

# Capstone Project Assignment – Freight and Climate Sustainability

## *Scenario:*

You are the multi-modal freight unit of your state's department of transportation. Your state legislature has recently passed a bill that requires all state agencies to draft climate sustainability action plans with a goal of reducing greenhouse gas emissions to 1990 levels by 2020. The DOT Commissioner has asked you to lead the effort to develop a freight component of the climate sustainability action plan. It is important to the Commissioner to balance climate concerns within the service requirements of the department. You need to advocate for freight to ensure the state's overall climate plan considers the environmental and economic stewardship of freight.

## *Your Assignment:*

Make a recommendation that describes the course of action for developing this component. Specifically, the final product should address the following:

- How will you identify the impacts of freight on climate sustainability, and conversely the impacts of climate sustainability actions on freight movement?
- What data sources will you need to quantify those impacts?
- How will you use performance measurement to support the freight component of the plan, and what steps do you suggest for ongoing performance tracking?
- What suggestions can be made to ensure climate stewardship within the context of freight resiliency?
- Who will be involved from other DOT departments and other state agencies, and in what capacity?
- Who will be involved from the private sector, and in what capacity?
- How should the citizenry be involved?

## *Product:*

Be prepared to present your recommendations for development of a freight sustainability plan and answer questions to a panel of executive level members of the I-95 Corridor Coalition via a webcast. Each capstone group will give a 30 minute PowerPoint presentation, followed by Q&A and discussion. You are also required to compile your recommendations into a final report (no more than 10 pages in length), due at the time of presentation. The report should be prepared as an executive briefing document that would be given to the DOT Commissioner and Governor's Office.

## **CAPSTONE PROJECT**

# **Freight Component of Climate Sustainability Action Plan**

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# 1. Introduction

The State legislature recently passed a bill that requires all state agencies to draft climate sustainability action plans with a goal of reducing greenhouse gas (GHG) emissions to 1990 levels by 2020.

This report presents the process to develop a freight component for the Climate Sustainability Action Plan (CSAP) as requested by the Department of Transportation (DOT) commissioner. The overall objectives of the CSAP are to:

- Reach the State legislature's GHG emissions goal.
- Engage all state agencies in developing climate change and sustainability goals.
- Achieve the greatest economic benefit for the State.
- Ensure current and future quality of life for the State's residents.

The CSAP will address the GHG emission reduction goal and balance climate concerns within the service requirements of the State DOT. The freight component of the CSAP will measure freight impacts on the climate, identify performance measures, and assess potential freight strategies to address climate change. Overall, it will ensure that the importance of freight to the region's economy and quality of life is maintained.

Freight strategies to reduce GHG emissions could include using modal alternatives to bring goods from industry to consumers, using state-of-the-art technologies for a seamless transportation system and a more energy efficiency fleet, and reducing bottlenecks on congested corridors.

Consultations with key stakeholders from the public and private sector will help to ensure that all measures will contribute to the reduction of GHG emissions while supporting transportation sector competitiveness. The State DOT will also partner with freight industry stakeholders to investigate ways of streamlining deliveries to reduce congestion and reduce GHG emissions.

The State DOT will analyze the potential impacts of the proposed measures to be included in the CSAP. Balancing between the three components of sustainability, including its social, economic and environmental aspects, will be key for long-term growth. As freight transportation is a major element for the state economy, the State DOT should be careful to not constrain freight transportation with the new measures.

Finally, the State DOT will look at potential funding sources to implement the recommendations and identify who will be responsible for these improvements. Some potential funding sources could include tolling or public-private partnerships. The appropriate funding source will depend on the type of improvement, strategy, or recommendation made. For example, certain types of projects could be funded through the Environmental Protection Agency or with use of Congestion Mitigation and Air Quality funding.

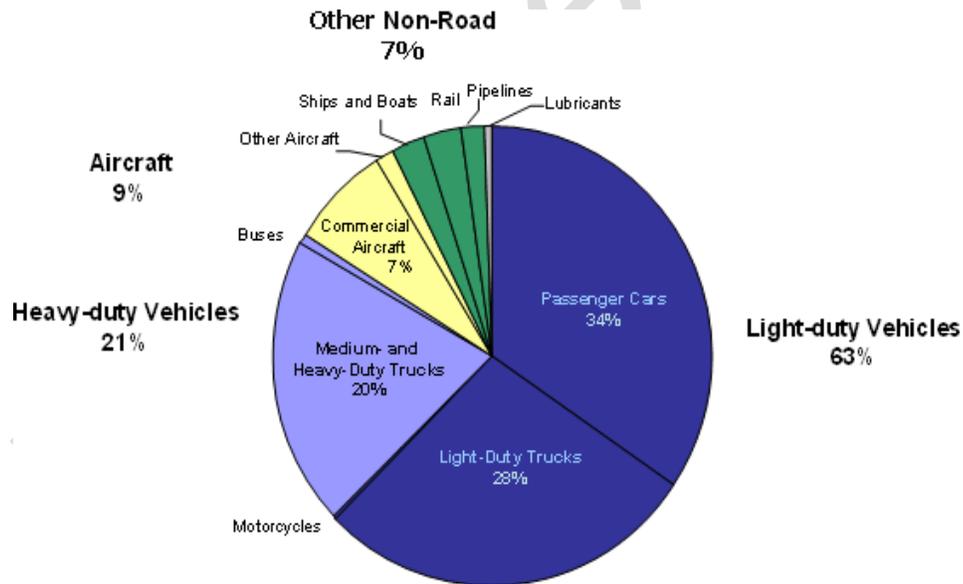
## 2. Background information

### 2.1 GHG & Freight Transportation

Freight is an integral part of the transportation sector and a major contributor to the well-being of the national economy. According to estimates from the 2007 Commodity Flow Survey (CFS), more than 13 billion tons of freight, valued at \$11.8 trillion, were transported nearly 3.5 trillion ton-miles on the nation's interconnected transportation network.<sup>1</sup> The Bureau of Transportation Statistics reports that 20 million people in the U.S. are employed in the transportation sector and more than 10% of the U.S. Gross Domestic Product can be attributed to transportation-related activities.

Despite the fact that transportation is crucial to the nation's economic and personal well-being, it is also a significant source of GHG emissions. Specifically, carbon dioxide (CO<sub>2</sub>) emissions from fossil fuel combustion are the largest source of greenhouse gas emissions. The Environmental Protection Agency notes that: "transportation sources accounted for approximately 29 percent of total U.S. GHG emissions in 2006. Transportation is also the fastest-growing source of U.S. GHGs, accounting for 47 percent of the net increase in total U.S. emissions since 1990."<sup>2</sup> Figure 1<sup>3</sup> below shows of a breakdown of GHG emissions by transportation source.

**Figure 1. Breakdown of GHG emissions by transportation source.**



As future economic activities and freight movement grow, freight's carbon footprint is expected to increase in some proportion with ton-miles traveled by mode. The goal of the CSAP is to reduce GHG emissions while not constraining freight transportation activities.

<sup>1</sup> U.S. Freight on the Move: Highlights from the 2007 Commodity Flow Survey Preliminary Data

<sup>2</sup> US EPA, <http://www.epa.gov/otaq/climate/index.htm>

<sup>3</sup> US DOT, <http://climate.dot.gov/about/transportations-role/overview.html>

## 2.2 Identification of Potential Strategies to Address GHG Emissions

A comprehensive freight component of the CSAP will need to present a combination of strategies to be successful.

