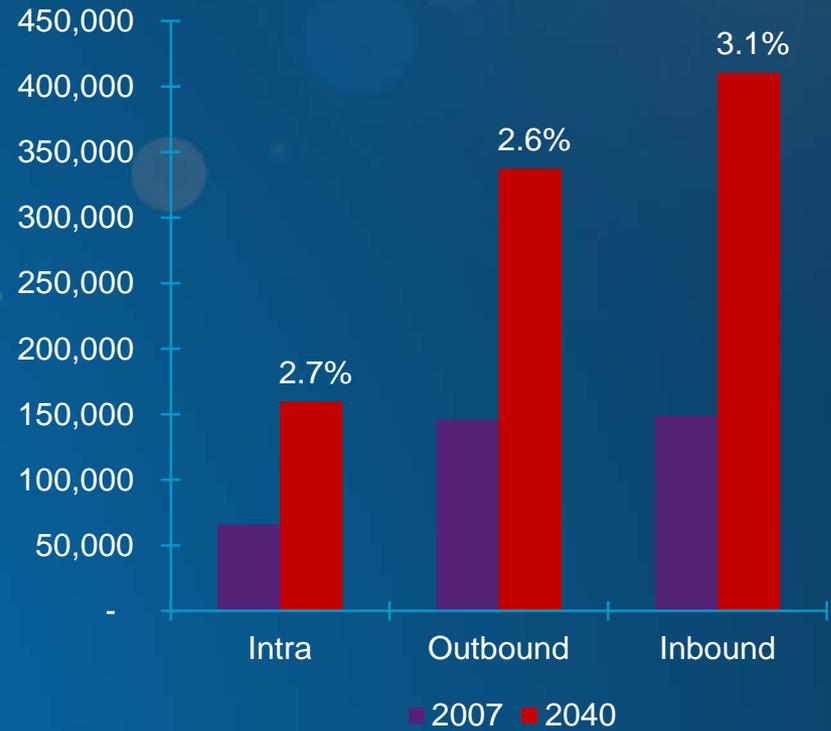
- **Cereal Grain.** Existing FAF forecasts for originated grain could not be supported. Grain tons were forecasted using IHS production forecasts.
- **Auto imports.** Flows were reassigned so that total rail volumes matched the ports' statistics, with destination assigned in proportion to the volumes in the 2007 Carload Waybill Sample.
- **Non-metallic mineral products.** FAF3 growth is unrealistically high. Growth rates adjusted using HIS forecast rates based on the most recent County Business Forecasts.
- **Precision Instruments.** FAF3 growth unrealistically high. Growth rates adjusted based on most recent version of County Business Forecasts.

Growth of Flows by Direction*

Tonnage (ktons)



Value (\$M)



Growth of Flows by Trade Type

Tonnage (ktons)

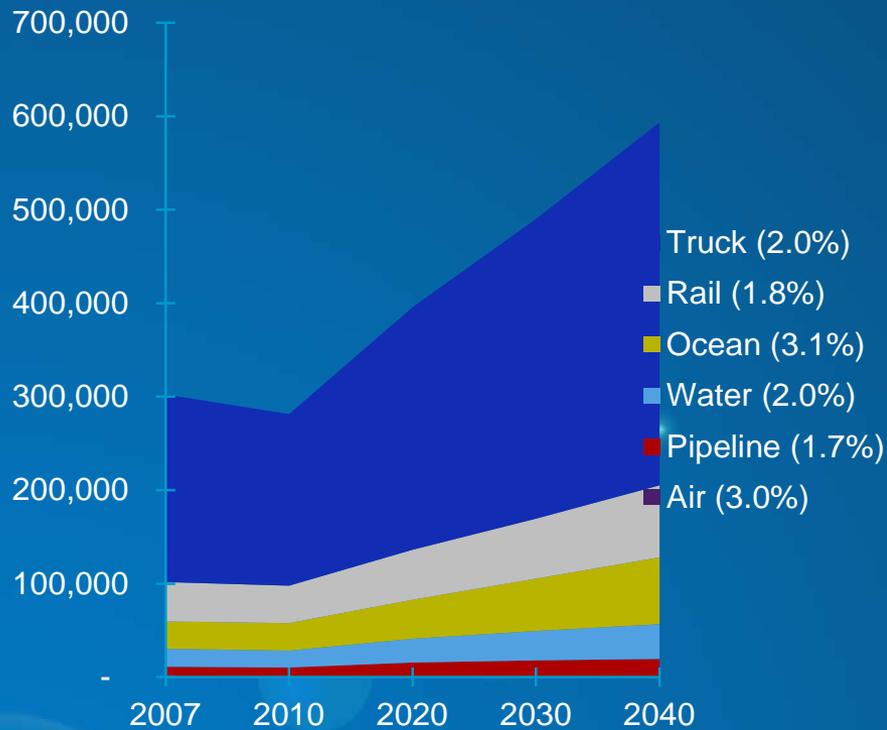


Value (\$M)

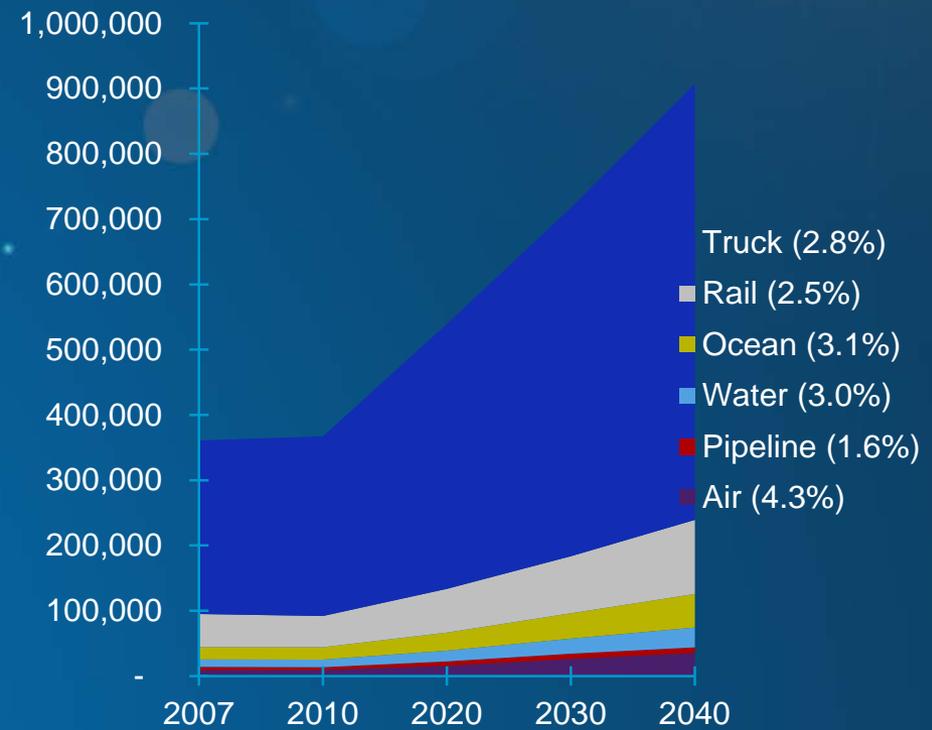


Growth of Flows by Mode

Tonnage (ktons)



