

# **Future Freight Flows**



**Washington State Department of  
Transportation (WSDOT)**

**Prepared by**  
MIT Center for Transportation & Logistics

March 9, 2011  
Seattle, WA



# Executive Summary

## **Overview and Methods**

The Washington State Department of Transportation (WSDOT) in coordination with the MIT Center for Transportation and Logistics (CTL) held the Future Freight Flows scenario planning workshop on March 9, 2011. Attendance was by invitation only with approximately 55 attendees representing state, federal, and local governments, as well as the private sector including, carriers, shippers, consultants, and academics.

The workshop was centered around the four scenarios created by MIT's CTL:

- Global Marketplace
- Naftastique
- On World Order
- Technology Savior

Sixteen freight infrastructure segments identified by WSDOT were used for scenario planning. Each segment consisted of a single-mode contiguous artery used for transporting freight in or near the State of Washington. The segments were chosen from five different modes: highways (six segments), rail lines (five), waterways (two), air (two), and pipeline (one). The freight segments were represented on a geographic map of the State of Washington.

Participants were assigned to the four different scenario groups using stratified sampling with eight different strata to represent the various subsets of the participant population. Within each strata the participants were randomly assigned to each group to ensure a mix of people with different backgrounds assigned to each scenario.

## **Allocation of Time and Materials**

The workshop was held in a conference room facility from 8am to 3pm. The time was allocated as follows:

- 8:00 – 8:30 Registration

- 8:30 – 10:00 Introduction to the project, the freight segments, and the scenario planning process
- 10:00 – 12:30 Interactive workshop in four parallel breakout groups
- 12:30 – 3:00 Working Lunch and joint session with all participants to compare and contrast findings of breakout groups

Prior to the workshop participants were given reading materials which included:

- A map of freight infrastructure in the State of Washington
- A list of freight infrastructure segments with brief descriptions
- A link to download the brochure of the scenario the participant was assigned to

At registration the morning of the workshop participants were given:

- A list of freight infrastructure segments with brief descriptions
- A one-page document showing 16 freight infrastructure segments on separate
- A map of the State of Washington
- A scenario brochure (one scenario per folder)

Additionally, each breakout group was shown a video of the scenario used in that group and after the breakout sessions, all participants saw the videos of all four scenarios.

### **Voting Instruments**

Three voting instruments were used during breakout sessions to collect data. These included:

- **Voting chips** – Each participant was given a set of 14 chips, 11 “invest” chips and 3 “veto” chips. The “invest” chips were used to vote on the bundles that the participant recommended investing in his/her respective scenario. Invest chips had values marked on them, totaling 100 points. A “veto” chip was used to indicate a segment not to invest in and each individual could place only one “veto” chip on any segment.
- **Individual investment decision form** – Each participant in the scenario breakout session was given one form to write his/her individual vote (invest points or veto) for each freight segment in that scenario. Each form listed all sixteen freight segments, with three decision choices for each segment: number of points (out of 100) if one recommended investing in the segment, a check box to indicate vetoing the segment, and a checkbox to indicate a decision to neither invest nor veto. The forms also had two rows for the

participant to recommend any additional segments besides the 16 chosen by WSDOT. Segments were grouped by mode and modes were ordered randomly to avoid any effect on a person's vote of the order in which the segments were presented.

- **Voting sheets** – A document presenting the freight segments on a map was used for the participants in each breakout session to place their chips on. Each participant in the breakout group placed his/her chips on this map, as per the investment decision s/he had written on the individual investment decision form as to make individual investment decisions visible and to facilitate a discussion around them. The scenario facilitator tallied all the votes on each segment and wrote in the box for that segment. If any participant changed his/her vote after the group discussed the votes, the changed vote was noted on the form.

### **Results of the Scenario Planning Exercise**

Results of the scenario planning exercise are presented in two sections. The results of the investment decisions made on the 16 freight infrastructure segments for each of the four scenario groups is displayed graphically. Additionally, each scenario group was asked to create one or two corridors from the 16 segments that were most important in their scenario.

#### **Overall Results**

Overall results indicate that most robust investment segments appear to be S07 – I-5 North/South Rail Lines and S08 – Columbia River East/West Rail Line, receiving zero veto votes and high value in three of the four scenarios. S11 – Grays Harbor – Chehalis Rail Line and S06 – East/West Canadian Highways with access to Washington State were identified as robust non-investment segments as both were highly vetoed in all four scenarios.

Results show that only one segment, S01 – I-5 North/South Major Highways (West), appears in at least one of the two corridors in each of the four scenarios. This result combined with the usefulness of this segment at the segment analysis level indicates that this investment is a robust decision. Six of the segments appeared in the corridors created in three of the four scenarios, three rail lines, two waterways, and one highway segment. Segment S07 – I-5 North/South Rail Lines appeared in a corridor in three out of four further indicating investment in this segment is a robust decision. Three segments, S02 – North/South Major Highways (East), S04 – I-82, and S06 – East/West Canadian Highways with Access to Washington State, did not

appear in any corridor for any of the four scenario groups suggesting that not investing in these segments is a robust decision.

## **Summary of Segment and Corridor Level Results by Scenario**

### ***Global Marketplace Scenario Results***

The most favored segments included:

- S01 – I-5 and North/South Major Highways (West) (145 points / 11%)
- S12 – Columbia/Snake River Strategic Waterways (145 points / 11%)

The least favored segments included:

- S16 – Strategic Pipelines (5 vetoes / 25%)
- S05 – I-84 (4 vetoes / 20%)

Identified corridors:

- Corridor-1 – The primary corridor consisted of segments carrying freight North/South along the state’s west coast, and East/West along the Columbia and Snake rivers. (Segments: S01, S14, S08, S07, S13, S12)
- Corridor-2 – The secondary corridor consisted of segments carrying freight East/West through the center of the state. (Segments: S03, S15, S14, S10, S09, S13)

### ***Naftástique Scenario Results***

The most favored segments included:

- S07 – I-5 North/South Rail Lines (205 points / 13%)
- S01 – I-5 and North/South Major Highways (West) (200 points / 13%)
- S16 – Strategic Pipelines (175 points / 11%)

The least favored segments included:

- S11 – Grays Harbor- Chehalis Rail Line (9 vetoes / 30%)

Identified corridors:

- Corridor-1 – This corridor consisted of highways, railways, and waterways for transporting freight East/West. (Segments: S03, S10, S09, S12)
- Corridor-2 – This corridor focused on freight flow North/South in the western part of the state. (Segments: S01, S16, S07, S13)

### ***One World Order Scenario Results***

The most favored segments included:

- S12 – Columbia/Snake River Strategic Waterways (215 points / 16%)
- S08 – Columbia River East/West Rail Lines (195 points / 15%)

The least favored segments included:

- S15 – Cargo Airports (East) (4 vetoes / 25%)
- S11 – Grays Harbor- Chehalis Rail Line (4 vetoes / 25%)
- S14 – Cargo Airports (West) (3 vetoes / 19%)
- S06 – East/West Canadian Highways with Access to Washington State (3 vetoes / 19%)

Identified corridors:

- Corridor-1 – This corridor consisted of segments carrying freight East/West along the Columbia and Snake rivers using four modes. (Segments: S05, S16, S08, S12)
- Corridor-2 – This corridor contained segments carrying flow North/South using highways, rail lines and waterways, and carrying freight East/West using two rail lines. The East/West flows in this corridor were in the central part of the state, as opposed to in the south as in Corridor-1. (Segments: S01, S10, S07, S09, S13)

### ***Technology Savior Scenario Results***

The most favored segments included:

- S03 – I-90 (150 points / 12%)
- S01 – I-5 and North/South Major Highways (West) (140 points / 12%)

The least favored segments included:

- S06 – East/West Canadian Highways with Access to Washington State (5 vetoes / 24%)
- S16 – Strategic Pipelines (4 vetoes / 19%)
- S11 – Grays Harbor- Chehalis Rail Line (4 vetoes / 19%)

Identified corridors:

The corridors identified by the Technology Savior group consisted of very few segments; this group recommended investing in other segments for carrying freight on local roads. In this scenario, goods are finished locally for the local market, and thus local roads are more important than long-distance freight segments.

- Corridor-1 – This corridor consisted of two segments to carry goods East/West through the central part of the state.
  - I-90
  - Grays Harbor - Chehalis Rail Line
- Corridor-2 –
  - I-5 and North/South Major H Highways (West)

## **Additional Information**

For more information about the MIT CTL Future Freight Symposium:

<http://ctl.mit.edu/futurefreightflows>

For more information about the national project:

<http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2629>

<http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2628>

# Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>5</b>
1.1	Planning organization.....	5
1.2	Engagement with the planning organization .....	5
1.2.1	Key decisions made.....	5
1.2.2	Geographic scope and timeline.....	5
1.2.3	Type of workshop.....	6
1.2.4	Workshop facilitation.....	6
1.2.5	Other decisions made by the planning agency.....	6
1.3	Summary .....	6
<b>2</b>	<b>Design of Future Freight Flows Workshop.....</b>	<b>7</b>
2.1	Scenarios .....	7
2.2	Freight infrastructure segments.....	7
2.3	Workshop participants .....	7
2.3.1	Assignment of participants to scenarios .....	8
2.4	Workshop agenda.....	9
2.5	Resources used in the workshop.....	9
2.5.1	Personnel and their roles .....	9
2.5.2	Facilities and equipment.....	10
2.5.3	Information about segments and scenarios .....	11
2.5.4	Instruments used in the workshop.....	11
2.6	Summary .....	13
<b>3</b>	<b>Results of Scenario Planning Exercise .....</b>	<b>14</b>
3.1	Individual segment voting by scenario .....	14
3.1.1	Caution about reading charts .....	14
3.1.2	Segment voting in Global Marketplace.....	15
3.1.3	Segment voting in Naftástique.....	16
3.1.4	Segment voting in One World Order .....	17
3.1.5	Segment voting in Technology Savior .....	18
3.2	Corridors created by individual scenarios .....	18
3.2.1	Corridors in Global Marketplace.....	19
3.2.2	Corridors in Naftastique.....	20
3.2.3	Corridors in One World Order .....	20
3.2.4	Corridors in Technology Savior .....	21
3.3	Cross-scenario analysis .....	21
3.3.1	Comparison of investments in segments across scenarios .....	22