A review of the literature indicates that there are different strategies that can be adopted to reduce GHG emissions. For example, the Federal Highway Administration's Review of State Plans<sup>4</sup> lists 21 strategy categories and the Michigan Climate Action Plan divides all strategies into three basic categories. The State DOT has added a fourth category to these strategies. The categories are:

1. Improving vehicle operations efficiency;
2. Replacing conventional gasoline and diesel with lower-emission fuels;
3. Reducing the growth of VMT.
4. Strategies to reduce emissions and energy use at freight facilities such as ports, airports, and warehouses (e.g., LEED-certified designs at freight facilities).

The freight component of the CSAP will address these four categories in order to be successful.

To reduce greenhouse gas emissions from freight related activities, the plan will need to present a varied combination of strategies. These strategies will be selected by the stakeholder committees, who will be able to evaluate the choices, and select those which are most appropriate and feasible. It should be noted that implementing new, sustainable technologies can be an economic opportunity for an area: a chance to attract technology manufacturers and develop a workforce to install and maintain the new technologies.

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<sup>4</sup> [http://www.fhwa.dot.gov/hep/climate/action\\_plan/](http://www.fhwa.dot.gov/hep/climate/action_plan/)

### 3. Coordination

It is important to involve a diverse set of stakeholders when identifying freight considerations to include in the CSAP. There are many benefits to including stakeholders in the overall process. For example, inclusion of stakeholders can help obtain early buy-in to proposed strategies, minimizing potential for opposition during implementation phases. Stakeholder involvement can also ensure that strategies reflect diverse opinions and can facilitate development of an overall framework for creating strategies and implementation options. Finally, stakeholder involvement ensures that needs and feedback of transportation users and providers are represented and that a comprehensive set of policies and strategies are considered to achieve emission reduction goals.

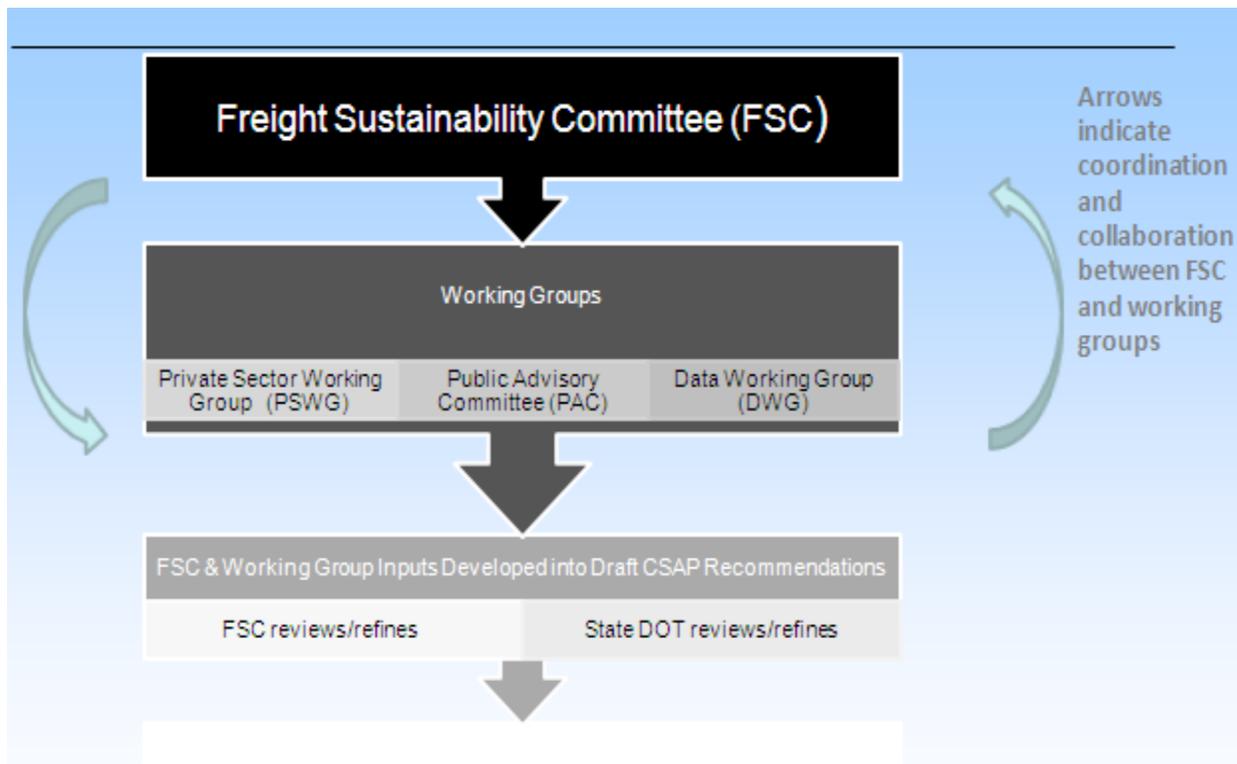
#### 3.1 Development of the CSAP and Stakeholder Involvement

Four different groups will be created to facilitate stakeholder involvement and development of the CSAP. The roles and responsibilities for each group are summarized below but are also detailed throughout this section. It is important to note that all committee and working groups will be involved with public outreach, but the Public Advisory Committee (PAC) will take the lead role for coordinating public outreach. The groups will meet on a continual basis after implementation of the CSAP to gauge performance and discuss issues and considerations that might arise over time.

NAME OF GROUP	PRIMARY ROLES AND RESPONSIBILITIES	EXAMPLE MEMBERS
Freight Sustainability Committee (FSC)	<p>The FSC will review data and recommendations by the working groups to make policy recommendations for inclusion in the plan.</p> <p>Based on the performance outcomes, the FSC may propose some changes and updates for the freight component of the CSAP.</p> <p>If needed, FSC will also conduct preliminary and/or ongoing consultation with other state agencies to ensure coordination on other agencies' climate change action plans.</p>	8-10 State DOT staff representing all modes
Private Sector Working Group (PSWG)	<p>PSWG is an advisory committee that will be consulted to provide information on freight transportation issue. The PPSWG will include representatives of the private sector and will be the sounding board for strategies that should be recommended to the FSC.</p> <p>The PSWG will be responsible for coordinating ongoing general outreach with the private sector to ensure that private sector representatives are involved at milestone points of the plan development.</p>	20-25 members including representatives from private sector/business community. The number of participants should reflect what is needed.