Value (\$M)



Growth of Domestic Flows by Direction (NSEW)

Tonnage (ktons)

Entering from	2007	2040	CAGR	Exiting to	2007	2040	CAGR
N	27,440	47,797	1.7%	N	15,882	25,875	1.5%
E	27,855	51,492	1.9%	E	15,866	23,923	1.3%
S	14,564	27,340	1.9%	S	17,378	22,829	0.8%
W	10,691	17,398	1.5%	W	3,246	4,251	0.8%

Value (\$M)

Entering from	2007	2040	CAGR	Exiting to	2007	2040	CAGR
N	27,203	69,427	2.9%	N	31,985	67,532	2.3%
E	38,215	91,976	2.7%	E	29,614	52,973	1.8%
S	29,125	62,443	2.3%	S	28,279	53,980	2.0%
W	5,024	9,555	2.0%	W	1,883	3,717	2.1%

Growth of Import Flows by Direction (NSEW)

Tonnage (ktons)

Entering From	2007	2040	CAGR	Exiting To	2007	2040	CAGR
N	7,243	19,511	3.0%	N	2,325	6,961	3.4%
E	1,716	5,562	3.6%	E	1,700	3,487	2.2%
S	1,342	4,922	4.0%	S	2,812	7,377	3.0%
W	7,225	18,748	2.9%	W	247	478	2.0%

Value (\$M)

Entering From	00	00	CAGR	Exiting To	00	00	CAGR
N	11,946	44,924	4.1%	N	2,550	11,017	4.5%
E	3,196	18,226	5.4%	E	7,575	9,754	0.8%
S	3,553	17,659	5.0%	S	9,529	32,371	3.8%
W	14,264	36,711	2.9%	W	73	288	4.2%

Growth of Export Flows by Direction (NSEW)

Tonnage (ktons)

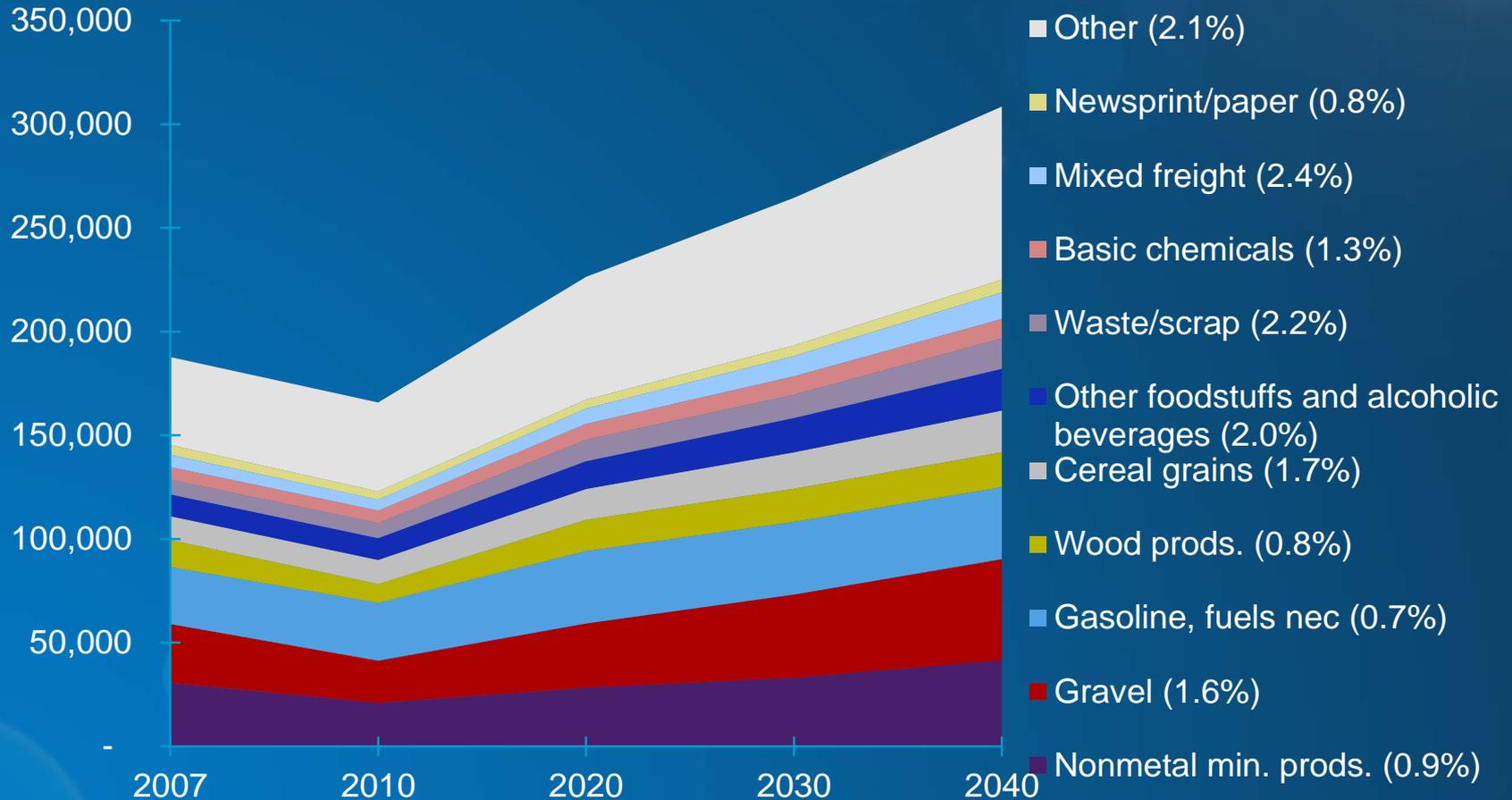
Entering From	2007	2040	CAGR	Exiting To	2007	2040	CAGR
N	2,635	6,447	2.7%	N	11,642	37,624	3.6%
E	12,484	26,765	2.3%	E	1,201	3,706	3.5%
S	6,023	19,545	3.6%	S	197	831	4.5%
W	209	862	4.4%	W	18,937	44,084	2.6%

Value (\$M)