3.3.2	Comparison of corridors across scenarios .....	23
3.3.3	Comparison of initiatives across corridors.....	24
3.4	Summary .....	25
<b>4</b>	<b>Post-workshop reflections .....</b>	<b>26</b>
4.1	Post-workshop feedback from WSDOT team members .....	26
4.2	Post-workshop feedback from workshop participants.....	26
4.2.1	Perceptions about individual scenarios .....	27
4.2.2	Feedback on workshop components.....	27
4.2.3	Feedback on workshop material.....	29
4.3	Suggested improvement for future workshops.....	29
4.4	Summary .....	30
<b>Appendix</b>	.....	<b>31</b>

## **List of Figures**

Figure 1: Distribution of Group Vote in Global Marketplace .....	15
Figure 2: Distribution of Group Vote in Naftastique .....	16
Figure 3: Distribution of Group Vote in One World Order .....	17
Figure 4: Distribution of Group Vote in Technology Savior.....	18
Figure 5: Cross-scenario Comparison of Investment Decisions .....	22

## **List of Exhibits**

Exhibit 1: Map of Washington State Showing 16 Freight Segments .....	31
Exhibit 2: Freight Infrastructure Segments.....	32
Exhibit 3: Number of Invitees to the Workshop by Group .....	33
Exhibit 4: Subpopulations used in Stratified Sampling.....	33
Exhibit 5: Workshop Agenda .....	34
Exhibit 6: List of Freight Infrastructure Segments .....	35
Exhibit 7: Freight Infrastructure Segments on Map .....	36
Exhibit 8: Individual Investment Decision Form (Half-page View).....	37
Exhibit 9: Corridors in Four Scenarios .....	38
Exhibit 10: Perceptions of Individual Scenarios .....	38
Exhibit 11: Participant Feedback on the Workshop .....	39
Exhibit 12: Participant Feedback on the Workshop Material.....	40

# 1 Introduction

The goal of this section is to introduce the reader to the context in which this Future Freight Flows workshop was conducted. The section describes two aspects of the context: the transportation planning organization that hosted the workshop and the geographic region considered in the scope of the workshop.

## 1.1 Planning organization

The workshop was hosted by the Washington State Department of Transportation (WSDOT). WSDOT considers itself “the steward of a large and robust transportation system” that is “responsible for ensuring that people and goods move safely and efficiently” in the State of Washington. WSDOT builds, maintains, and operates the state’s highway system; manages the ferry system; and partners with other organizations to “maintain and improve local roads, railroads, airports, and multi-modal alternatives to driving”.<sup>1</sup>

## 1.2 Engagement with the planning organization

The primary contact person for the workshop was Barbara Ivanov, the State of Washington’s top executive in charge of WSDOT’s Freight System. MIT CTL and WSDOT held the first phone call to discuss this workshop on January 19, seven weeks before the workshop. A recurring phone call was scheduled for every two weeks since this call.

### 1.2.1 Key decisions made

Several decisions were made jointly by MIT CTL and WSDOT teams. Barbara Ivanov played a key role in defining the objectives and the scope workshop on the behalf of WSDOT. They are listed in the sections 1.2.2-1.2.5 below.

### 1.2.2 Geographic scope and timeline

The geographic area to be considered for freight infrastructure investment decisions was the entire state of Washington. The timeline for considering the infrastructure investment decisions in the exercise was 30 years.

---

<sup>1</sup> Source: <http://www.wsdot.wa.gov/about/>

### **1.2.3 Type of workshop**

The Future Freight Flows scenario planning workshops can be customized to meet different needs of the planning organization. WSDOT was asked to make two choices regarding the workshop.

- Duration: Half-day, three-fourths of the day, or full-day
- Objective: Visioning or evaluation

WSDOT chose the workshop to be three-fourths of the day exercise. Instead of choosing just one of visioning and evaluation, WSDOT decided to use both approaches. The workshop was designed to first evaluate a few freight infrastructure segments selected by WSDOT. These were then put together into corridors to form a “transportation system” and then use the visioning approach to identify initiatives for each corridor.

### **1.2.4 Workshop facilitation**

One of the deliverables for the Future Freight Flows project is a facilitator’s guide that outlines how a workshop should be conducted. MIT CTL team decided that its researchers, who have experience of conducting dozens of scenario planning workshop, will facilitate the workshop as well as the breakout sessions. WSDOT associates would could potentially facilitate these workshops in future would be present in each breakout session.

### **1.2.5 Other decisions made by the planning agency**

In addition to the above decisions made at the beginning of the engagement with WSDOT, the following decisions were made at later stages in the engagement. The specifics of these decisions are provided in section 2.

- Identification of pertinent groups of stakeholders for involving in the workshop and personnel to represent those groups
- Identification of freight infrastructure segments used in the exercise

## **1.3 Summary**

This section presented the context in which the workshop was conducted. The planning agency, the role it played, and the key decisions made are described. This section gives very little information about the specifics of the workshop. These are presented in next two sections (workshop specifics in Section 2, results in Section 3).

## **2 Design of Future Freight Flows Workshop**

This section describes all the components of the workshop conducted at the Washington State Department of Transportation (WSDOT). These components can be seen as different decisions made by the WSDOT and MIT teams.

### **2.1 Scenarios**

All Future Freight Flows workshops use the four scenarios created by MIT's Center for Transportation & Logistics (CTL). The scenarios describe the world at a macro socio-technical and economic level. The four scenarios are:

- Global Marketplace
- Naftastique
- One World Order
- Technology Savior

### **2.2 Freight infrastructure segments**

16 freight infrastructure segments identified by WSDOT were used in the workshop. Each segment consisted of a single-mode contiguous artery used for transporting freight in or near the State of Washington. The segments were chosen from five different modes: highways (six segments), rail lines (five), waterways (two), air (two) and pipeline (one). The complete list of freight infrastructure segments is provided in Exhibit 2 in the Appendix. The freight segments were represented on the geographic map of the State of Washington. The map was prepared by WSDOT, and is presented in Exhibit 1 in the Appendix.

For the workshop, the segments from the same mode were shown together. Furthermore, the modes were color-coded as follows: highways (grey), rail lines (blue), waterways (green), airports (red), and pipeline (orange).

### **2.3 Workshop participants**

The participation in the workshop was by invitation only. It was decided to invite those individuals who had first-hand knowledge of the region's freight infrastructure needs. This suggested that transportation planners in the region, shippers, carriers, and community & environmental groups be invited

to participate in the workshop. This also suggested that consulting firms and independent consultants be not invited, unless such a person was deemed to be highly insightful.

MIT and WSDOT tapped into their own rolodex to identify insightful people to attend the workshop. A total of 275 invitations were sent to people outside WSDOT from private and public sectors; 85 of which came from MIT, the rest from WSDOT. Out of these, 64 people agreed to participate in the workshop (23%). Exhibit 3 in the Appendix shows the number of people invited and attending by the type of organization they belong to. Out of 64 people who agreed to attend the workshop, 55 actually attended (86%). The actual number of participants in each scenario was as follows:

- Global Marketplace: 13
- Naftastique: 16
- One World Order: 13
- Technology Savior: 13

### **2.3.1 Assignment of participants to scenarios**

About two weeks before the workshop, the invitees who had agreed to attend were segmented into four groups, one for each scenario. The groups were formed using stratified sampling. Stratified sampling was used because the population of attendees was a heterogeneous mix of various subpopulations, such as government agencies, environmental groups, shippers, carriers, etc. For the purpose of stratified sampling, eight strata were identified. The strata and the corresponding number of invitees who committed to attend are presented in Exhibit 4 in the Appendix. Within each stratum, the participants were randomly assigned to one of the four groups. Each group had about 16 participants. The final composition of each group was *approximately* as follows:

- Academics and consultants: 1
- Carrier: 2
- Government – Federal: 1 or 2
- Government – Local: 4
- Government – State: 4
- Industry advocate : 0 or 1
- Port: 2
- Shipper: 2 or 3

## **2.4 Workshop agenda**

The workshop was held from 8 am to 3 pm at the conference room facilities of the Seattle-Tacoma International Airport. The first 30 minutes were allocated to registration. The time from 8:30 am to 3 pm was divided in three blocks. First 90 minutes were used for introducing all the workshop participants to the Future Freight Flows project, the freight segments selected by WSDOT, and the scenario planning process. This was followed by a two-and-a-half hour interactive workshop, conducted in four parallel breakout groups – one for each scenario. Finally, the last two hours of the workshop included a working lunch and a joint session of all participants that compared and contrasted the findings of the four breakout groups. Exhibit 5 in the Appendix presents the agenda for the workshop.

## **2.5 Resources used in the workshop**

This section describes various resources used in the workshop. The list of resources includes personnel (and the roles played they played), facilities, information about the segments and the scenarios, and instruments used for gathering participant input.

### **2.5.1 Personnel and their roles**

Five roles were performed by the MIT and WSDOT team members.

- *Host:* Paula J. Hammond, the Secretary of the Washington State Department of Transportation, welcomed the attendees to the workshop. Secretary Hammond briefly described the objective of the workshop and introduced Barbara Ivanov, who provided details about the workshop.
- *Planning Manager:* Barbara Ivanov of WSDOT introduced and illustrated the sixteen freight infrastructure segments to be used in the exercise to the workshop participants.
- *Main facilitator:* Dr. Chris Caplice of MIT played the role of the main facilitator. He introduced the workshop participants to scenario planning, introduced the members of the facilitation team, and played the emcee for the debrief and discussion session after the breakout session.
- *Scenario facilitator:* The role of the scenario facilitators is to facilitate the discussion within their breakout group. The main objective of the facilitator is to help the participants in his/her group immerse

themselves into the scenario, and then help them apply their knowledge and insights to express the utility of the candidate freight segments in their scenario through a voting mechanism. The scenario facilitator has to manage the dynamic interaction within the group so that at first, individual group members can express their unique insights and then, they can combine the individual insights to bring forth group's insights. Four experienced facilitators from MIT – Jim Rice, Dr. Mahender Singh, Dr. Roberto Perez-Franco, and Shardul Phadnis – played this role.