	<p>PSWG representatives will also provide data - if available- to the Data Working Group, described below.</p> <p>Members of the PSWG will meet with the PAC as needed.</p>	
Public Advisory Committee (PAC)	<p>The PAC will provide policy guidance on recommended strategies to address freight-related issues and thoughts on whether these strategies are implementable. The PAC will be the sounding board for strategies that should be recommended to the FSC.</p> <p>The PAC will be responsible for coordinating ongoing general outreach with the public sector to ensure that the public is involved at milestone points of the plan development.</p> <p>Members of the PAC will meet with the PSWG as needed.</p>	<p>15-20 members including representatives from metropolitan planning organizations/rural planning organization representatives, contacts from local planning agencies, and members of the general public. The number of participants should reflect what is needed.</p>
Data Working Group (DWG)	<p>The DWG is a technical working group that will identify relevant data, compile these data and synthesize them.</p> <p>The DWG will also conduct a detailed literature review to obtain a basic knowledge on the impact of transportation on GHG emissions and climate sustainability. It will also conduct a state scan and data analysis to identify GHG sources.</p> <p>Based on data analysis and literature review, the DWG will develop recommendations to address sustainability issues. These recommendations will be communicated to the FSC for review.</p>	<p>5-10 State DOT contacts representing all modes.</p>

Figure 2 shows how the groups interact and coordinate to build the freight component of the state CSAP.

**Figure 2. Interaction of Working Groups.**

### 3.2 Freight Sustainability Committee (FSC)

The overall purpose of the FSC will be to review data collected from the working groups and recommendations to make targeted policy recommendations for inclusion in the CSAP. FSC has ultimate responsibility for reviewing, and making, recommended strategies to address freight sustainability issues. FSC will identify how these strategies should be included in the CSAP. FSC should coordinate with the three other working groups (PSWG, PAC, and DWG) via regularly occurring meetings. As part of this coordination, the FSC will vet any proposed recommendation with the three working groups before finalizing it for inclusion in the CSAP. If necessary, revision and refinement of the recommendation can occur with the help of all working groups, including the FSC.

The FSC will also be responsible for ensuring that any strategies recommended by the working groups are applicable to the overall goals of the State DOT CSAP. One way of doing so might be to coordinate with other state agencies working on their components of the CSAP. Performance measures will be used to assess the applicability and relevance of strategies. An important part of ongoing performance tracking will be periodic evaluations of strategies and performance measures. These evaluations will chart the progress of the CSAP versus the goals and allow the FSC to make decisions on whether any corrective action is necessary. The FSC should ensure that these strategies are consistent with overarching state policies, such as maintaining competitiveness and ensuring safety/security for the overall transportation network.

In addition to the data analysis conducted by the DWG, the FSC will focus also on information collected from several major sources:

- Interviews with public sector freight transportation officials,
- Freight industry stakeholders, and

- Experts from the academic community.
- Review of best practices from comparable regions/agencies around the country.

The FSC will also review all of the recommended strategies proposed by the PPSWG, the DWG and by the general public. It will compile these recommendations into targeted policies. These targeted policies will be communicated to the CCAP committee.

The FSC will be comprised of 8-10 State DOT staff representing planning, highway, aviation, port, and rail departments/divisions. The FSC will meet every two months over the course of CSAP development to review working group recommendations and data. The FSC will meet as needed with other state agencies to ensure coordination.

### 3.3 Private Sector Working Group (PSWG)

The PSWG is an advisory committee that will provide information on freight transportation issues, practices, and ideas, including private sector inputs, and will be the sounding board for strategies that should be recommended to the FSC.

The PSWG will also be responsible for coordinating general private sector outreach to ensure that the broader public is involved at milestone points of the plan development. It will identify environmental and freight initiatives across the state and initiatives occurring in key neighboring states. All recommendations will be communicated to the FSC for review.

The PSWG would be comprised of 15-20 members. All committee members will represent a wide range of experience and sectors, and demonstrate enthusiasm for devising solutions that result in greenhouse gas emission reductions in the freight sector. To support PSWG negotiations, a neutral facilitator could be employed. Also, private sector representatives will provide data, if available, to the Data Working Group

The PSWG will take the following specific actions:

- Conduct interviews with public sector freight transportation officials, freight industry stakeholders, experts from the academic community. These data will be provided to the DWG.
- Conduct a survey of private sector freight transportation providers.
- Review data from the public survey.
- Represent the needs and perspectives of private sector freight transportation provider
- Advise the FSC on strategies that could be implemented to reduce allocation of emission reductions, including national and international models and contemporary approaches for reducing energy use and greenhouse gas emissions.
- Ensure that any strategies developed to meet emissions reductions are compatible with industry needs.

Potential members of the PSWG are listed in the table below.

<b>PSWG POTENTIAL MEMBERS</b>
Freight operators (PWSG)
Industrial building developers. (PWSG)
Representatives from the private sector/business community (PWSG)
Shippers(PWSG)

Railroad companies (PWSG)
Airport authority (PWSG)
Trucking company representatives (PWSG)
Environmental groups (PAC/PWSG)

### 3.4 Public Advisory Committee (PAC)

The PAC will provide policy guidance on recommended strategies to address freight-related issues and thoughts on whether these strategies are implementable. The PAC will be the sounding board for strategies that should be recommended to the FSC.

The PAC will be responsible for coordinating ongoing general outreach with the public sector to ensure that the public is involved at milestone points of the plan development.

The PAC would be comprised of 15-20 members. To support PAC negotiations, a neutral facilitator could be employed.

Potential members of the PAC are listed in the table below.

<b>PAC POTENTIAL MEMBERS</b>
Environmental groups (PAC/PWSG)
Federal field staff planners (PAC)
Representatives from State environmental agency (PAC)
Representatives from State economic development agency (PAC)
MPO/RPO representatives (PAC)
Representatives from other local planning agencies (PAC)
Tribal council representatives (PAC)
Representatives from neighboring states involved in freight sustainability issues (PAC)
Members of the general public (PAC)

### 3.5 Data Working Group

The DWG is a technical working group that is responsible for the data analysis needed to support CSAP development. It will identify relevant data, compile these data and synthesize them. It will conduct a detailed literature review to obtain a basic knowledge on the impact of transportation on GHG emissions and climate sustainability. It will also conduct a state scan and data analysis to identify GHG sources. The DWG will conduct an internal assessment of local trends highlighting the impacts of freight on climate sustainability and the potential impacts of sustainability actions on freight movement

Based on data analysis and literature review, the DWG will develop recommendations to address sustainability issues. These recommendations will be communicated to the FSC for review. The DGW will be comprised of members of the State DOT.

### 3.6 Conduct Ongoing Citizen Outreach

In addition to being represented by members on the PSWG, the public will be involved at milestone points in the development of recommendations to the FSC. Public involvement will provide useful feedback and transparency in developing the freight sustainability component of the CSAP.

The following strategies could be used to involve the general public:

- Conduct public interviews and survey to obtain information on public sentiment related to freight sustainability issues or to solicit feedback on proposed strategies and recommendations;
- Conduct public climate summit to provide education on freight sustainability issues and 'kick off' development of the CSAP;
- Conduct public workshops to solicit feedback on PSWG activities and initial recommendations;
- Develop website to keep public apprised of actions related to this effort. The website could include a listserv and electronic comment form. Draft recommendations could be posted to the website for public review;
- Targeted media outreach, including newspaper ads, mailings, radio or TV spots, use of social media, etc., to keep the public informed on the effort and advertise the website;
- Review performance outcomes, suggest changes in strategies
  - An important part of ongoing performance tracking will be periodic evaluations of strategies and performance measures that will involve the appropriate stakeholders. These evaluations will chart the progress of the CSAP versus the goals and allow the group to make decisions on whether any corrective action is necessary.

## 4. Performance Measures

Performance measures allow the State DOT to quantitatively measure progress towards its goals, subsequently helping to facilitate more informed and strategic decision-making. Performance measures can also help focus the overall effort by taking advantage of the truism “what gets measured gets done.”