Entering From	00	00	CAGR	Exiting To	00	00	CAGR
N	778	2,618	3.7%	N	8,991	33,593	4.1%
E	2,618	8,079	3.5%	E	2,392	8,201	3.8%
S	5,986	23,881	4.3%	S	243	1,128	4.8%
W	235	957	4.4%	W	4,794	17,410	4.0%

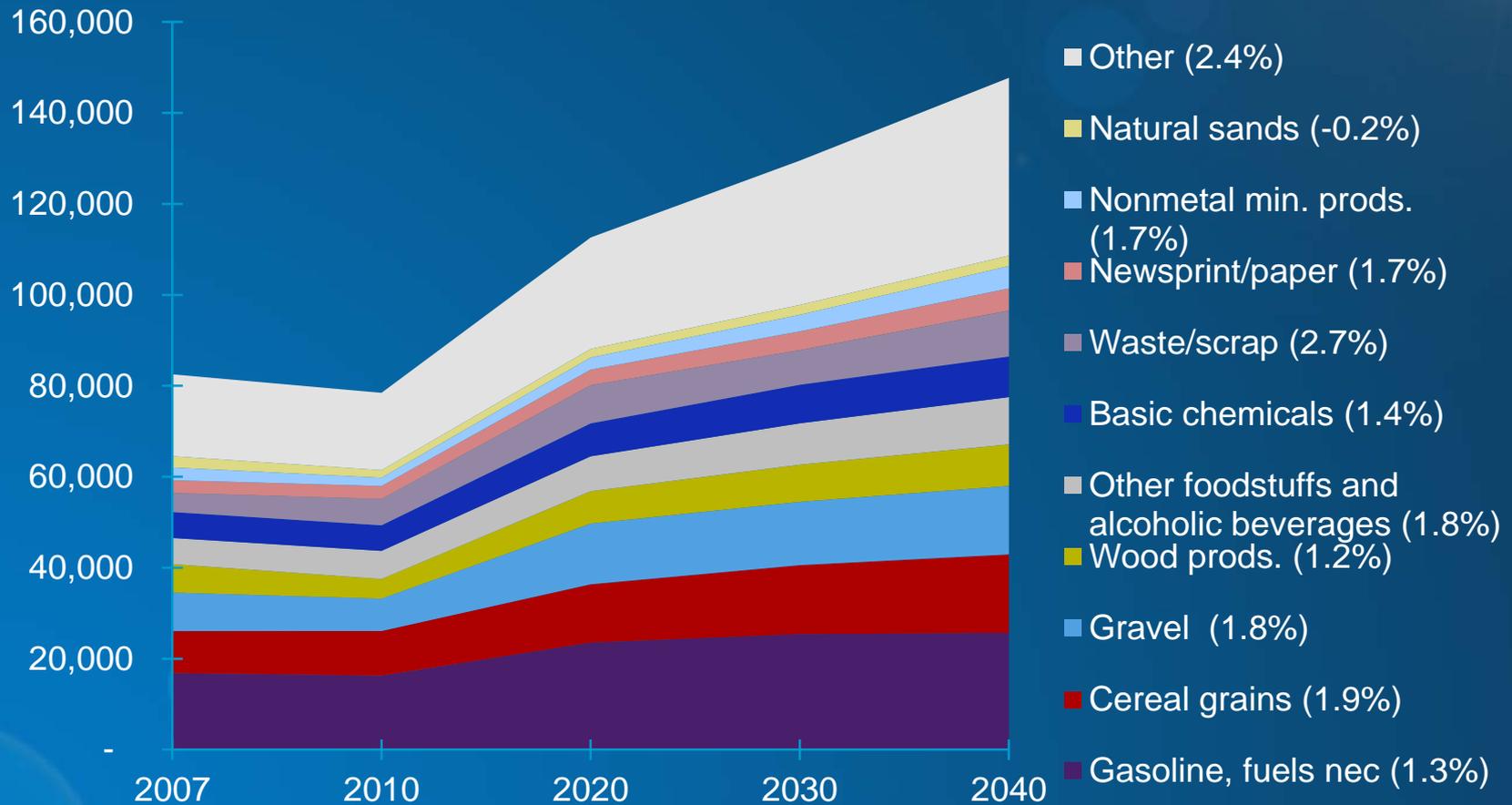
Growth of Top Domestic Commodities – Tonnage

Tonnage (ktons)



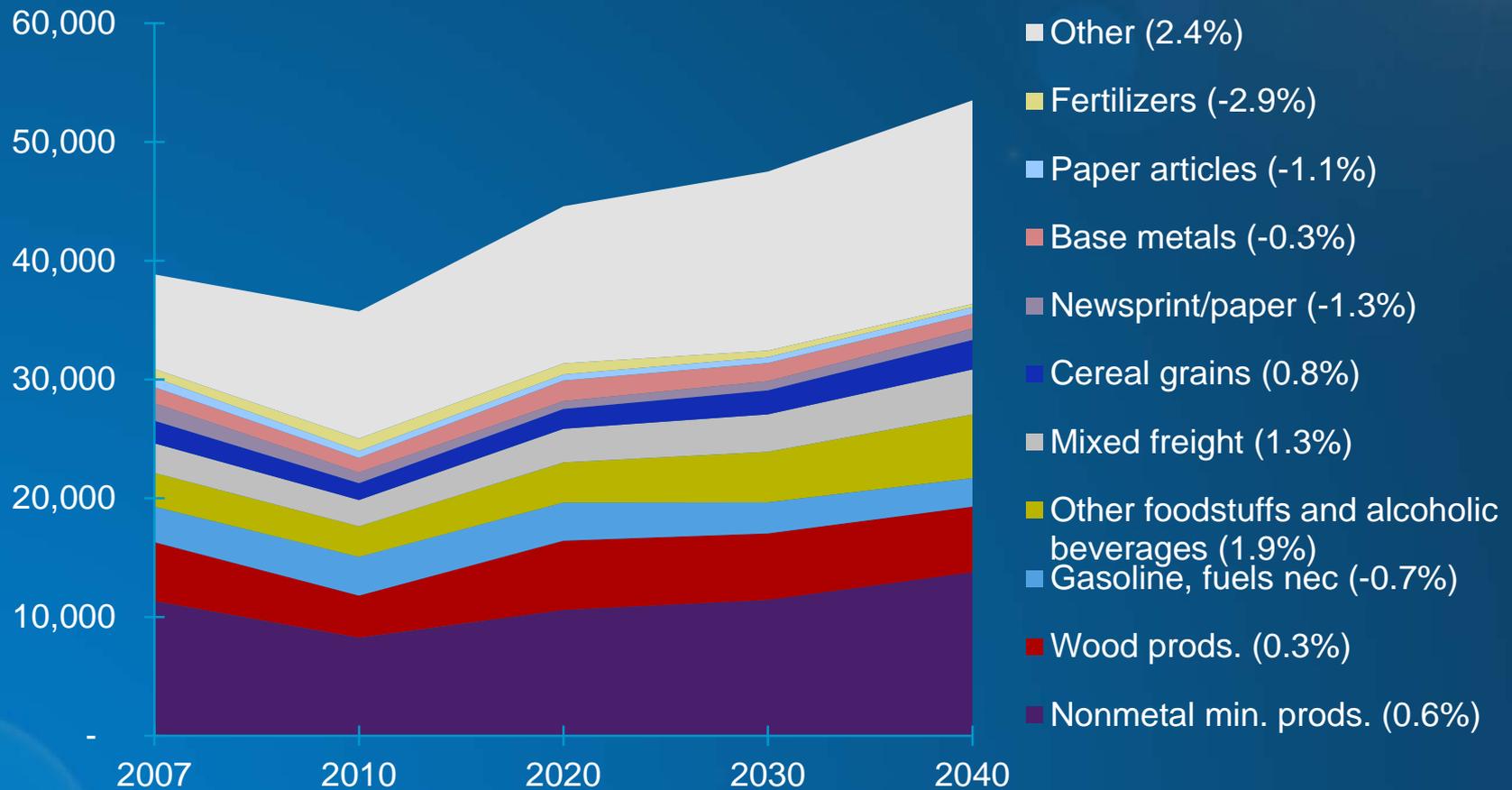
Growth of Top Domestic Commodities – Inbound by Tonnage