- *Associate facilitator*: The associate facilitator helped the Main Facilitator compile the data generated by individual scenario teams during the breakout sessions. This helped to expedite the cross-scenario analysis so that a fairly thorough analysis could be presented to the workshop participants during the debrief and discussion session. Miguel Sanchez of MIT played this role.

### **2.5.2 Facilities and equipment**

Three types of facilities and equipment were used:

- *Conference room*: This room was large enough to seat the entire group of workshop attendees. The room had two large projector screens and Audio-Video equipment that were used for the PowerPoint presentations.
- *Breakout rooms*: Four breakout sessions were conducted in separate rooms. Three groups met in three smaller rooms, and one group met in the main conference room. In the three smaller breakout rooms, the participants were seated around tables in a U-shape so they faced each other and the facilitator. In the breakout session held in the main conference room, the participants were seated around the round lunch tables that were already arranged in the room; they sat facing each other and the facilitator. Each breakout room had Audio-Video equipment, which was used for showing the video of newscast in each scenario.
- *Audio Video (AV) equipment*: Each breakout room had a projector, a screen, and speaker phones. The AV equipment in the breakout rooms was used to show the video of each scenario (audio needed). The AV equipment in the main conference room was used to show the videos of all four scenarios during lunch and for the presentations during the panel sessions.

### **2.5.3 Information about segments and scenarios**

The information about the freight infrastructure segments and the appropriate scenarios was provided to inform the participants about what they were making investment decisions about (segments) and in what scenarios. This information was provided in three bundles.

- *Pre-workshop reading material:* Each workshop participant was sent reading material three days before the workshop via email. This included the following:
  - Map of freight infrastructure in the State of Washington
  - List of freight infrastructure segments with brief descriptions
  - A link to download the brochure of the scenario the participant was assigned to
- *Individual folders:* Each workshop participant received a folder containing information about the exercise when they registered in the morning. The folders were made specific to each scenario. The following information was contained in each folder:
  - List of freight infrastructure segments with brief descriptions (Exhibit 6; printed in color back-to-back on a 8½ x11 paper)
  - One-page document showing 16 freight infrastructure segments on separate maps (Exhibit 7; printed in color back-to-back on a 8½ x11 paper)
  - Map of the State of Washington
  - Scenario brochure (one scenario per folder)
- *Scenario video:* Each breakout group was shown a video of the scenario used in that group. After the breakout sessions, all participants saw the videos of all four scenarios during the lunch.

### **2.5.4 Instruments used in the workshop**

Three instruments are used in each breakout session. These are called “instruments” (as in a scientific instrument) because they are used for collecting data, i.e. the participants’ votes on the freight segments.

- *Voting chips:* Each participant in the scenario breakout session was given a set of 14 chips. The chips were of two different kinds: “invest” chips and “veto” chips. The “invest” chips were used to vote on the bundles that the participant recommended investing in his/her respective scenario. Each invest chip had a value marked on it. There were 11

invest chips: five worth 5 points each, five worth 10 points each, and one worth 25 points. Thus, the total value of the invest chips in each set was 100 points. The remaining three chips in the set were “veto” chips. A veto chip was used to indicate a segment not to invest in. Each individual could place only one veto chip on any segment.

- *Individual investment decision form:* Each participant in the scenario breakout session was given one form to write his/her individual vote (invest points or veto) for each freight segment in that scenario. A partial view of a sample form is shown in Exhibit 8 in the Appendix. Each form listed all sixteen freight segments, with three decision choices for each segment: number of points (out of 100) if one recommended investing in the segment, a check box to indicate vetoing the segment, and a checkbox to indicate a decision to neither invest nor veto. The forms also had two rows for the participant to recommend any additional segments besides the 16 chosen by WSDOT. Each form showed the name of the scenario on top and was printed on an 11x17 sheet of paper. All segments from one mode were presented together. However, the five modes were ordered randomly, and the segments within each mode were also ordered randomly on each form. This was done to avoid any effect on a person’s vote of the order in which the segments were presented. The reason for using these forms was to allow the individuals to write their investment decision based only on their own thoughts, before participating in a group voting process.
- *Voting sheets:* The document presenting the freight segments on a map shown in Exhibit 7 was used for the participants in each breakout session to place their chips on. The document was printed on two sheets in color on a 11x17 paper (one side only). Each breakout session had its own set of voting sheets. Each participant in the breakout group placed his/her chips on this map, as per the investment decision s/he had written on the individual investment decision form. Thus, the voting sheets and the chips were used to make individual investment decisions visible and subsequently to facilitate a discussion around them. The scenario facilitator tallied all the votes on each segment and wrote in the box for that segment. If any participant changed his/her vote after the group discussed the votes, the changed vote was noted on the form. The associate facilitator went around the breakout rooms and collected the final vote by segment from each scenario group.

## **2.6 Summary**

This section presented the components of the WSDOT workshop and described how they were chosen. The process of choosing these components involves making certain decisions that shape the nature of the workshop. The next chapter presents the investment decisions made by the four scenario groups during the breakout session and compares the decisions across the scenarios.

## 3 Results of Scenario Planning Exercise

This section presents the investment decisions made by the four scenario groups at the Washington State Department of Transportation (WSDOT) workshop. The investment decisions were made on 16 freight infrastructure segments chosen by WSDOT. Section 3.1 presents the decisions made by each scenario team of the individual freight segments. Each team then assembled the individual segments into freight corridors. The corridors created by each scenario team are presented in section 3.2. This presentation of individual scenario decisions is followed by cross-scenario comparison of investment decisions presented in section 3.3.

### 3.1 Individual segment voting by scenario

The votes by the four scenario teams on the 16 freight segments are presented graphically in sections 3.1.2 through 3.1.5. These bar charts show the distribution of “invest” and “veto” votes among the 16 freight segments using green and red bars, respectively.

The green bar for each freight segment shows the percentage of the “invest” points each segment received in the total invest points assigned in the respective scenario. Thus, for instance, participants in Global Marketplace assigned a total of 1300 points to the 16 freight segments and 105 to the segment “I-90”. Thus, the height of the green bar for the segment “I-90” in the chart is  $105/1300=8\%$ .

The red bar for each freight segment shows the percentage of the “veto” votes each segment received in the total veto votes assigned in each respective scenario. Participants in Global Marketplace assigned a total of 20 vetoes and two to the segment “I-90”. Thus, the height of the red bar for the segment “I-90” in the chart is  $2/20=10\%$ .

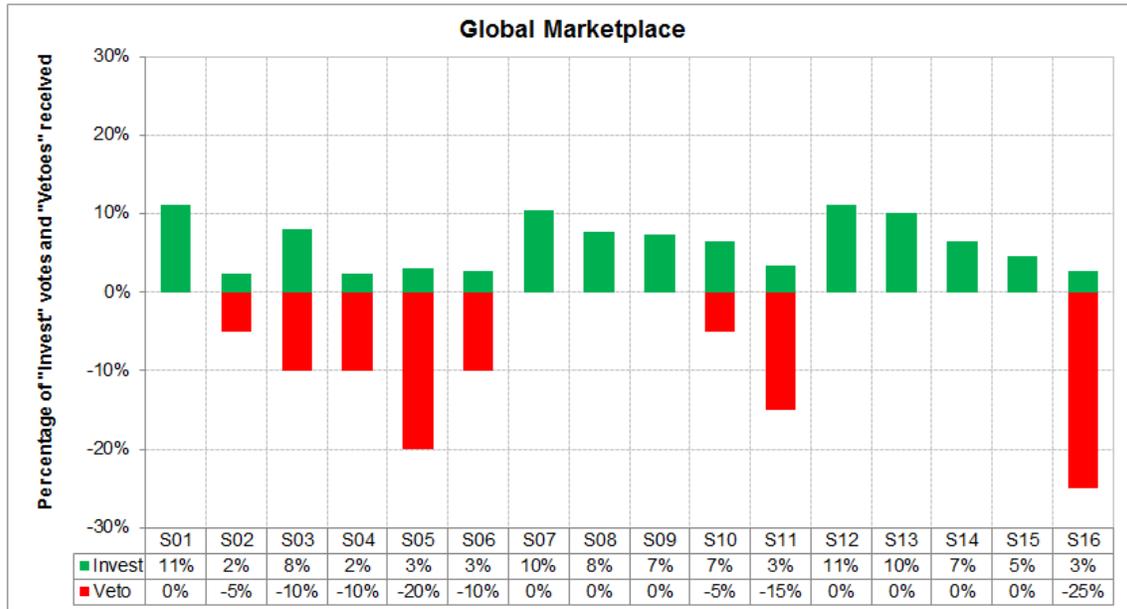
#### 3.1.1 Caution about reading charts

The group’s vote on the investments in various bundles is shown in Figures 1 through 4 in the proceeding sections. Each chart shows the “invest” and “veto” votes both. Note that the votes are shown as percentage of the total “invest” and “veto” votes, respectively. However, the scales of the two bar charts may not be comparable. The “invest” (green) bar shows the percentage of votes

among more than 1000 points, whereas the “veto” (red) bar shows the percentage point veto votes among no more than 30.

### 3.1.2 Segment voting in Global Marketplace

The results of the group vote in Global Marketplace are shown in Figure 1 below. The group assigned a total of 1300 “invest” points and 20 “vetoes”.