### 4.1 Methodology to determine optimal performance measures

Performance measures are data driven and require available (or obtainable) high-quality data. The measures must be evaluated to ensure that they capture the impact of the selected GHG reduction strategies. Many performance measures exist; optimal measures are plan specific, based on available data, and are related to the overall strategies. Performance measures should be reviewed periodically by the stakeholders to ensure validity. The measures will show progress (or lack of progress) and thus allow the stakeholders to evaluate and revise strategies related to the CSAP.

Selected performance measures should shape the effort by<sup>5</sup>:

- Instilling a sense of mission;
- Communicating organization performance;
- Identifying areas for improvement;
- Improving credibility; and
- Linking budget decisions to public priorities.

Actionable performance measures, whether direct or indirect, must also be<sup>6</sup>:

- Valid;
- Reliable;
- Understandable;
- Timely;
- Comprehensive;
- Non-redundant;
- Affordable; and
- Controllable.

### 4.2 Performance measurement to support the freight component of the CSAP

To identify performance measurement that supports the freight component of the CSAP, it is recommended to utilize the “triple bottom line approach”. The specific elements of the “triple bottom line” will help factor in environmental, economic and social impacts and allocate equal consideration of these driving forces. According to the American Association of State Highway and Transportation Officials (AASHTO), the specific elements of the triple bottom line and the steps required to achieve them can be summarized as follows:

<sup>5</sup> New Jersey Certified Public Manager Program Materials Level 4, module 7

<sup>6</sup> New Jersey Certified Public Manager Program Materials Level 4, module 7

- **Robust Economic Growth:** Deliver a sustainable, high performance transportation system in support of a robust economy by first optimizing existing infrastructure, then reshaping demand, and, lastly expanding judiciously.
- **Improved quality of life for all citizens:** Enhance quality of life by integrating transportation with the built environment by using the full tool kit, including context sensitive solutions, land use policy and diversified mode choice.
- **Better than before health of the environment:** Embrace environmental stewardship as a preeminent approach to delivering transportation services that result in a zero carbon footprint and better than before environment.

In addition to the three elements of the triple bottom line approach, the State DOT also intends to consider a fourth element in performance measurement that specifically focuses on the cost-effectiveness of the freight system and supply chain.

#### 4.3 Potential tools to develop performance measures.

An initial literature review on the utilization of performance measurement tools and indicators to measure GHG reduction was conducted to find potential sources. Potential sources for performance measures include:

- AASHTO – Center for Environmental Excellence - <http://environment.transportation.org/>
- Victoria Transport Policy Institute; Well Measured Developing Indicators for Comprehensive and Sustainable Transportation Planning - [www.vtpi.org/wellmeas.pdf](http://www.vtpi.org/wellmeas.pdf)
- *World Economic Forum; Supply Chain Decarbonization – The role of logistics and transport in reducing supply chain carbon emissions* - [https://microsite.accenture.com/sustainability/Pages/supply\\_chain\\_decarbonization.aspx](https://microsite.accenture.com/sustainability/Pages/supply_chain_decarbonization.aspx)
- *Hawaii 2050 Sustainability Plan* - [www.hawaii2050.org](http://www.hawaii2050.org)
- *Michigan Climate Action Plan* - <http://www.miclimatchange.us/stakeholder.cfm>
- *Washington State Comprehensive Plan on Climate Change* - <http://www.ecy.wa.gov/climatechange/2008CompPlan.htm>

Using best practices from literature search and available data previously identified will help develop performance measures. Possible performance measures could include:

- Fuel Savings estimates through efficiencies;
- Emissions calculations;
- Energy consumption per ton mile;
- Direct energy consumption at a facility;
- Participation in US EPA Smartway program;
- Freight mobility (ton miles) by mode;
- Land use – freight villages/freight-oriented development;
- Average freight transport speed and reliability;
- Total transport expenditures; and
- Overall transport system satisfaction rating.
- Benefits/cost analysis.

It is important to review guidelines to ensure appropriateness of performance measures in relation to the transportation sector in the State.

#### 4.4 Climate stewardship in the context of freight resiliency

Resiliency is defined as an ability to recover from or adjust easily to misfortune or change (Merriam-Webster 2008). According to the paper *Interpreting Resiliency: An Examination of the Use of Resiliency Strategies within the Supply Chain and Consequences for the Freight Transportation System*<sup>7</sup>, resiliency is described along three dimensions:

- *Physical Infrastructure*  
The system of a network of nodes and links that support freight transportation and travel (road and road structures, railway lines, port facilities, warehouses, intermodal yards etc.).  
Example – Redundancy in the physical infrastructure is the availability of multiple routes and modes.
- *Managing Organization*  
The unit that oversees construction, maintenance and performance of the physical infrastructure (and disseminates current performance data).  
Example – Redundancy in the managing organization is multiple information sources and multiple dissemination options.
- *Systems Users*  
The business enterprise that move goods using the transportation infrastructure.  
Example – Redundancy in the user system is multiple suppliers for parts and materials.

Climate stewardship and freight resiliency can work together to provide a vibrant and flexible transportation system. Freight resiliency offers options to the users of the transportation system to transport their goods. As described above, these options could be mode, route, information sources, supplier etc. Within these transportation options, companies try to find the most efficient method in which to transport their cargo based on the requirements of the shipment. The private sector deals with a dynamic freight environment. For a case study on the importance of freight resiliency in the private sector, see [Appendix B](#).

To ensure climate stewardship within the context of freight resiliency, the State DOT will need to evaluate physical infrastructure, managing organizations, and understand the supply chains of users of the transportation systems.

<sup>7</sup> <http://www.husdal.com/2009/02/25/what-is-freight-transportation-system-resilience/>

## 5. Data

In order to support the development of the CSAP and performance measurement, data are required. There are different ways of obtaining relevant information about the impacts of freight on climate sustainability and vice versa. Some proposed strategies are listed below.

### 5.1 Potential strategies for obtaining data

The DWG will conduct a detailed review of existing literature on freight and climate sustainability from private, public and academic sources. The purpose of the review is to obtain a basic knowledge on the impact of transportation on GHG emissions and climate sustainability.

The DWG will also conduct a regional state scan and data analysis to identify the different sources of GHG emissions in the state. Identifying specific sources of GHG emissions within the state will allow the state DOT to address them in the freight component of the CSAP. Building an inventory of major freight related infrastructure (assets) will also allow the State DOT to identify the areas that will most likely contribute to GHG emissions and promote measure that directly benefit the users of these infrastructures. It will help to develop strategies and policies for emissions reductions and to track the progress of those policies. Major highways, rail yards, ports, airports, warehouses should be identified on a map and provided with a description. Description should include the size, its use (traffic, VMT, etc.), vehicle fleet, presence of bottlenecks. If bottlenecks exist, frequency and time of the day when they occur should be indicated as well. Finally, the inventory should include, when possible, the type of operations happening at those facilities.

In addition, the data committee will draw on information gathered by the FSC and PPSWG as described in detail in the Coordination section.

### 5.2 Identification of impacts

GHG emissions impact climate sustainability. Climate change may have potential impacts on transportation infrastructures as it brings new weather patterns and extreme events.