Tonnage (ktons)



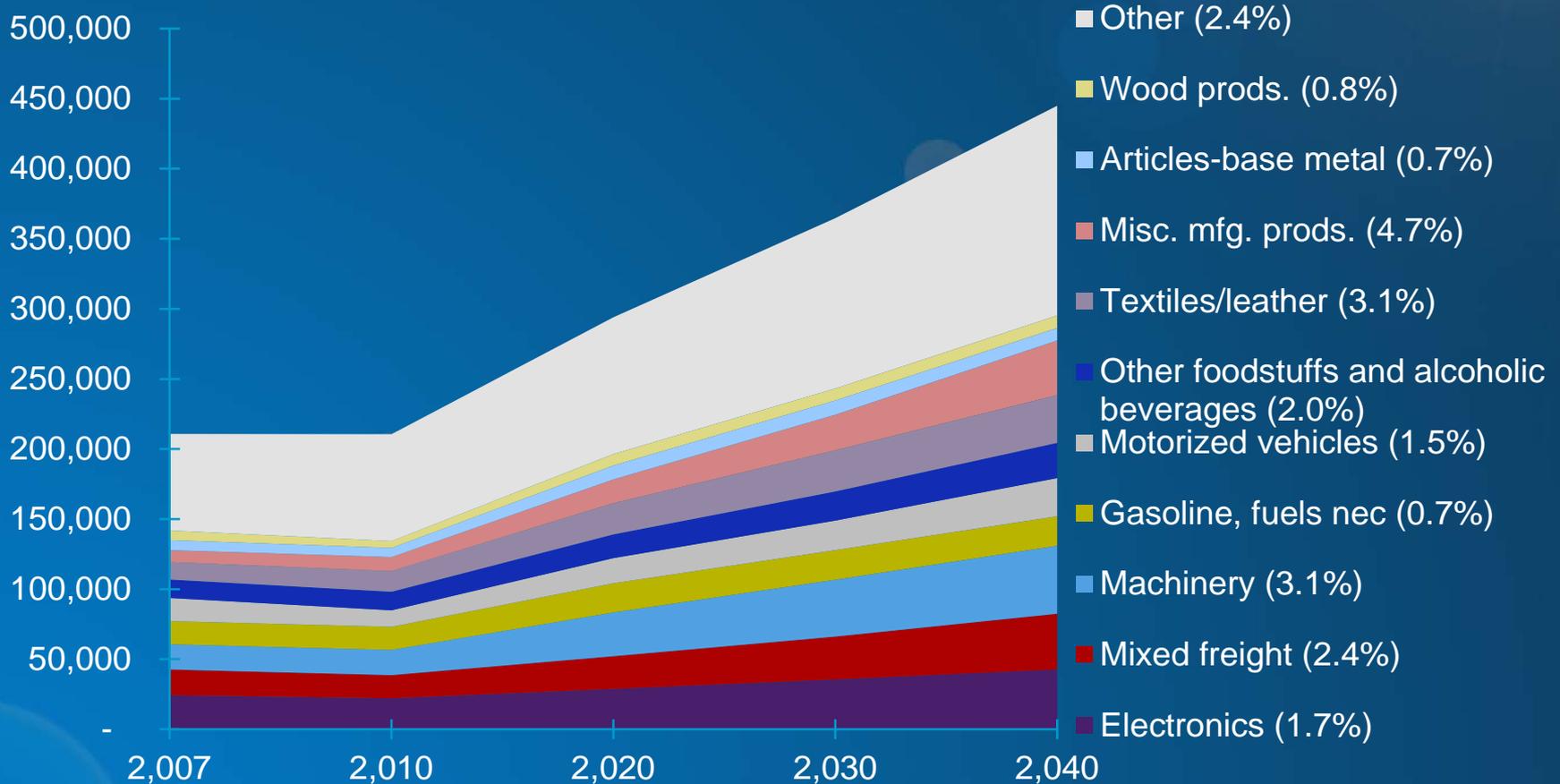
Growth of Top Domestic Commodities – Outbound by Tonnage

Tonnage (ktons)