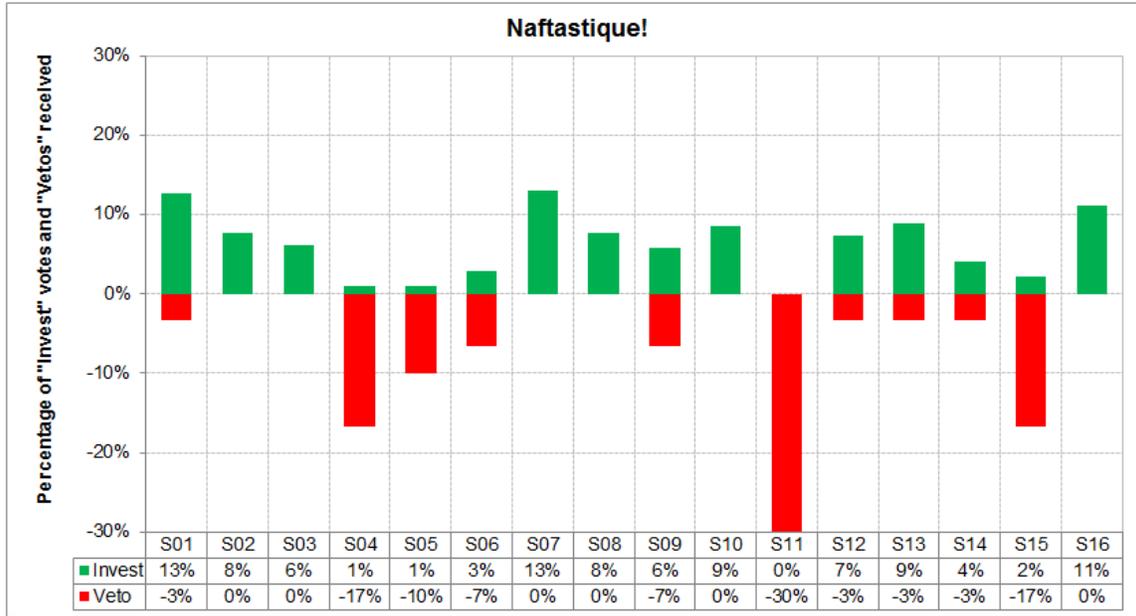
**Figure 1: Distribution of Group Vote in Global Marketplace**

Summary of the investment decisions by the group:

- Freight segments S01 (“I-5 and North/South Major Highways (West)”) and S12 (“Columbia/Snake River Strategic Waterways”) were the two most favored segments. Each received the highest proportion of points (11%, or 145), and no vetoes.
- Segments S07 (“I-5 North/South Rail Lines”) and S13 (“Strait of Juan de Fuca – Puget Sound Strategic Waterways”) were the second and third most favored segments with 10% (135 and 130, respectively) of the invest points each and no vetoes.
- Four more segments – S08, S09, S14, and S15 – also received between 60 and 100 invest points each, and no vetoes.
- Segments S16 (“Strategic Pipelines”) and S05 (“I-84”) were the least favored segments. They received 5 (25%) and 4 (20%) vetoes (and 35 and 40 invest points), respectively.

### 3.1.3 Segment voting in Naftástique

The results of the group vote in Naftastique are shown in Figure 2 below. The group assigned a total of 1600 “invest” points and 30 “vetoes”.



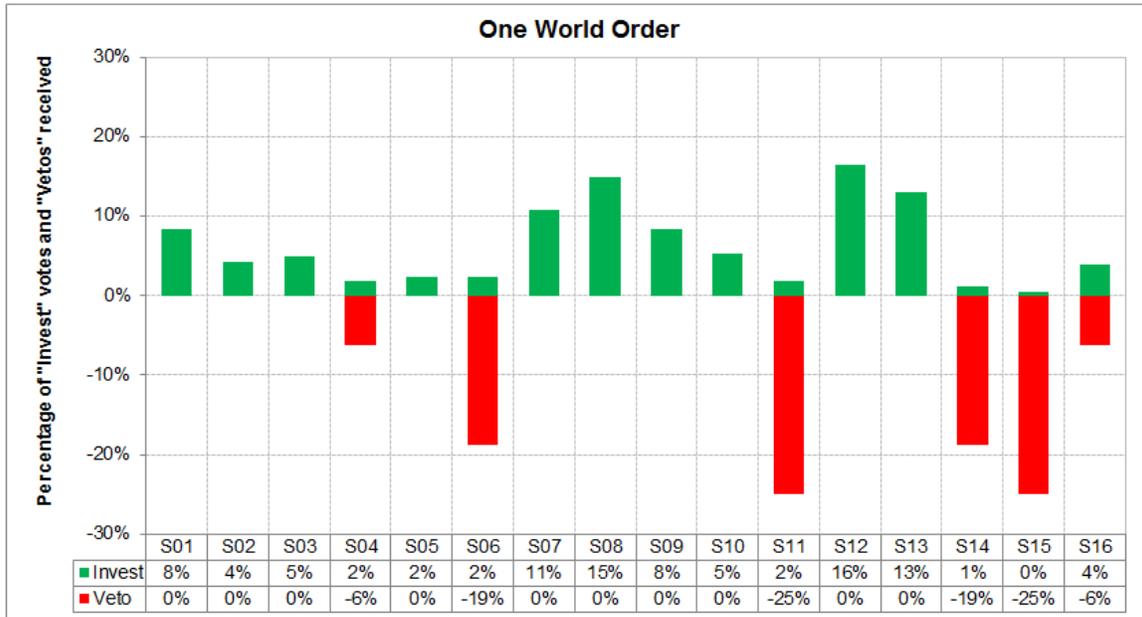
**Figure 2: Distribution of Group Vote in Naftastique**

Summary of the investment decisions by the group:

- Segments S07 (“I-5 North/South Rail Lines”), S01 (“I-5 and North/South Major Highways (West)”) and S16 (“Strategic Pipelines”) were the top three most favored segments, receiving 205 (13%), 200 (13%) and 175 (11%) of the invest points, respectively. S07 and S16 did not receive any vetoes; S01 was vetoed only once.
- Besides S07 and S16, four other segments received positive votes without any vetoes (S10, S08, S02 and S03).
- S11 (“Grays Harbor – Chehalis Rail Line”) was the least favored segment, receiving 30% (9 out of 30) of all the vetoes. This segment was also unique; it was the only segment (in all four scenarios) to receive not a single invest point.
- Three other segments were heavily vetoed with few invest points: S04 “I-82” (5 vetoes (17%); invest points (1%)), S15 “Cargo Airports (East)” (5 vetoes (17%); 35 invest points (2%)), and S05 “I-84” (3 vetoes (10%); 15 invest points (1%)).

### 3.1.4 Segment voting in One World Order

The results of the group vote in One World Order are shown in Figure 3 below. The group assigned a total of 1310 “invest” points and 16 “vetoes”.



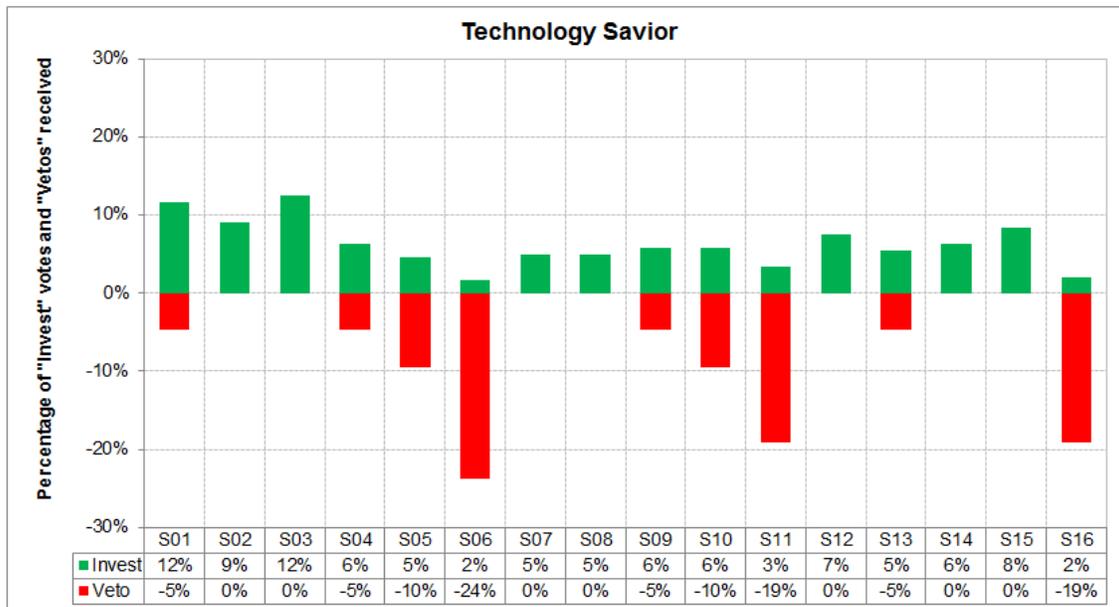
**Figure 3: Distribution of Group Vote in One World Order**

The summary of the voting:

- S12 (“Columbia/Snake River Strategic Waterways”) and S08 (“Columbia River East/West Rail Lines”) were the two most heavily favored segments receiving 215 (16%) and 195 (15%) of the total invest points, respectively and no vetoes. This indicates a clear preference for an East-West movement of freight.
- Segments S13 (“...Juan de Fuca...”) and S07 (“I-5 North/South Rail Lines”) were the next two most favored segments with 170 (13%) and 140 (11%) invest points respectively. Neither received any vetoes either.
- The top four most favored segments – S12, S08, S12, and S07 – are either waterways or rail lines, indicating a preference for high energy-efficient modes of transportation in the One World Order scenario.
- Four segments were heavily and disproportionately vetoed: S15 (“Cargo Airports (East)”), S11 (“Grays Harbor ... Rail Line”), S14 (“Cargo Airports (West)”) and S06 (“East/West Canadian Highways...”) receiving 4 (25%), 4, 3 (19%) and 3 vetoes, respectively. They received anywhere from 5 (~0%; S15) to 30 (2%; S06) of the invest points. It is notable that both segments in the “air” mode were heavily vetoed, again due to the preference for high energy-efficient modes of transporting freight.

### 3.1.5 Segment voting in Technology Savior

The results of the group vote in Technology Savior are shown in Figure 4 below. The group assigned a total of 1205 “invest” points and 21 “vetoes”.