According to the Transportation Research Board, “climate change will affect transportation primarily through increases in several types of weather and climate extremes, such as very hot days; intense precipitation events; intense hurricanes; drought; and rising sea levels, coupled with storm surges and land subsidence. The impacts will vary by mode of transportation and region of the country, but they will be widespread and costly in both human and economic terms and will require significant changes in the planning, design, construction, operation, and maintenance of transportation systems.”<sup>8</sup>

On the other hand, climate sustainability plans could potentially affect freight movement patterns by encouraging a shift towards lower carbon emitting transportation modes (e.g., road to rail and road to waterways) and an increase in intermodal goods movement. Sustainability plans would also encourage the adoption of new technologies, new equipments and retrofitted engines. In

<sup>8</sup> TRB, Potential impacts of Climate change on US transportation, p. 5, <http://onlinepubs.trb.org/onlinepubs/sr/sr290.pdf>

addition to these, shippers and distribution centers could also adopt more efficient packaging and routing mechanisms, leading to a gradual decline in the overall number of truck trips and relieving highway congestion. On the downside, government regulations mandating the adoption of new technologies and equipments could force some small providers out of business and help consolidate the industry into fewer but more efficient carriers. The increased cost of adopting new technologies could translate into higher priced goods when they finally hit the stores.

To broadly identify the impacts of freight on climate sustainability, and conversely the impacts of climate sustainability actions on freight movement, we will utilize the following steps:

- The first step is to conduct a detailed literature review to obtain a broad knowledge of the impact of transportation on GHG emissions and climate sustainability, and the impacts of climate sustainability actions on freight movement.
- The second step is to interview key public sector transportation industry professionals, metropolitan planning organization officials, freight industry stakeholders, consultants and experts from the academic community in order to obtain a first hand assessment of potential impacts of freight movement on climate sustainability and vice versa.
- The third step is to carry out a regional/ state scan to identify the different sources of GHG emissions in the state. Identifying specific sources of GHG emissions within the state will allow the Department of Transportation (DOT) to address them in the freight component of the Climate Sustainability Action Plan.
- The fourth step is to build an inventory of major freight related infrastructure (assets) to allow the State DOT to identify those assets that will most likely be impacted by climate change
- Lastly, we would conduct an internal assessment of local data trends highlighting the impacts of freight on climate sustainability and the potential impacts of sustainability actions on freight movement. Collecting baseline data will be done at this step.

### 5.3 Potential specific data types

The follow are examples of specific data types that could be included<sup>9</sup>:

- Transportation GHG emissions baseline. (View 1990 GHG emissions and current GHG emissions of the State to determine effective performance measurement tracking to achieve GHG reduction goal in 2020);
- Transportation GHG inventories document historic (and possibly projected) GHG emissions;
- Vehicle Miles Travelled;
- Fuel savings estimate;
- Volumes, types, and sources of emissions;
- Annual average daily vehicle miles traveled (VMT) by vehicle type and road class;
- Quantify GHG emissions associated with *construction and maintenance* of transportation facilities;
- Inventory of major freight infrastructures such as ports, airports, rail, rail yard, highways, warehouses, etc;

<sup>9</sup> [http://www.fhwa.dot.gov/hep/climatechange/chapter\\_five.htm](http://www.fhwa.dot.gov/hep/climatechange/chapter_five.htm)

- Inventories of transportation GHG emissions are typically developed by fuel type based on fuel sales data, while strategy analysis requires estimate of emissions for individual modes, vehicle types, and geographic areas;
- Volumes, types and sources of emissions;
- Average Freight transport speed and reliability<sup>10</sup>;
- Per Capita Congestions Costs.

### 5.4 Potential specific data sources

There are several existing data sources that can be used for the analysis needed to support the development of the CSAP. Potential data sources could include:

SOURCE	DATA	DESCRIPTION / USE
State Department of Environmental Resources	State Inventory of GHG Emissions	The State's GHG inventory is an accounting of the amount of greenhouse gases emitted to the atmosphere over a specific period of time (e.g., one year) from different sources. A greenhouse gas inventory also provides information on the activities that cause emissions.
Federal Environmental Protection Agency (EPA)	State Energy CO2 Emissions by Source	Carbon dioxide (CO <sub>2</sub> ) emissions from fossil fuel combustion are the largest source of greenhouse gas emissions. This state level data source provides estimates of carbon dioxide (CO <sub>2</sub> ) emission inventories from fossil fuel combustion, by end-use sector (commercial, industrial, residential, transportation, and electric power), in million metric tons of carbon dioxide (MMTCO <sub>2</sub> ) from 1990 though 2007.
State Department of Transportation	Different State DOT data	<ul style="list-style-type: none"> <li>▪ Freight Ton Miles by Transportation Mode</li> <li>▪ Truck Vehicle Miles Traveled (TVMT)</li> <li>▪ Freight Movement by size, value and distance</li> <li>▪ Fuel Consumption by Mode</li> <li>▪ Fuel Savings Estimate</li> <li>▪ GHG Emissions by Transportation Mode</li> <li>▪ Inventory of major freight infrastructures such as ports, airports, rail, rail yard, highways, warehouses, etc.</li> </ul>
Industry Associations	Private economic data from associations representing industry stakeholders	The data could provide some insight into the impact of climate sustainability actions on the freight industry. It would shed light on the number and distribution of members who have adopted new technologies, equipments and retrofitted engines and equipment, cost savings from new technologies/equipments/retrofits, possible job gains/losses from regulatory compliance, and other costs and benefits. The data can be utilized in estimating the state-wide economic and regulatory impacts of certain climate sustainability actions.

<sup>10</sup> Victoria Transport Policy Institute

## 6. Recommendations

The major CSAP recommendations will be initiated through the four working groups described earlier in this report:

- Freight Sustainability Committee (FSC)
- Private Sector Working Group (PSWG)
- Public Advisory Committee (PAC)
- Data Working Group (DWG)

Any recommendation proposed by the working groups and vetted by the FSC should take into consideration that public transportation is directly linked to the efficiency of freight movements. Any improvements to public transportation, such as passenger rail, can also benefit freight. The FSC should meet regularly with the team responsible for the public transportation component of the CSAP to coordinate efforts to reduce GHG emissions.

It is recommended that specific goals and a statement of purpose be developed for each of the working groups so that they fully understand their charge.

Some potential types of recommendations that the working group might make are listed below. The groups may recommend development of:

- Incentive programs for uses of alternative fuel vehicles
- Anti-idling measures
- Congestion pricing
- Parking management programs
- Incentives for green technology adoption at freight facilities
- Incorporation of climate change performance measures into project prioritization schemes
- Programs/incentives to locate new freight facilities in areas less vulnerable to climate change
- Low carbon fuel performance standards
- Cap-and-trade programs to create an emissions limit or “cap” on freight transportation emissions
- Programs or initiatives to work/collaborate with regional partners or other states on reductions of freight-related emissions.

Administering, implementing, and enforcing these recommendations will require a stable and continuing source of funding. To address this issue, State DOT recommends looking at potential funding sources to implement the recommendations. Some potential funding sources could include tolling or public-private partnerships, or authorization by the State legislature to fund the bill that requires state agencies to reduce GHG emissions. The appropriate funding source will depend on the type of improvement, strategy, or recommendation made.