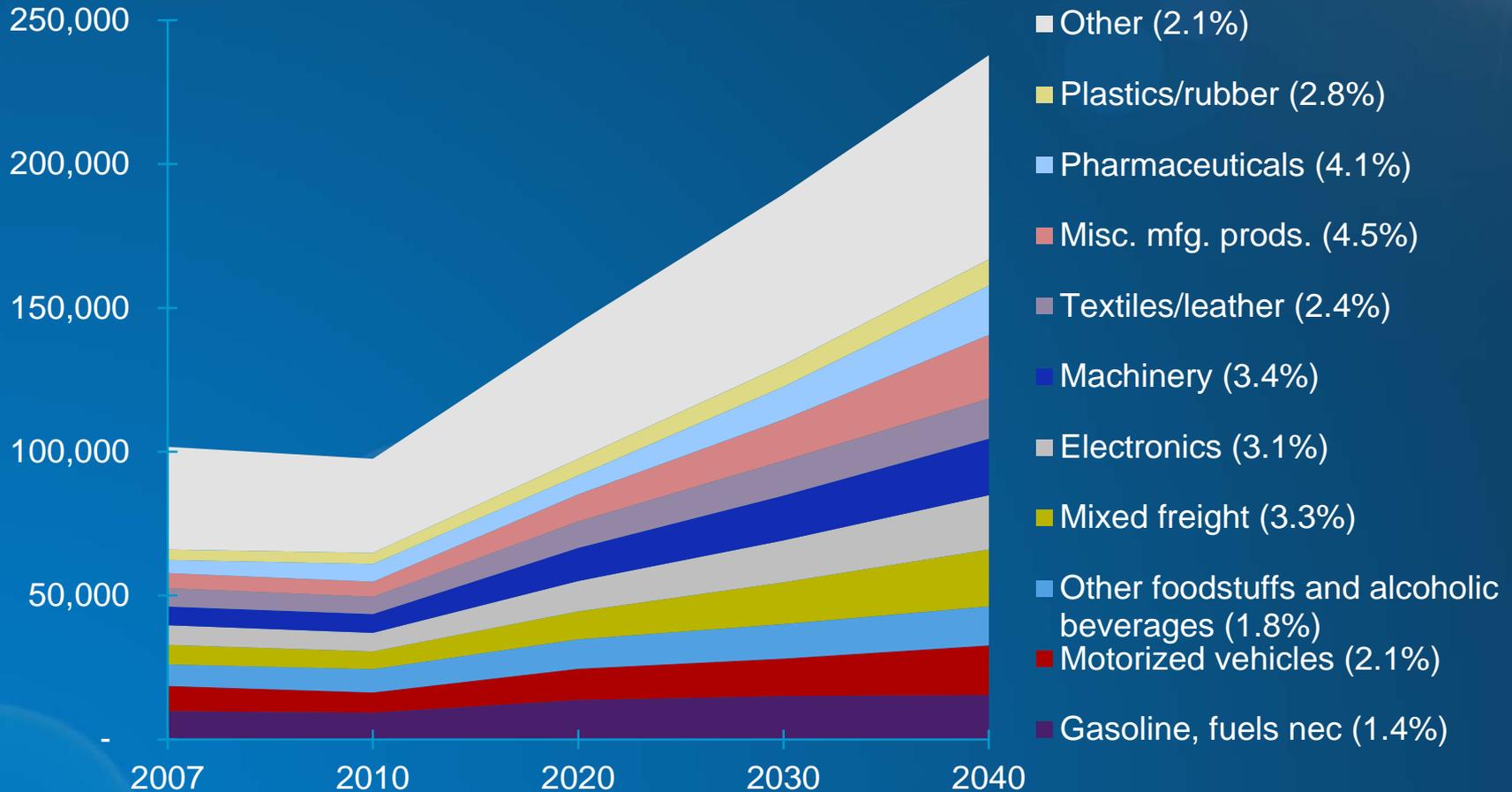
Growth of Top Domestic Commodities – Value

Value (\$M)



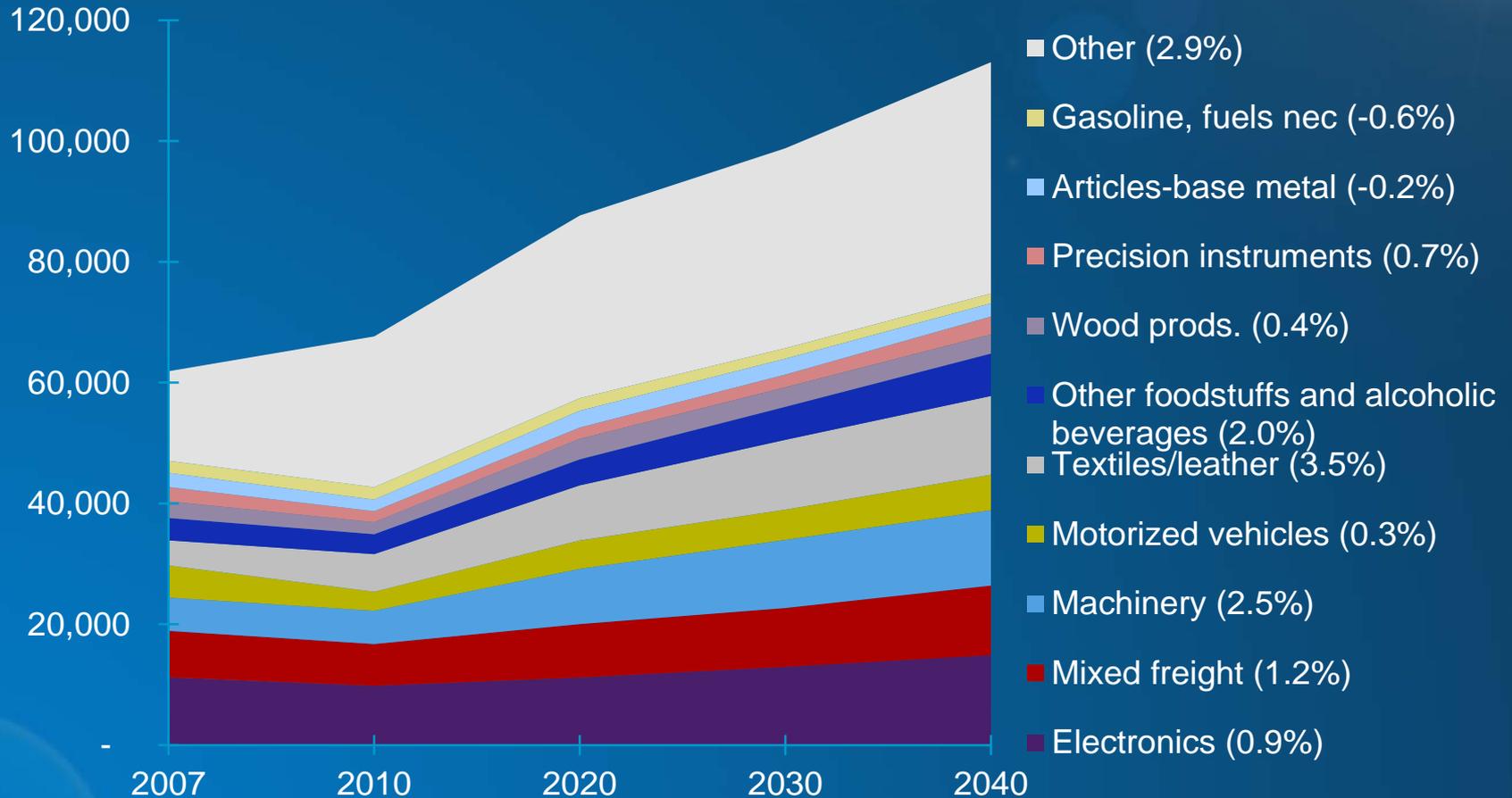
Growth of Top Domestic Commodities – Inbound by Value