**Figure 4: Distribution of Group Vote in Technology Savior**

Summary of the investment decisions by the group:

- S03 (“I-90”) and S01 (“I-5 and North/South Major Highways (West)”) were the two most favored segments, receiving 150 (12%) and 140 (12%) of the invest points respectively. S03 did not receive any vetoes, S01 received one.
- Next three most favored segments – S02 (“North/South Major Highways (East)”), S15 (“Cargo Airports (East)”), and S12 (“Columbia/Snake ... Waterways”) – received between 90 and 110 invest points and no vetoes.
- Three segments were heavily and disproportionately vetoed: S06 (“East/West Canadian Highways...”), S16 (“Strategic Pipelines”) and S11 (“Grays Harbor –Chehalis Rail Line”). They received 5 (24%), 4 (19%) and 4 vetoes each and no more than 40 (3%) invest points.

### 3.2 Corridors created by individual scenarios

After voting on the individual segments and discussing the rationale for the vote, the participants in each scenario were asked to create one or two corridors that were most important in their scenario. A corridor was defined as a collection of *contiguous* segments. The segments for creating corridors were chosen from the 16 segments used in voting. The participants were asked to create corridors by

considering their votes on individual segments, but not restricting themselves to the vote. Thus, they were free to exclude a highly voted segment from a corridor as well as include a heavily vetoed segment into a corridor. The purpose of creating a corridor is to create a *transportation system* to carry the freight flow using the modes that made the most sense in a given scenario.

Each scenario team created two corridors and identified top five initiatives for their corridors. The segments composition of all corridors is presented in Exhibit 9 in the Appendix. The list of segments in each corridor and top five initiatives for the corridors in each scenario are also presented in sections 3.2.1 to 3.2.4 below.

### 3.2.1 Corridors in Global Marketplace

- **Corridor-1:** The primary corridor consisted of segments carrying freight North/South along the state's west coast, and East/West along the Columbia and Snake rivers.
  - I-5 and North/South Major H Highways (West)
  - Cargo Airports (West)
  - Columbia River East/West Rail Lines
  - I-5 North/South Rail Lines
  - Strait of Juan de Fuca/Puget Sound Strategic Waterways
  - Columbia/Snake River Strategic Waterways
- **Corridor-2:** The secondary corridor consisted of segments carrying freight East/West through the center of the state.
  - I-90
  - Cargo Airports (East)
  - Cargo Airports (West)
  - Stevens Pass East/West Rail Line
  - Stampede Pass East/West Rail Line
  - Strait of Juan de Fuca/Puget Sound Strategic Waterways

The scenario team identified the following five **top initiatives** for the corridors:

- Complete I-5 rail projects, expand capacity on I-5 rail, complete 167/509 Corridors (missing links) & mitigate flood issues in Lewis County, protect freight rail from passenger rail
- Reserve industrial lands for industrial use
- Replace Columbia River Crossing (CRC)
- Implement ITS & Demand Management techniques for freight flow
- Improve access to Columbia River ports

### 3.2.2 Corridors in Naftastique

- **Corridor-1:** This corridor consisted of highways, railways, and waterways for transporting freight East/West.
  - I-90
  - Stevens Pass East/West Rail Line
  - Stampede Pass East/West Rail Line
  - Columbia/Snake River Strategic Waterways
- **Corridor-2:** This corridor focused on freight flow North/South in the western part of the state.
  - I-5 and North/South Major H Highways (West)
  - Strategic Pipelines
  - I-5 North/South Rail Lines
  - Strait of Juan de Fuca/Puget Sound Strategic Waterways

The scenario team identified the following five **top initiatives** for the corridors:

- Increase capacity on East-West rail line
- Develop short line feeder into Class I lines
- Increase I-90 capacity and linkage with other highways
- Enhance barge interfaces and intermodal exchanges
- Build interoperability between modes via policy changes, investment in information technology, etc.

### 3.2.3 Corridors in One World Order

- **Corridor-1:** This corridor consisted of segments carrying freight East/West along the Columbia and Snake rivers using four modes.
  - I-84
  - Strategic Pipelines
  - Columbia River East/West Rail Lines
  - Columbia/Snake River Strategic Waterways
- **Corridor-2:** This corridor contained segments carrying flow North/South using highways, rail lines and waterways, and carrying freight East/West using two rail lines. The East/West flows in this corridor were in the central part of the state, as opposed to in the south as in Corridor-1.
  - I-5 and North/South Major H Highways (West)
  - Stevens Pass East/West Rail Line
  - I-5 North/South Rail Lines
  - Stampede Pass East/West Rail Line
  - Strait of Juan de Fuca/Puget Sound Strategic Waterways

The scenario team identified the following five **top initiatives** for the corridors:

- Improve railroad operations
- Improve railroad infrastructure
- Develop and/or improve port-barge-rail connectors
- Invest in dredging and building locks
- Improve roads

### **3.2.4 Corridors in Technology Savior**

The corridors identified by the Technology Savior group consisted of very few segments (two and one segment in the two corridors). Instead, this group recommended investing in other segments for carrying freight on local roads. In this scenario, goods are finished locally for the local market, and thus local roads are more important than long-distance freight segments.

- **Corridor-1:** This corridor consisted of two segments to carry goods East/West through the central part of the state.
  - I-90
  - Grays Harbor - Chehalis Rail Line
- **Corridor-2:**
  - I-5 and North/South Major H Highways (West)

The scenario team identified the following five **top initiatives** for the corridors. The first initiative was recommended by nine members of the group; each of the remaining four by four members each:

- Create dedicated freight or truck lanes or corridors on the freeway
- Snoqualmie high mountain pass: Invest in winter maintenance, avalanche control and all weather improvement
- Invest in grade separation
- Improve capacity for Highway 18
- Expand rail capacity, including passenger rail, double tracking, etc.

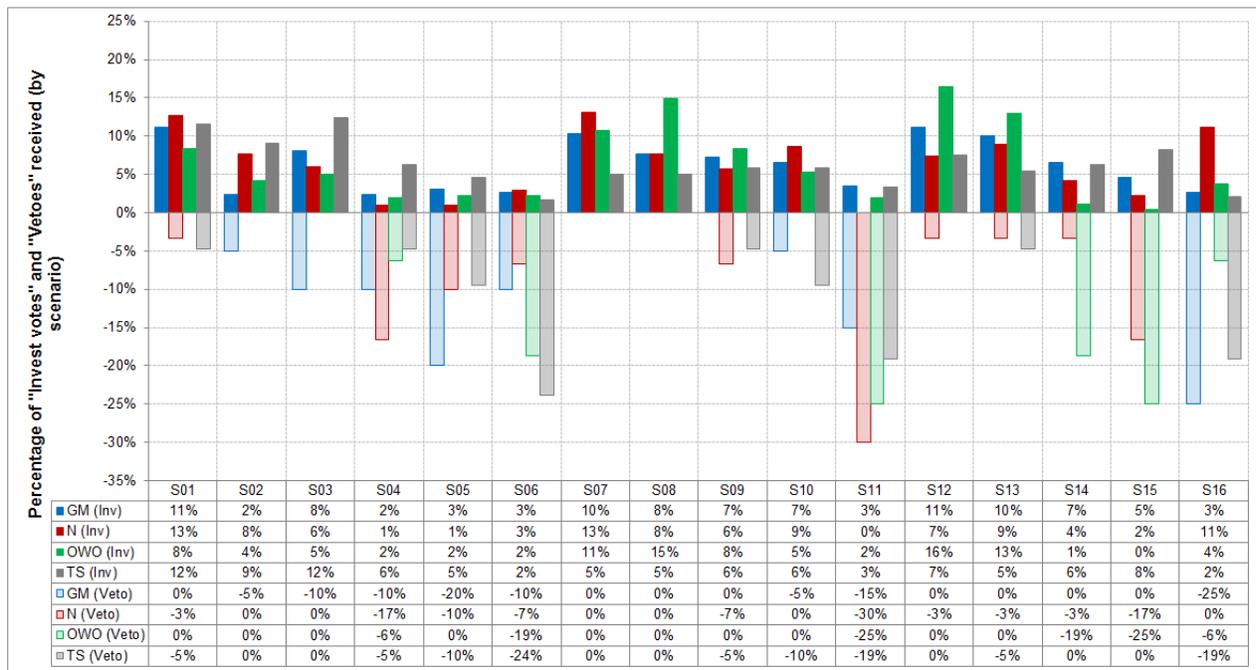
## **3.3 Cross-scenario analysis**

So far, section 3 has presented the findings from one scenario at a time. In this section, the findings from all four scenarios are compared to inform the policy makers of the utility of different freight segments and corridors under four diverse scenarios. This analysis is presented in two sections. First, we present a comparison of investment decisions for each freight infrastructure segment

across the four scenarios (section 3.3.1). The cross-scenario comparison of investment decision helps separate out segments whose utility is robust across all scenarios from the ones whose utility is contingent on a scenario. This is followed by a comparison of the corridors created by the four scenario groups (section 3.3.2).

### 3.3.1 Comparison of investments in segments across scenarios

The results from the individual scenarios presented above are compared across-scenarios in Figure 5 below. This figure uses the same convention as individual scenarios: “invest” votes are shown as percentage of invest votes received in the scenario on the *positive-Y* axis, and “vetoes” are shown as percentage of vetoes cast in each scenario on the *negative-Y* axis. However, instead of using green and red bar charts for invest and veto votes respectively, solid and transparent shades of four different colors are used. The purpose of this analysis is to identify robust and contingent investments. Robust investments are the ones whose utility is fairly uniform across scenarios.



**Figure 5: Cross-scenario Comparison of Investment Decisions**

Some observations on the cross-scenario analysis:

- Segments S07 (“I-5 North/South Rail Lines”) and S08 (“Columbia River East/West Rail Lines”) appear to be robust segments, as they have not received a single veto in any scenario. Furthermore, they also appear to

be highly valued in at least three of the four scenarios (all except Technology Savior).

- Segment S11 (“Grays Harbor – Chehalis Rail Line”) is another type of robust segment. It is highly vetoed in all four scenarios and has received very little invest votes in any of the four scenarios. Thus, it is a robust *non*-investment segment.
- Segment S06 (“East/West Canadian Highways with access to Washington State”) also appears to be another robust *non*-investment segment, as it is heavily vetoed in all four scenarios and have received not many invest votes in any scenario. However, the disutility of investing in this segment is not as extreme as that of segment S11.