## APPENDIX A : Glossary & Definitions

### Key Acronyms

CO2 – Carbon Dioxide  
CSAP – Climate Sustainability Action Plan  
DWG – Data Working Group  
FSC – Freight Sustainability Committee  
GHG – Greenhouse Gas  
MPO – Metropolitan Planning Organization  
PPSWG – Public Private Sector Working Group  
RPO – Rural Planning Organization  
State DOT – State Department of transportation  
VMT – Vehicle miles traveled

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### Key Definitions

#### Sustainable development<sup>11</sup>

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

#### Sustainable transportation<sup>12</sup>

A sustainable transportation system is one that:

- Allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.
- Is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy
- Limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.

#### GHGs<sup>13</sup>

Gases that trap heat in the atmosphere are often called greenhouse gases.

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<sup>11</sup> Brundtland Report

<sup>12</sup> Center for Sustainable Transportation, [http://cst.uwinnipeg.ca/documents/Definition\\_Vision\\_E.pdf](http://cst.uwinnipeg.ca/documents/Definition_Vision_E.pdf)

<sup>13</sup> <http://www.epa.gov/oppeoee1/climatechange/emissions/index.html>

## APPENDIX B: Additional Information

### Impact of freight on climate<sup>14</sup>:

Freight transportation impacts climate because it contributes to the GHG emission.

“Transportation sources accounted for approximately 29 percent of total U.S. GHG emissions in 2006. Transportation is the fastest-growing source of U.S. GHGs, accounting for 47 percent of the net increase in total U.S. emissions since 1990. Transportation is also the largest end-use source of CO<sub>2</sub>, which is the most prevalent greenhouse gas. These estimates of transportation GHGs do not include emissions from additional lifecycle processes, such as the extraction and refining of fuel and the manufacture of vehicles, which are also a significant source of domestic and international GHG emissions.”

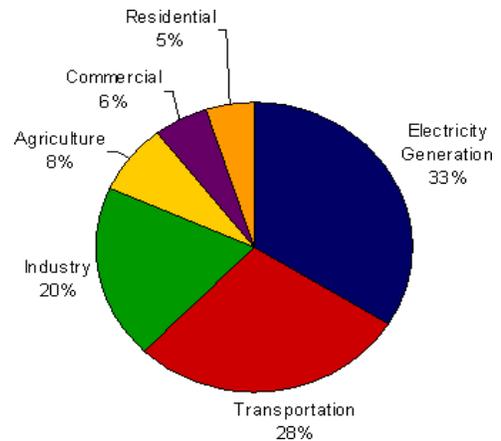
### Transportation and Greenhouse Gas Emissions

Virtually all human activities have an impact on our environment, and transportation is no exception. While transportation is crucial to our economy and our personal lives, as a sector it is also a significant source of greenhouse gas (GHG) emissions.

Based on current GHG emission reporting guidelines, the transportation sector directly accounted for about 28 percent of total U.S. GHG emissions in 2006, making it the second largest source of GHG emissions, behind only electricity generation (34 percent). Nearly 97 percent of transportation GHG emissions came through direct combustion of fossil fuels, with the remainder due to carbon dioxide (CO<sub>2</sub>) from electricity (for rail) and Hydrofluorocarbons (HFCs) emitted from vehicle air conditioners and refrigerated transport. Transportation is the largest end-use sector emitting CO<sub>2</sub>, the most prevalent greenhouse gas. Estimates of GHG emissions do not include additional "lifecycle" emissions related to transportation, such as the extraction and refining of fuel and the manufacture of vehicles, which are also a significant source of domestic and international GHG emissions.

The largest sources of transportation GHGs in 2006 were passenger cars (34%) and light duty trucks, which include sport utility vehicles, pickup trucks, and minivans (28%). Together with motorcycles, these light-duty vehicles made up about 63% of transportation GHG emissions. The next largest sources were freight trucks (20%) and commercial aircraft (7%), along with other non-road sources (which combined, totaled about 7%). These figures include direct emissions from fossil fuel combustion, as well as HFC emissions from mobile air conditioners and refrigerated transport allocated to these vehicle types.<sup>15</sup>

**Percentage of U.S. Greenhouse Gas Emissions, 2006 (all gases, in Teragram [Tg] CO<sub>2</sub> equivalent)**



<sup>14</sup> US EPA, <http://www.epa.gov/otaq/climate/index.htm>

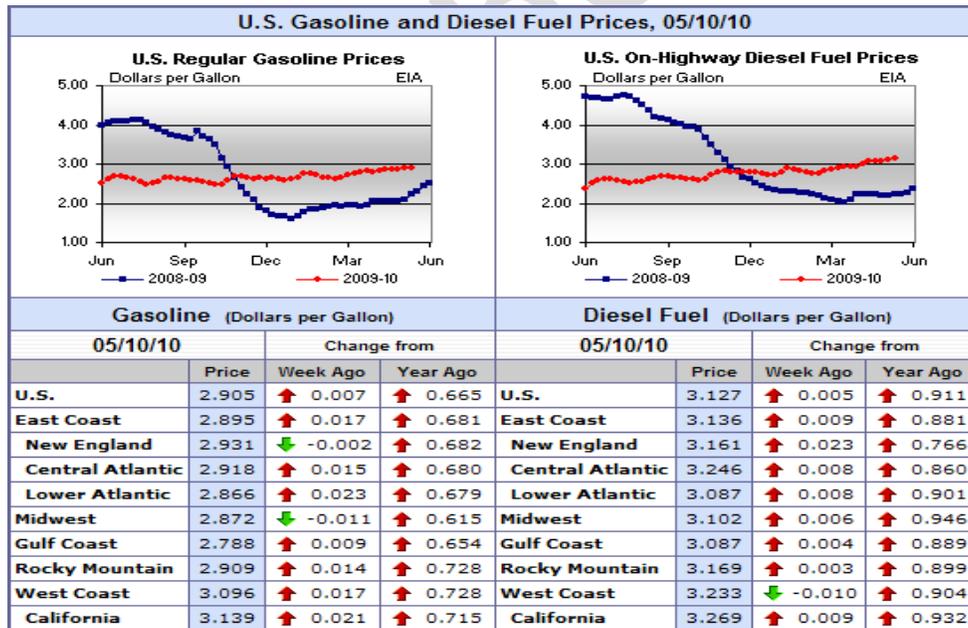
<sup>15</sup> US DOT, <http://climate.dot.gov/about/transportations-role/overview.html>

## Lessons learned from Private Sector

In 2008 when fuel costs hit record levels and the downturn of the economy, transportation companies and suppliers were forced into sustainable measures. Sustainability in this context means that fuel conservation and increasing efficiency were necessary to remain profitable.

The increase in fuel costs changed the dynamic of their business, and the supply chains in which they worked. With this increase in energy costs, “Green Alternatives” became more feasible. These “Green Alternatives” became fuel saving measures to lower expenses (which ultimately reduced GHG emissions) and try to remain profitable during these tough economic times. In addition consumers with a greater awareness of the environment demanded greener products giving companies with sustainable practices a competitive edge. The lessons learned from the private sector in greening their businesses should be incorporated into the strategies for reducing GHG emissions. Some of the efficiency measures were utilizing more energy efficient modes to transport goods through the supply chain, upgrading their fleets with more energy efficient vehicles, energy saving programs such as reducing idling emissions, alternative fuelled vehicles and increasing efficiencies through more strategic loading, packaging, distribution and land use. The high fuel prices of 2008 and the recession propelled sustainable transportation in the private sector and their continued involvement in the process to reduce GHG emissions and fulfill the important role of freight in the state and national economy is necessary.