Value (\$M)



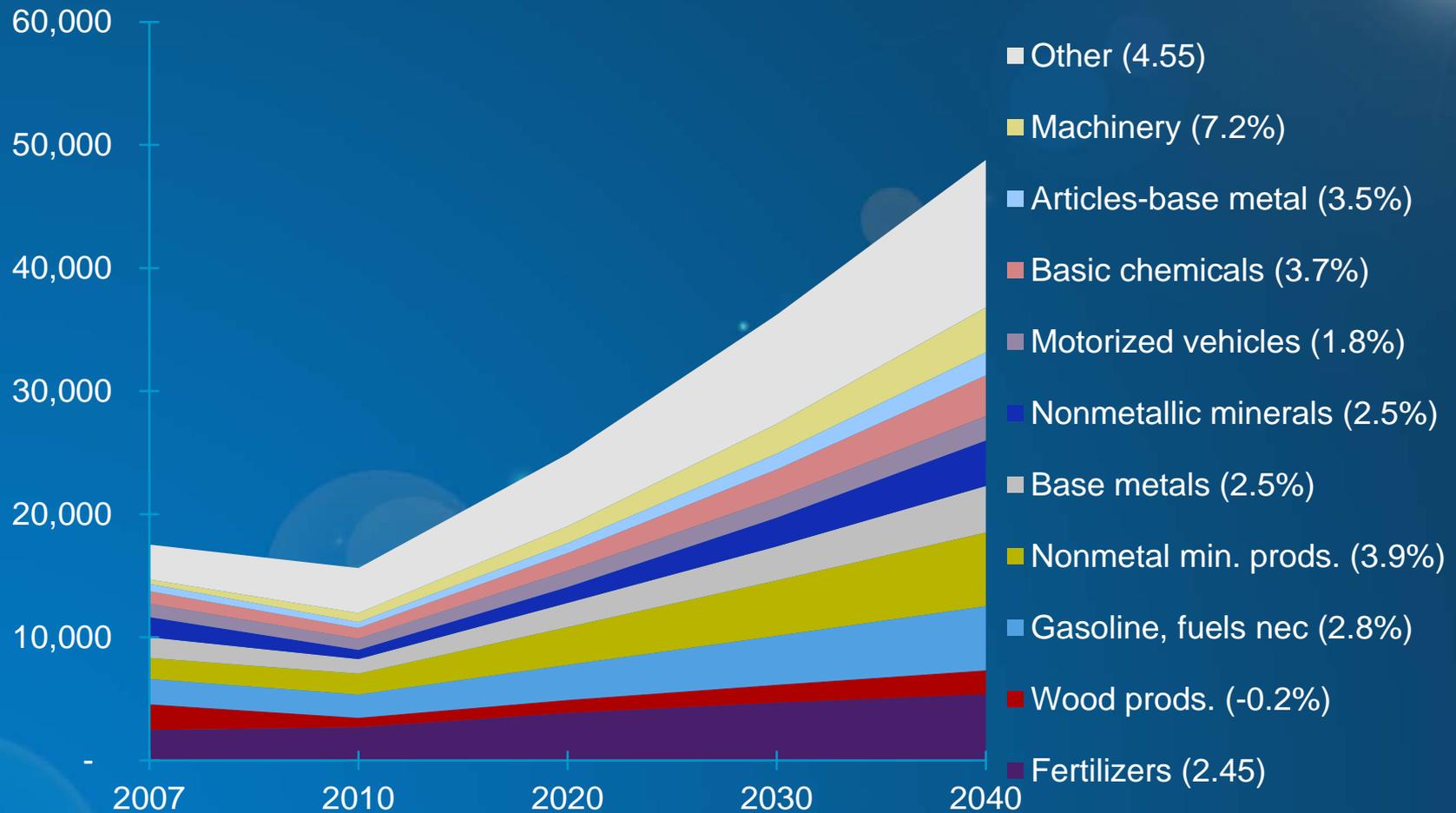
Growth of Top Domestic Commodities – Outbound by Value

Value (\$M)



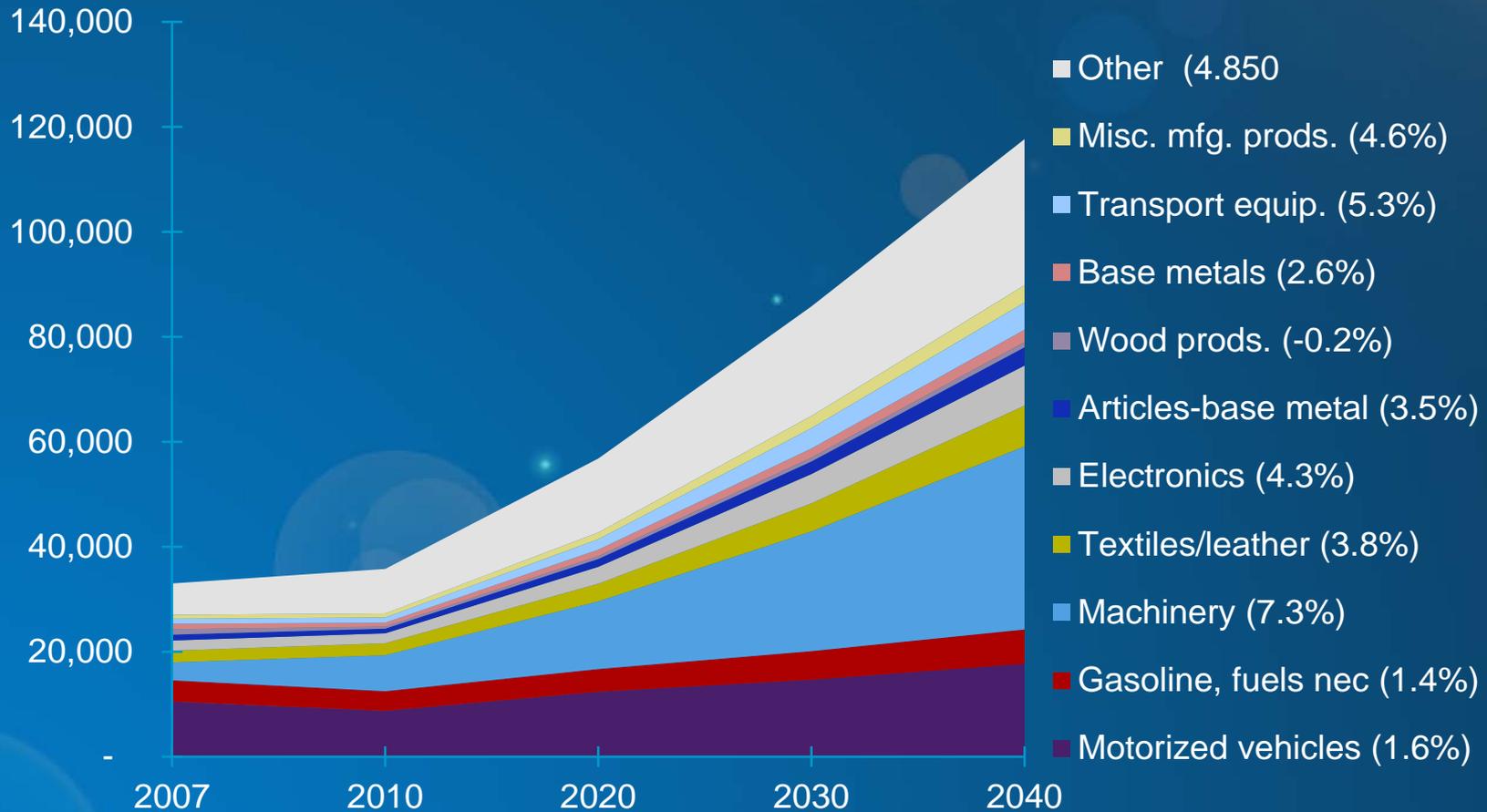
Growth of Top Import Commodities – Tonnage