### **3.3.2 Comparison of corridors across scenarios**

The composition of all eight corridors created by the four scenario breakout teams is shown in Exhibit 9 in the Appendix. A colored cell indicates that the segment at the corresponding row is contained in the corridor at the corresponding column. Given below are the highlights from the comparison of corridors across four scenarios:

- Only on segment – I-5 and North/South Major Highways (West) – appears in one of the two corridors in each scenario. This segment was also found to be useful in all four scenarios when evaluated as the segment-level. The usefulness of this segment at the segment- as well as corridor-levels in all four scenarios suggests that investing in this segment would be a robust no-brainer decision.
- Six segments appear in the corridors created in three of the four scenarios. Three of these are rail lines (I-5, Stampede Pass, and Stevens Pass) and two are waterways (Columbia/Snake and Puget Sound). All five of these appear in corridors created in Global Marketplace, Naftastique, and One World Order. One more segment – I-90 – is found in corridors in Global Marketplace, Naftastique, and Technology Savior.
- Besides appearing in a corridor in three out of four scenarios, I-5 North/South Rail Line was also found to be a useful investment at the segment-level in all four scenarios. Thus, investing in this segment is also a robust decision.
- Three segments (North/South Major highways (East), I-82, and East/West Canadian Highways) appear in not a single corridor. The latter two, I-82 and Canadian Highways, were also heavily vetoed in all

four scenarios. This suggests that these two are no-gainer investments, and *not* investing in them would be a robust decision.

- Not all segments vetoed at the segment-level analysis are bad investments. One segment – Grays Harbor-Chehalis Rail Line – was heavily vetoed in all four scenarios, but was contained in one corridor created by the Technology Savior team. Thus, more investigation in this segment is needed before rejecting it as a no-gainer investment.

### **3.3.3 Comparison of initiatives across corridors**

The initiatives identified in all four scenarios have many commonalities. Given below is a summary of the initiatives:

- ***Expand rail capacity (all four scenarios):***
  - (GM) Complete I-5 rail projects, expand capacity on I-5 rail, complete 167/509 corridors (missing links) & mitigate flood issues in Lewis County, protect freight rail from passenger rail
  - (N) Increase capacity on East-West rail line
  - (OWO) Improve railroad operations, Improve railroad infrastructure
  - (TS) Expand rail capacity, including passenger rail, double tracking, etc.
- ***Develop and/or improve inter-modal connections (all scenarios):***
  - (GM) Improve access to Columbia River ports
  - (N) Develop short line feeder into Class I lines; Enhance barge interfaces and intermodal exchanges; Increase I-90 capacity and linkage with other highways; Build interoperability between modes via policy changes, investment in information technology, etc.
  - (OWO) Develop and/or improve port-barge-rail connectors;
- ***Grade separation:***
  - (GM) Replace Columbia River Crossing (CRC)
  - (TS) Invest in grade separation
- ***Improve highways capacity:***
  - (N) Increase I-90 capacity and linkage with other highways
  - (OWO) Improve road
  - (TS) Improve capacity for Highway 18
- ***Other:***
  - (GM) Reserve industrial lands for industrial use
  - (GM) Implement ITS & Demand Management techniques for freight flow
  - (OWO) Invest in dredging and building locks

- (TS) Snoqualmie high mountain pass: Invest in winter maintenance, avalanche control and all weather improvement
- (TS) Create dedicated freight or truck lanes or corridors on the freeway

### **3.4 Summary**

This section presented the results from the scenario planning session. Results at the individual scenario level are presented first. Section 3.1 presents each scenario group's vote on the 16 freight infrastructure segments used in the workshop. Section 3.2 presents the corridors created by the four scenarios and the top five initiatives identified by each scenario team for their corridors. The individual scenario results are followed by cross-scenario comparison in section 3.3. This analysis first compares the votes at the segment-level and then at the corridor-level. This is followed by the comparison of initiatives identified for corridors in each scenario.

## 4 Post-workshop reflections

This section presents the lessons learned from the workshop. The lessons come from two different groups: members of the Washington State Department of Transportation (WSDOT) team and the participants in the workshop. The MIT team met with the WSDOT facilitators after the workshop to get their feedback. This is presented in section 4.1. The feedback from the workshop participants about the workshop itself and the material used in the workshop was sought in a post-workshop survey. The important points of this feedback are presented in section 4.2. Both the feedback are identified separately and then integrated to suggest improvements for the future workshops.

### 4.1 Post-workshop feedback from WSDOT team members

The MIT team met with the WSDOT facilitators after the workshop to get their feedback. Given below are the comments of the WSDOT team:

- MIT facilitators thought that the group of participants invited to the workshop was very good. They actively participated in the discussion, made insightful comments, and were involved in voting process.
- WSDOT argued that some of the charts used in the scenario brochures show trade balances, which may be too much information and biasing the participants in the scenario discussion.
- Barbara Ivanov informed that it is customary for the attendees at the WSDOT workshops to return from breakout sessions, listen to the presentations by the breakout groups, and leave. If more is expected from them during the presentations by the breakout groups (i.e. for performing a cross-scenario analysis), they need to be informed up-front.
- A WSDOT team member suggested that we should have the participants in each scenario sit together, as this may make them feel as a team.
- One person argued that the emails sent from MIT were too long, and did not make it clear that there was material to read before the workshop.

### 4.2 Post-workshop feedback from workshop participants

A survey was sent out to all the participants in the WSDOT workshop. Out of 55 who participated in the workshop, 37 completed the entire survey (67%) and

one additional respondent completed some parts of the survey (total 69%). The survey about the workshop asked for feedback on three types of items. First, the respondents were asked which of the four scenarios they perceived to resemble the world we live in today the most closely and which scenario was of the most desirable. Second, they were asked to evaluate the effectiveness of various segments of the one-day workshop. Finally, the respondents were asked to evaluate the usefulness of different items used for describing the scenarios and the instruments used for capturing the participants' thoughts. The results are summarized in Exhibit 10 (perceptions about individual scenarios), Exhibit 11 (feedback on workshop segments), and Exhibit 12 (feedback on workshop material), and discussed in sections 4.2.1, 4.2.2, and 4.2.3, respectively.

#### **4.2.1 Perceptions about individual scenarios**

Between seven and ten participants from each of the four scenarios answered the questions about their perceptions of the four scenarios. 25 out of 32 workshop participants (78%) thought that Global Marketplace resembles the world we live in today most closely; nobody thought One World Order does. Global Marketplace was also seen as the most desirable by about two thirds of the respondents (21 out of 32). Between 3 and 5 respondents also found each of the other three scenarios desirable.

#### **4.2.2 Feedback on workshop components**

The survey asked the respondents to rate the effectiveness of ten segments of the WSDOT workshop on a four-point scale ranging from "Very effective" to "Very ineffective" (See Exhibit 11 for results). The participants were also able to write comments. Given below are the highlights of the votes and the comments:

- For each of the ten segments of the workshop, more than half the respondents voted it as either "Very effective" or "Somewhat effective". For nine out of the ten workshop segments, the modal vote was also either "Very effective" or "Somewhat effective". Judged by this, the entire workshop was effective.
- The only segment for which the modal vote was "Somewhat ineffective" was "Creation of corridors". 14 (38%) respondents thought it was "Somewhat ineffective" followed by 12 (32%) who thought it was "Somewhat effective" and 7 (19%) who rated it "Very effective". This workshop was the first ever we have conducted in which we asked the workshop participants to create a *system* by combining the components

provided to them. There are two reasons for this, as judged from the comments provided by the respondents,

- **Insufficient time:** One participant noted, “We were left with something like 7 minutes to come up with one "corridor" with input from all the disparate interests in the room”. Another thought that more time was needed: “I do think that the rapid pace forced some decisions and the efforts to choose primary corridors were confusing.”
- **Not easy to create one corridor for the State:** One participant argued that “Washington does not lend itself to a simple single corridor”. Another respondent elaborated why this may be: “The road and Rail [parallel] each other on the I-5 corridor but have separate routes east- west thru the state so when asked to select only 1 east west route the groups had to choose either water/ rail, rail only or road only. That is not [reasonable] based upon our geography”. One participant narrated the difficulty his/her group faced in creating corridors: “Our group ended up making a very long primary corridor that covered most of the state...and some of the group wanted even more!” This difficulty made one respondent to argue that “[t]he corridors and initiatives work was a little less than clear.”
- “Creation of corridors” and “Identification of initiatives within corridors” both received more “Somewhat ineffective” and “Very ineffective” votes (18/37 and 15/36, respectively) than any other segment. However, the number of responding voting these segments as at least “Somewhat ineffective” was still less than half of all those who voted.
- 89% of the respondents thought that the individual voting forms and poker chips were at least “Somewhat effective” mechanisms for capturing the individual participants’ perception of the importance of each infrastructure segments. However, one respondent noted that one could not tell if the investments on a segment were made heavily by a select few who represented that segment (mode and/or region) or in smaller amounts by a larger proportion of the group: “You could have one idea realize 190 chip points however that could be from only 5 people who happened to be representatives from the area they were voting on.” This is likely to happen in any group. Individuals may vote on the segment they are associated with not necessarily only because of their political motives; it could be because they are more knowledgeable about the

needs of those particular segments because of their intimate knowledge of it than other participants who are not as close to the segment. We try to minimize the biasing effect of this by having a fairly even representation of participants from multiple modes and regions in each scenario breakout group.