Source: U.S. Energy Information Administration<sup>16</sup>:



<sup>16</sup> <http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp>



I-95 CORRIDOR  
COALITION

# Climate Sustainability Action Plan

## *Freight Component*

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Christian Bisson, Québec Ministry of Transportation

Alisa Fine, U.S. DOT Volpe Center

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October 2010

This report is based on a hypothetical scenario developed through an academic exercise for the I-95 Corridor Coalition Freight Academy. The contents of this report should not be construed as factual in any way.

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# Content

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- Context
- Background information
- Coordination
- Performance Measures
- Data
- Recommendations



# Context

- State legislature has recently passed a bill that requires all state agencies to draft a Climate Sustainability Action Plan
  - *DOT Commissioner asked for a freight component*
  - *Freight Component will address strategies for GHG emissions reduction*





# Background Information

- GHG emissions impact climate sustainability
- Climate change may have potential impacts on infrastructures
- May cause new weather patterns and extreme events
  - *Intense precipitation*
  - *Rising sea levels*
  - *Intense hurricanes*
  - *Storm surges*
  - *Very hot days*
  - *Land subsidence*
  - *Drought*





# Background Information

- Economic importance of freight transportation
  - *13 billion tons of freight valued at \$11.8 trillion per year* (2007 Commodity Flow Survey)
  - *Employ 20 million people in the US*
  - *10 % of US GDP to transportation related activities* (Bureau of Transportation Statistics)
- Transportation is a significant source of GHG emissions
  - *29 % of total US GHG emission in 2006*
  - *Fastest-growing source of US GHG*
    - Passenger cars: 34 %
    - Light-duty trucks: 28 %
    - Freight trucks : 20 %
    - Commercial Aircraft: 7 %
    - Non-road: 7 %



# Potential Strategies

■ Freight Component of the CSAP will need to present a combination of strategies to be successful



- *Improving vehicle operations efficiency*
- *Replacing conventional gasoline and diesel with lower-emission fuels*
- *Reducing the growth of VMT*
- *Strategies to reduce emissions and energy use at freight facilities*



# Coordination

- Four different groups will be created to facilitate stakeholder involvement

NAME OF GROUP
Freight Sustainability Committee (FSC)
Private Sector Working Group (PSWG)
Public Advisory Committee (PAC)
Data Working Group (DWG)



# Coordination

NAME OF GROUP	PRIMARY ROLES AND RESPONSIBILITIES	EXAMPLE MEMBERS
Freight Sustainability Committee (FSC)	<p>The FSC will review data and recommendations by the working groups to make policy recommendations for inclusion in the plan. Based on the performance outcomes, the FSC may propose some changes and updates for the freight component of the CSAP. If needed, FSC will also conduct preliminary and/or ongoing consultation with other state agencies to ensure coordination on other agencies' climate change action plans.</p>	8-10 state DOT staff representing all modes
Private Sector Working Group (PSWG)	<p>PSWG is an advisory committee that will be consulted to provide information on freight transportation issues. The PSWG will include representatives of the private sector and will be the sounding board for strategies that should be recommended to the FSC.</p> <p>The PSWG will be responsible for coordinating ongoing general outreach with the private sector to ensure that private sector representatives are involved at milestone points of the plan development.</p>	20-25 members including representatives from private sector/business community. The number of participants should reflect what is needed.