Tonnage (ktons)



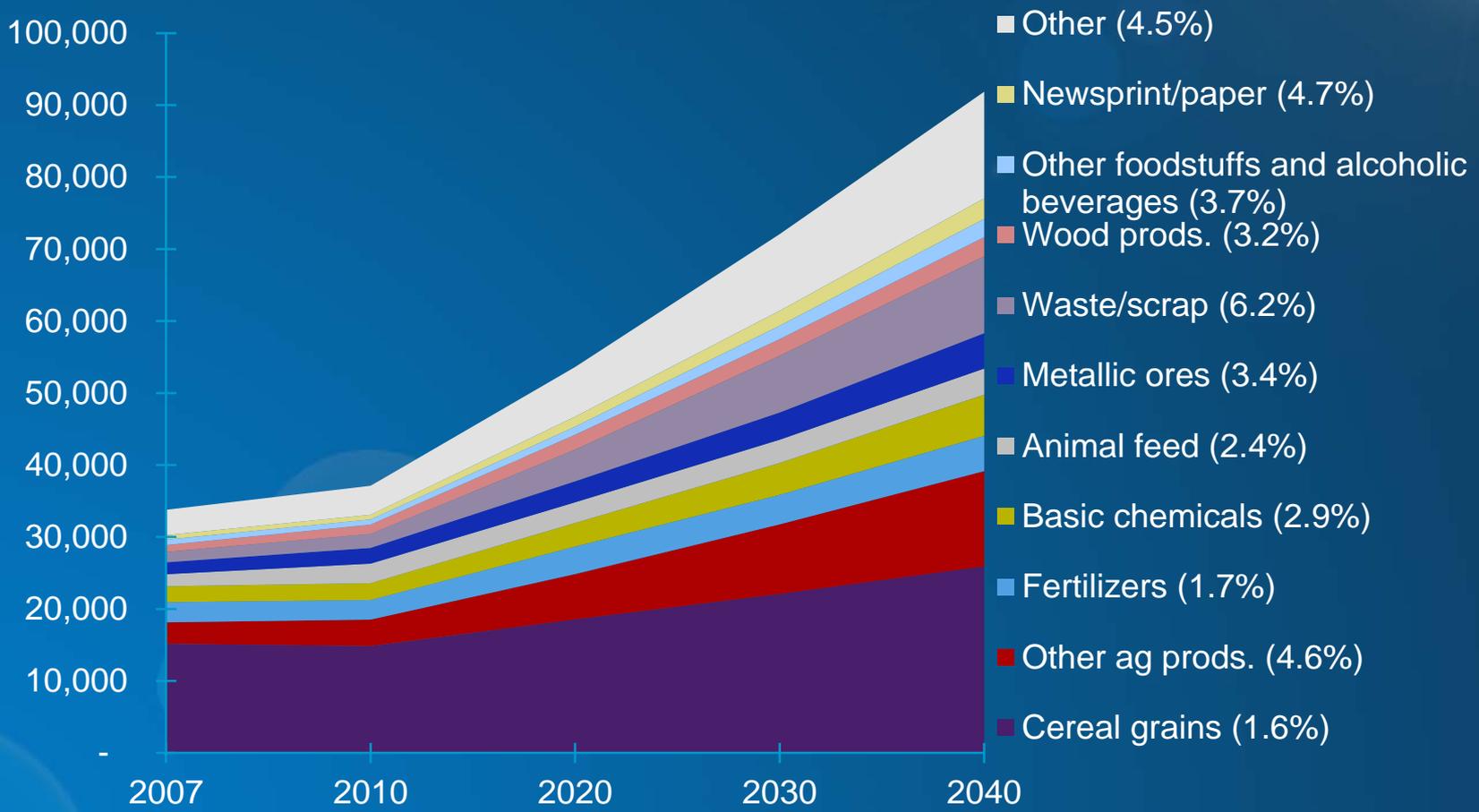
Growth of Top Import Commodities – Value

Value (\$M)