#### **4.2.3 Feedback on workshop material**

The survey asked the respondents to evaluate the usefulness of five tools or instruments used in the WSDOT workshop on a four-point scale ranging from “Very useful” to “Not useful at all” (See Exhibit 12 for results). The participants were also able to write comments. Given below are the highlights of the votes and the comments:

- The modal vote for the usefulness of all five items was either “Very useful” (three items) or “Somewhat useful” (two items). Four out of five items were evaluated to be at least “Somewhat useful” by at least 88% of all the survey respondents.
- The vote on the usefulness of one item, the maps of Washington State posted on walls in the breakout rooms, was bimodal. 11 respondents (31%) each voted it as “Very useful” and “Not very useful”. The “Not very useful” votes for this item came from participants in all four scenarios (3 each from Global Marketplace and One World Order, and 2 each from Naftastique and Technology Savior). Thus, it is not possible to attribute this bimodal distribution to the shape/size of the room in which the breakout group met.
- Contrary to the maps on Washington State posted on the walls, the maps of infrastructure segments provided in the participant folders were found to be overwhelmingly useful, with almost 90% of the respondents voting them to be at least “Somewhat useful”. This item was also the one that received the most votes for being “Very useful” (both by number and percentage of votes) among the five.

#### **4.3 Suggested improvement for future workshops**

This section lists the improvements to consider in the future workshops. The suggestions are based on the feedback received from the Washington State Department of Transportation (WSDOT) team members who participated in or observed the workshop, and from the participants in the workshop through the post-workshop survey.

- The biggest opportunity for improvement is in “Creation of corridors” and “Identification of initiatives within corridors”. We think that the following are needed to improve this in future:
  - Provide specific definition of “corridor” to ensure that all facilitators and participants have a uniform understanding of it.
  - Provide more time for creation of corridors and identification of initiatives within the corridors.
  - Emphasize that the group has to create only one or two of *potentially many* useful corridors.
  - Emphasize the level of specificity of the corridor initiatives expected from the participants.
- All other segments of the scenario planning workshop are effective and working well.
- The pre-workshop reading material, scenario brochure (provided at the workshop in folder), and the videos of the scenarios are all found to in the present form.
- The maps of the individual infrastructure segments were used for the first time in the series of workshops MIT is conducting at the WSDOT workshop. They were found to be useful and should be used in future workshops.

#### **4.4 Summary**

This section summarized the lessons learned from the WSDOT workshop, through the feedback of WSDOT team members as well as the workshop participants. The lessons learned about different components of the workshop from different groups are presented. Section 4.3 summarized the improvements for the future workshops.

# Appendix



**Exhibit 1: Map of Washington State Showing 16 Freight Segments**

ID	Segment	Description
<b>Highways</b>		
S01	I-5 and North/South Major Highways (West)	Examples of what may be included in this segment: I-5 and neighboring highways, BC Route 99 and neighboring highways.
S01	I-5 and North/South Major Highways (West)	I-5 and North/South Major Highways (West).
S02	North/South Major Highways (East)	Examples of what may be included in this segment: US-395 and any neighboring highways, US-195 and any neighboring highways.
S03	I-90	I-90 highway and associated infrastructure.
S04	I-82	I-82 highway and associated infrastructure.
S05	I-84	I-84 highway and associated infrastructure.
S06	East/West Canadian Highways with Access to Washington State	Examples of what may be included in this segment: BC Route 3, Trans-Canada Highway (Highway 1), Access to the highways, etc.
<b>Rail lines</b>		
S07	I-5 North/South Rail Lines	Examples of what may be included in this segment: North/South rail line along I-5, Major rail terminals on the line (e.g. Seattle, Tacoma, Vancouver (WA), etc.).
S08	Columbia River East/West Rail Lines	Examples of what may be included in this segment: Columbia River East/West rail line (BNSF), Columbia River East/West rail line (Union Pacific), Major rail terminals associated with the lines.
S09	Stampede Pass East/West Rail Line	This segment includes the Stampede Pass rail line and associated terminals.
S10	Stevens Pass East/West Rail Line	This segment includes the Stevens Pass rail line and associated terminals.
S11	Grays Harbor - Chehalis Rail Line	This segment includes the Grays Harbor - Chehalis rail line and the associated terminals.
<b>Waterways</b>		
S12	Columbia/Snake River Strategic Waterways	Examples of what may be included in this segment: Columbia River waterway, Snake River waterway, Major ports associated with the waterways (e.g. Kalama, Longview, Pasco, Vancouver (WA), etc.).
S13	Strait of Juan de Fuca - Puget Sound Strategic Waterways	Examples of what may be included in this segment: Waterways in Strait of Juan de Fuca and Puget Sound, Major ports associated with the waterways (e.g. Anacortes, Everett, Olympia, Seattle, Tacoma, etc.).
<b>Airports</b>		
S14	Cargo Airports (West)	Examples of what may be included in this segment: Boeing Field - King County International Airport (BFI), Seattle - Tacoma International Airport (SEA).
S15	Cargo Airports (East)	Examples of what may be included in this segment: Spokane International Airport (GEG).
<b>Pipelines</b>		
S16	Strategic Pipelines	Examples of what may be included in this segment: Chevron Pipeline, Olympic Pipeline, Yellowstone Pipeline, Associated pipeline terminals.

## **Exhibit 2: Freight Infrastructure Segments**

Organization classification	Number Invited	Number Attending
Academic	3	2
Association	3	1
Carrier	60	8
Carrier - assn.	5	0
Consultant	8	1
Developer	4	1
Government - Fed	6	3
Government - Local	18	9
Government - State	32	13
Government - Tribe	3	1
Labor	3	2
Military	7	3
Port	15	8
Port - assn.	1	0
Shipper	115	10
Shipper - assn.	11	2
	294	64
Minus WSDOT	19	
Total invitees	275	64

**Exhibit 3: Number of Invitees to the Workshop by Group**

Group	Number agreeing to attend
Academics and consultants	3
Carrier	8
Government - Federal	6
Government - Local	13
Government - State	13
Industry advocate	2
Port	9
Shipper	10

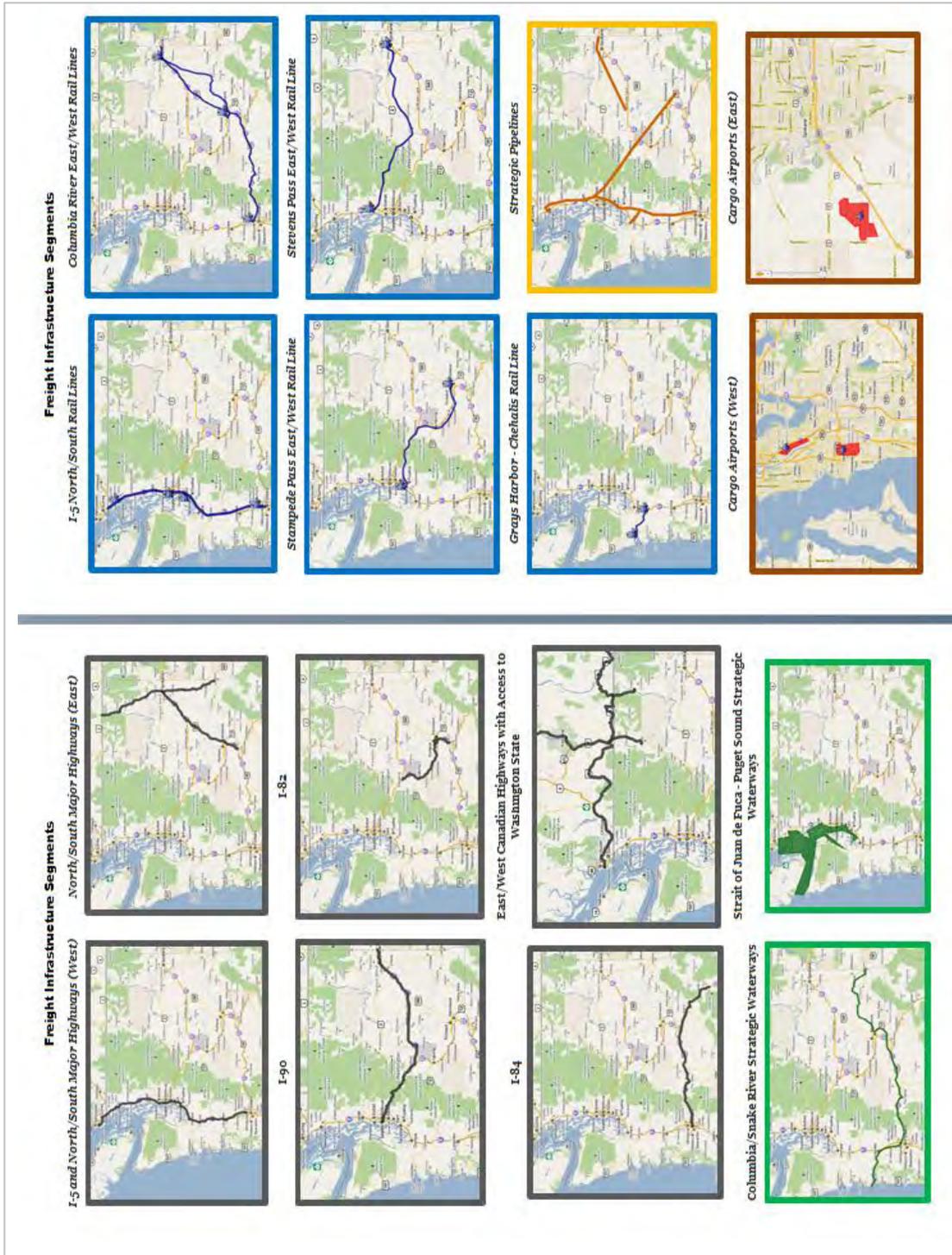
**Exhibit 4: Subpopulations used in Stratified Sampling**

Time	Activity
8:00 – 8:30	Registration and Sign In
8:30 – 8:45	Welcome and Project Overview
8:45 – 9:15	Introduction to freight investment segments
9:15 – 9:45	Introduction to the Scenario Planning
9:45 – 10:00	Break
10:00 – 12:30	Interactive breakout sessions (with a break): Four parallel sessions by scenario
12:30 – 13:15	Lunch
13:15 – 14:30	Debrief and discussion: Cross-scenario comparison
14:30 – 15:00	Wrap up