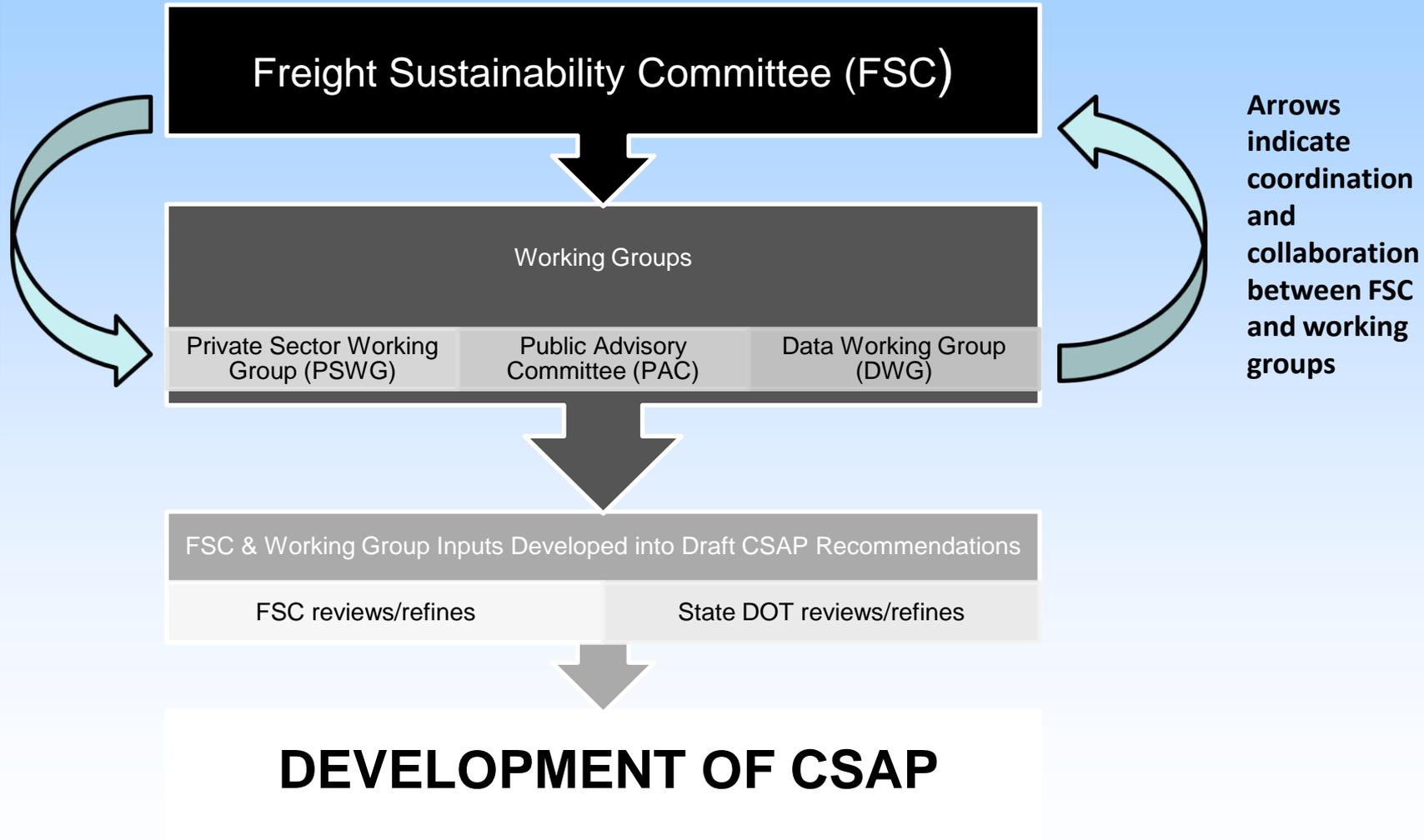
# Coordination

NAME OF GROUP	PRIMARY ROLES AND RESPONSIBILITIES	EXAMPLE MEMBERS
Public Advisory Committee (PAC)	<p>The PAC will provide policy guidance on recommended strategies to address freight-related issues and thoughts on whether these strategies are implementable. The PAC will be the sounding board for strategies that should be recommended to the FSC.</p> <p>The PAC will be responsible for coordinating ongoing general outreach with the public sector to ensure that the public is involved at milestone points of the plan development.</p> <p>Members of the PAC will meet with the PSWG as needed.</p>	<p>15-20 members including representatives from metropolitan planning organizations/rural planning organization representatives, contacts from local planning agencies, and members of the general public. The number of participants should reflect what is needed.</p>
Data Working Group (DWG)	<p>The DWG is a technical working group that will identify relevant data, compile these data and synthesize them.</p> <p>The DWG will also conduct a detailed literature review to obtain a basic knowledge on the impact of transportation on GHG emissions and climate sustainability. It will also conduct a state scan and data analysis to identify GHG sources.</p> <p>Based on data analysis and literature review, the DWG will develop recommendations to address sustainability issues. These recommendations will be communicated to the FSC for review.</p>	<p>5-10 state DOT staff representing all modes.</p>

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# Coordination – Interaction of Working Groups



# Performance Measures (PM)

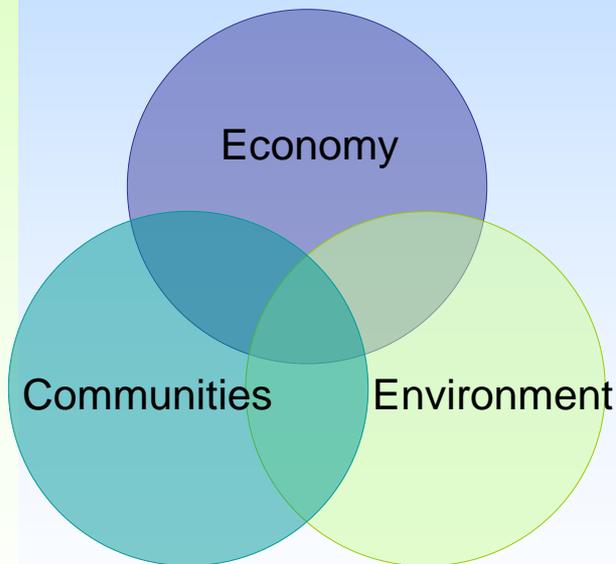
- Develop methodology to determine optimal PM
  - *PM are data driven*
  - *Require available or obtainable, high quality data*
  - *Should be reviewed periodically*
- PM must be selected based on these elements:
  - *instilling a sense of mission*
  - *communicating organization performance*
  - *identifying areas for improvement*
  - *improving credibility*
  - *linking budget decisions to public priorities with input from private sector stakeholders*





# Performance Measures (PM)

- State DOT proposes to use the triple bottom line approach and add a fourth element on cost-effectiveness.
  - *Triple Bottom Line Approach*



- **Robust Economic Growth :**  
Deliver a sustainable, high performance transportation system in support of a robust economy by first optimizing existing infrastructure, then reshaping demand, and lastly expanding judiciously.



# Performance Measures (PM)

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- *Triple Bottom Line Approach (continued)*
  - **Improved quality of life for all citizens :**

Enhance quality of life by integrating transportation with the built environment by using the full tool kit, including context sensitive solutions, land use policy and diversified mode choice.
  - **Better than before health of the environment :**

Embrace environmental stewardship as a preeminent approach to delivering transportation services that result in a zero carbon footprint and better than before environment.



# Performance Measures (PM)

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- Possible performance measures could include:
  - *Fuel Savings estimates through efficiencies*
  - *Emissions calculations*
  - *Energy consumption per ton mile*
  - *Participation in US EPA Smartway program*
  - *Freight mobility (ton miles) by mode*
  - *Land use – freight villages/ freight oriented development*
  - *Average freight transport speed and reliability.*
  - *Total transport expenditures*
  - *Overall transport system satisfaction rating*



# Performance Measures (PM)

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- 3 dimensions of freight resiliency :
  - *Physical Infrastructure*
  - *Managing Organization*
  - *System Users*
  
- Freight resiliency offers options to the users of the transportation system to transport their goods.



# Data Collection Effort

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- The Data Committee will be responsible for:
  - *Identification and collection of data from various secondary data sources*
  - *Primary data collection through interviews of key stakeholders*
  - *Broad based literature review*
  - *Identification of critical infrastructures within the State*
  - *Identification of different sources of GHG emissions within the State*
  - *Analysis and synthesis of the data*



# Potential Uses of the Data

- *Developing and calibrating performance measures*
- *Economic impact analysis*
- *Regulatory impact analysis*
- *Environmental impact analysis*
- *Vulnerability risk analysis and assessment*
- *Creation of a knowledge management system for future research activities*





# Data and Potential Sources

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- Potential data sources
  - *State Department of Environmental Resources*
    - State Inventory of GHG emissions
  - *Federal Environmental Protection Agency (EPA)*
    - State Energy CO2 emissions by source
  - *State Department of Transportation*
    - Freight Ton Miles by transportation mode
    - Truck Vehicle Miles Traveled
    - Freight movement by size, value and distance
    - Fuel consumption by mode
    - Fuel savings estimate
    - GHG emissions by transportation mode
    - Inventory of major freight infrastructure
  - *Industry Associations*
    - Private economic data (who have adopted new technologies, equipments and retrofitted engines, cost savings, etc.)



# Recommendations

---

- The major CSAP recommendations will be initiated through the four working groups described earlier in this report:
  - *Freight Sustainability Committee (FSC)*
  - *Private Sector Working Group (PSWG)*
  - *Public Advisory Committee (PAC)*
  - *Data Working Group (DWG)*



# Recommendations

- Potential recommendations - The groups may recommend development of:
  - *Incorporation of climate change performance measures into project prioritization schemes*
  - *Incentive programs for uses of alternative fuel vehicles*
  - *Programs or initiatives to work/collaborate with regional partners or other states on reductions of freight-related emissions.*
  - *Anti-idling measures*
  - *Congestion pricing*
  - *Parking management programs*
  - *Incentives for green technology adoption at freight facilities*
  - *Programs/incentives to locate new freight facilities in areas less vulnerable to climate change*
  - *Low carbon fuel performance standards*
  - *Cap-and-trade programs to create an emissions limit or “cap” on freight transportation emissions*



# Recommendations

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- Administering, implementing, and enforcing these recommendations will require a **stable and continuing source of funding**.
- To address this issue, State DOT recommends looking at potential funding sources to implement the recommendations :
  - *Tolling*
  - *Public-private partnerships*
  - *Authorization by the State legislature to fund the bill that requires state agencies to reduce GHG emissions.*
  - ***Appropriate funding source will depend on the type of improvement, strategy, or recommendation made.***



- Q & A / Discussion