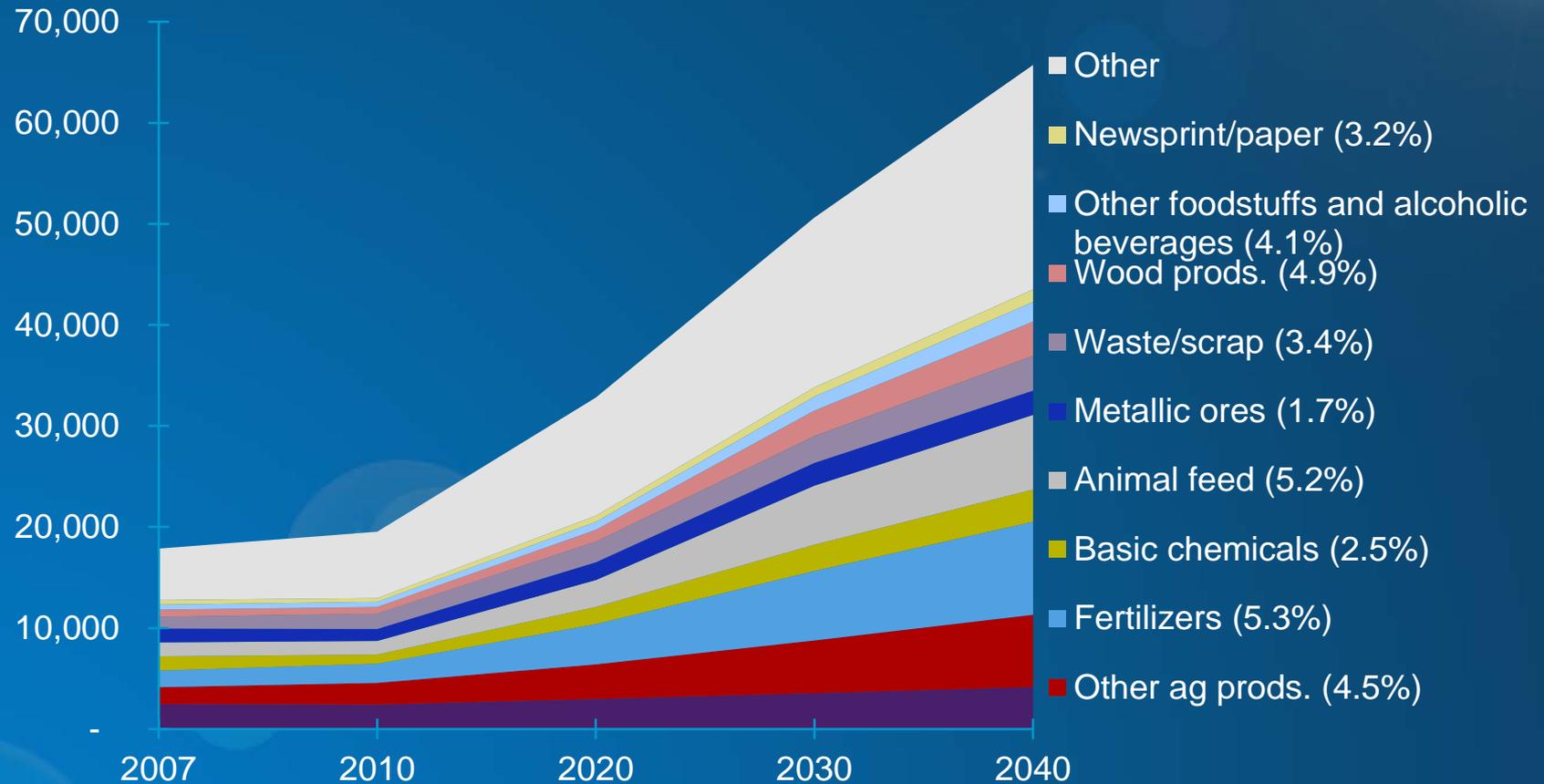
Growth of Top Export Commodities – Tonnage

Tonnage (ktons)



Growth of Top Export Commodities – Value

Value (\$M)



Summary of Written Tasks

Task F and H: Factors Specific to Top Commodity Groups for Growth and Mode

- **Cereal Grains.** Rail Congestion and barge congestion will have biggest impact on growth. Product likely to continue to move on rail.
- **Waste and Scrap.** Biggest driver of export will be price on the international market. Metallic scrap usually arrive by multiple modes to be exported by vessel. Non-metallic scrap arrives in trucks usually to be exported in containers. Shifts in modes can occur depending on demand.
- **Non-Metallic Mineral Products.** Domestic oil and gas production will drive imports of such products as barite. This will likely to continue move on rail, depending on rail pricing. Diversion of short haul movements to truck is also likely.
- **Gasoline and Fuels.** Future volume will be determined by success/failure of domestic extraction and refining of oil, and growth of alternative fuels (e.g., natural gas).

Task F and H: Factors Specific to Top Commodity Groups (Cont'd)

- **Precision Instrument.** This time sensitive commodity can be affected by delays on roadways and rail. Air transportation can be increasingly utilized in the future in addition to road and rail.
- **Machinery.** Movement will grow at the pace of local and U.S. economy but can be affected by outsourcing/reshoring of production. Traditionally break-bulk moved by truck, it can be increasingly moved on intermodal rail.
- **Electronics.** Volumes will growth with the economy, as well as outsourcing/reshoring trends. Intermodal trucking/rail will continue, with potential increases in air shares for more time sensitive electronics.
- **Motorized Vehicles.** Future imports will largely be driven by domestic demand, while exports by foreign demand. Trucking/rail will continue as dominant mode of transpo

Task G: Trends/Changed in Transportation Technologies

1. Conversion of shipment from pipeline to rail (e.g., crude by rail)
2. Increase of LTL shipments of fast moving consumer goods
3. Increase in transloading of imported goods from international containers to domestic containers (40ft to 53ft containers)
4. Increased exportation of minerals and bulk products such as copper ore, LNG, and coal
5. Conversion of fuel used in freight from diesel to LNG
6. Adoption of electric vehicles for freight movements
7. Continued concern of freight movement security
8. Continued pressure to reduce health/environmental impacts from freight
9. Environmental pressure to increase fuel mileage in all vehicles

Task I. Strength and Weakness of the Portland Region

Strengths

- Natural advantage of Columbia River to assist in moving bulk products
- Port of Portland's capacity and transfer of bulk products
- Solid base and good incentive of attracting high value manufacturers
- Class I and shortlines offer good modal alternative for BCOs
- Port of Vancouver pipeline facility, heavy lift cranes, and other specialized facilities enable movement of gasoline, clean energy products, and other niche products.

Opportunities

- Clustering of hi-tech sectors provide synergies and attract economy of scale and human capital.
- Large dry cargo market can create possibility to attract further service if ag products, footwear/apparel shippers can cluster with hi-tech to form a strong cargo base.

Weaknesses

- Increasing highway and local congestion
- Limited direct airfreight service at PDX
- Modal choice restricted for products sources from remote areas (e.g. ag products)
- Lack of highway redundancy
- Cumbersome OSOW permitting process
- Few roads across coastal range, especially affecting fish and seafood

Threats

- Dwindling containerized ocean carrier service can reduce competitiveness
- Scarcity of industrial land for logistics
- Failure to replace the Columbia River Crossing I-5 bridge that affects reliability and mobility

Task J: Global Trends that Can Affect Freight Flows

- Re-shoring of Manufacturing to the U.S.
- BCOs distribution strategy shift from “push” to “pull” supply chains, and the increase of ecommerce
- Increase use of Mega Vessels
- Changing Asian demand for raw materials
- Changing demand for recycled products

Task K: Potential Methodologies for Transshipment

1. TRANSEARCH approach to estimating warehouse and distribution center commodity flows as applied to the Portland – Vancouver regional commodity flow database
2. Transload secondary trip estimation methodology for the San Pedro Bay ports' PortTAM
3. CMAP mesoscale supply chain model

Thank You