**Exhibit 5: Workshop Agenda**

<p style="text-align: center;">Washington State Department of Transportation</p> <p style="text-align: center;"><b>List of Freight Infrastructure Segments</b></p> <p><b>Air</b></p> <p><b>Cargo Airports (East)</b> Examples of what may be included in this segment: Spokane International Airport (GEG).</p> <p><b>Cargo Airports (West)</b> Examples of what may be included in this segment: Boeing Field - King County International Airport (BFI), Seattle - Tacoma International Airport (SEA).</p> <p><b>Highway</b></p> <p><b>East/West Canadian Highways with Access to Washington State</b> Examples of what may be included in this segment: BC Route 3, Trans-Canada Highway (Highway 1), Access to the highways, etc.</p> <p><b>I-5 and North/South Major Highways (West)</b> Examples of what may be included in this segment: I-5 and neighboring highways, BC Route 99 and neighboring highways.</p> <p><b>I-82</b> I-82 highway and associated infrastructure.</p> <p><b>I-84</b> I-84 highway and associated infrastructure.</p> <p><b>I-90</b> I-90 highway and associated infrastructure.</p> <p><b>North/South Major Highways (East)</b> Examples of what may be included in this segment: US-395 and any neighboring highways, US-195 and any neighboring highways.</p> <p><b>Pipeline</b></p> <p><b>Strategic Pipelines</b> Examples of what may be included in this segment: Chevron Pipeline, Olympic Pipeline, Yellowstone Pipeline, Associated pipeline terminals.</p> <p><b>Rail</b></p> <p><b>Columbia River East/West Rail Lines</b> Examples of what may be included in this segment: Columbia River East/West rail line (BNSF), Columbia River East/West rail line (Union Pacific), Major rail terminals associated with the lines.</p>	<p style="text-align: center;">Washington State Department of Transportation</p> <p style="text-align: center;"><b>List of Freight Infrastructure Segments</b></p> <p><b>Rail</b></p> <p><b>Grays Harbor - Chehalis Rail Line</b> This segment includes the Grays Harbor - Chehalis rail line and the associated terminals.</p> <p><b>I-5 North/South Rail Lines</b> Examples of what may be included in this segment: North/South rail line along I-5, Major rail terminals on the line (e.g. Seattle, Tacoma, Vancouver (WA), etc.)</p> <p><b>Stampepe Pass East/West Rail Line</b> This segment includes the Stampepe Pass rail line and associated terminals.</p> <p><b>Stevens Pass East/West Rail Line</b> This segment includes the Stevens Pass rail line and associated terminals.</p> <p><b>Water</b></p> <p><b>Columbia/Snake River Strategic Waterways</b> Examples of what may be included in this segment: Columbia River waterway, Snake River waterway, Major ports associated with the waterways (e.g. Kalama, Longview, Pasco, Vancouver (WA), etc.)</p> <p><b>Strait of Juan de Fuca - Puget Sound Strategic Waterways</b> Examples of what may be included in this segment: Waterways in Strait of Juan de Fuca and Puget Sound, Major ports associated with the waterways (e.g. Anacortes, Everett, Olympia, Seattle, Tacoma, etc.)</p>
Page 1 of 2	Page 2 of 2

**Exhibit 6: List of Freight Infrastructure Segments**



**Exhibit 7: Freight Infrastructure Segments on Map**

**Future Freight Flows Workshop**  
**Washington State Department of Transportation**  
**Individual Investment Decision for Scenario: Global Marketplace**

Freight Infrastructure Modal Segments	Invest (points)	Veto	No opinion
<b>Rail</b>			
<b>Stevens Pass East/West Rail Line</b> This segment includes the Stevens Pass rail line and associated terminals.	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Grays Harbor - Chehalis Rail Line</b> This segment includes the Grays Harbor - Chehalis rail line and the associated terminals.	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Stampede Pass East/West Rail Line</b> This segment includes the Stampede Pass rail line and associated terminals.	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>I-5 North/South Rail Lines</b> Examples of what may be included in this segment: North/South rail line along I-5. Major rail terminals on the line (e.g. Seattle, Tacoma, Vancouver (WA), etc.)	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Columbia River East/West Rail Lines</b> Examples of what may be included in this segment: Columbia River East/West rail line (BNSF), Columbia River East/West rail line (Union Pacific), Major rail terminals associated with the lines.	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Pipeline</b>			
<b>Strategic Pipelines</b> Examples of what may be included in this segment: Chevron Pipeline, Olympic Pipeline, Yellowstone Pipeline. Associated pipeline terminals.	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Water</b>			
<b>Columbia/Snake River Strategic Waterways</b> Examples of what may be included in this segment: Columbia River waterway, Snake River waterway. Major ports associated with the waterways (e.g. Kalama, Longview, Pasco, Vancouver (WA), etc.)	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Strait of Juan de Fuca - Puget Sound Strategic Waterways</b> Examples of what may be included in this segment: Waterways in Strait of Juan de Fuca and Puget Sound, Major ports associated with the waterways (e.g. Anacortes, Everett, Olympia, Seattle, Tacoma, etc.)	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Air</b>			
<b>Cargo Airports (West)</b> Examples of what may be included in this segment: Boeing Field - King County International Airport (BFI), Seattle - Tacoma International Airport (SEA).	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Cargo Airports (East)</b> Examples of what may be included in this segment: Spokane International Airport (GEG).	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>Highway</b>			
<b>I-90</b> I-90 highway and associated infrastructure.	_____	<input type="checkbox"/>	<input type="checkbox"/>
<b>I-82</b> I-82 highway and associated infrastructure.	_____	<input type="checkbox"/>	<input type="checkbox"/>

**Exhibit 8: Individual Investment Decision Form (Half-page View)**

	Modal Segment	Global Marketplace		Naftastique!		One World Order		Technology Savior	
		Cor-1	Cor-2	Cor-1	Cor-2	Cor-1	Cor-2	Cor-1	Cor-2
S01	I-5 and North/South Major Highways (West)	█			█		█		█
S02	North/South Major Highways (East)								
S03	I-90		█	█				█	
S04	I-82								
S05	I-84					█			
S06	East/West Canadian Highways w/ Access to Wash.								
S07	I-5 North/South Rail Lines	█			█		█		
S08	Columbia River East/West Rail Lines	█				█			
S09	Stampede Pass East/West Rail Line		█	█			█		
S10	Stevens Pass East/West Rail Line		█	█			█		
S11	Grays Harbor - Chehalis Rail Line							█	
S12	Columbia/Snake River Strategic Waterways	█		█		█			
S13	Strait of Juan de Fuca/Puget Sound Strategic Waterways	█	█		█		█		
S14	Cargo Airports (West)	█	█		█				
S15	Cargo Airports (East)		█						
S16	Strategic Pipelines				█	█			

**Exhibit 9: Corridors in Four Scenarios**

1. Questions about the four scenarios we used <a href="#">Create Chart</a> <a href="#">Download</a>					
	Global Marketplace	Naftastique!	One World Order	Technology Savior	Response Count
In your opinion, which of the four scenarios MOST CLOSELY RESEMBLES the world we live in TODAY?	78.1% (25)	12.5% (4)	0.0% (0)	9.4% (3)	32
In your opinion, which of the four scenarios is MOST DESIRABLE?	65.6% (21)	9.4% (3)	9.4% (3)	15.6% (5)	32
Which scenario did you participate in?	25.7% (9)	28.6% (10)	25.7% (9)	20.0% (7)	35
			answered question		36
			skipped question		2

**Exhibit 10: Perceptions of Individual Scenarios**

**2. How effective were each of the following at the Future Freight Flows workshop conducted at WSDOT on Mar 9?** [Create Chart](#) [Download](#)

	Very effective	Somewhat effective	Somewhat ineffective	Very ineffective	Response Count
Introduction to infrastructure segments (9:15-9:30 am)	45.9% (17)	45.9% (17)	5.4% (2)	2.7% (1)	37
Introduction to scenario planning (9:00-9:30 am)	62.2% (23)	29.7% (11)	5.4% (2)	2.7% (1)	37
Instructions re. breakout sessions (9:30-9:45 am)	51.4% (19)	40.5% (15)	5.4% (2)	2.7% (1)	37
Discussion of your scenario and implications (10~10:45 am)	44.4% (16)	47.2% (17)	5.6% (2)	2.8% (1)	36
Individual voting mechanism (form and chips; 10:45-11:00 am)	54.1% (20)	35.1% (13)	8.1% (3)	2.7% (1)	37
Discussion of votes on segments (11:00-11:30 am)	36.1% (13)	41.7% (15)	13.9% (5)	8.3% (3)	36
Creation of corridors (11:45am-12:00 pm)	18.9% (7)	32.4% (12)	37.8% (14)	10.8% (4)	37
Identification of initiatives within corridors (12:00-12:30pm)	2.8% (1)	55.6% (20)	27.8% (10)	13.9% (5)	36
Videos of all four scenarios in giving you an idea of what other scenarios were (12:30-1:00 pm)	44.4% (16)	41.7% (15)	11.1% (4)	2.8% (1)	36
Report-out session comparing investments in all four scenarios (1:30-2:30 pm)	38.2% (13)	44.1% (15)	11.8% (4)	5.9% (2)	34
			answered question		37
			skipped question		1

**Exhibit 11: Participant Feedback on the Workshop**

3. How useful were each of the following items in giving you a good understanding of your scenario and the infrastructure segments?

[Create Chart](#) [Download](#)

	Very useful	Somewhat useful	Not very useful	Not useful at all	Response Count
Pre-workshop reading material	43.2% (16)	45.9% (17)	5.4% (2)	5.4% (2)	37
Scenario brochure in the workshop folder	41.7% (15)	47.2% (17)	5.6% (2)	5.6% (2)	36
Video of your scenario (break-out session)	54.1% (20)	37.8% (14)	5.4% (2)	2.7% (1)	37
Maps of Washington State posted on break-out room walls	31.4% (11)	22.9% (8)	31.4% (11)	14.3% (5)	35
Maps of infrastructure segments in the folder	56.8% (21)	32.4% (12)	8.1% (3)	2.7% (1)	37
			answered question		37
			skipped question		1

**Exhibit 12: Participant Feedback on the Workshop Material**