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Carbon Footprint Project: Environmental Performance and Energy Efficiency of Supply Chains

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Overview

- Background of the project
- Results achieved
- Details of the methodology
- Next steps
- Questions

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BACKGROUND: Carbon Footprint Project

- Developed to advance priorities identified in the joint Action Agenda by the 2011 Transportation and Energy Ministerial Conference through collaboration between APEC Transportation Working Group (TPTWG) and Energy Working Group (EWG);
- Aims to strengthen transportation's role in a clean energy future by providing a robust methodology and practical online tool to measure and allocate CO_2 emissions on per cargo, per port basis;
- Includes testing and verification of the methodology with actual operational data from ocean-going vessels serving a pilot route Port Ningbo-Port Prince Rupert

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PROJECT OBJECTIVES

- The project aims to directly link emissions and energy use to transportation activities by developing a methodology to allocate vessels' carbon emissions per port and per cargo type for the marine transportation segment serving trade between North America and the Asia-Pacific region;

- The outcomes of the project will help improve shippers' ability to measure vessels' energy and emission intensity to support finding opportunities to improve both. This has potential to reduce fuel costs and contribute to improved energy efficiency in the APEC region and the APEC aspirational goal of a 45% reduction in energy intensity;

- The project focuses only on container vessels as they are predominant in the trans-pacific marine trade, as per the Project Concept approved by TPTWG.

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Key Milestones achieved:

- June 2013: Governance Committee established
- July 2013: 1st Carbon Footprint Workshop held at TPTWG-38
- August 2013: 1st Interim Report submitted to APEC Secretariat
- October 2013: Pilot route Ningbo - Prince Rupert established
- November 2013: Methodological approach developed
- January 2014: 2nd Interim Report submitted to APEC Secretariat
- January 2014: Non-Disclosure Agreements established with Ningbo and Prince Rupert
- February 2014: APEC officials visit organized to Port Ningbo
- May 2014: 2nd Carbon Footprint Workshop held at EWG-44
- July 2014: 3rd Interim Report submitted to APEC Secretariat
- September 2014: Economies' review of the online tool completed

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2nd Carbon Footprint Workshop

- Key objective: present the methodology and demo version of the online tool, and engage energy and transportation experts in discussion on improvements in energy efficiency of maritime transport
- One-day event jointly organized by TPTWG and EWG; attended by about 100 experts representing 17 member economies and held as part of the APEC Energy Working Group meeting, May 2014, Kunming, China
- Presentations by the UN Economic and Social Commission for Asia and the Pacific, as well as several member economies on domestic policies and initiatives aimed to monitor and reduce emissions from marine transportation
- Demo version of the online tool and Questionnaire were distributed to all participants

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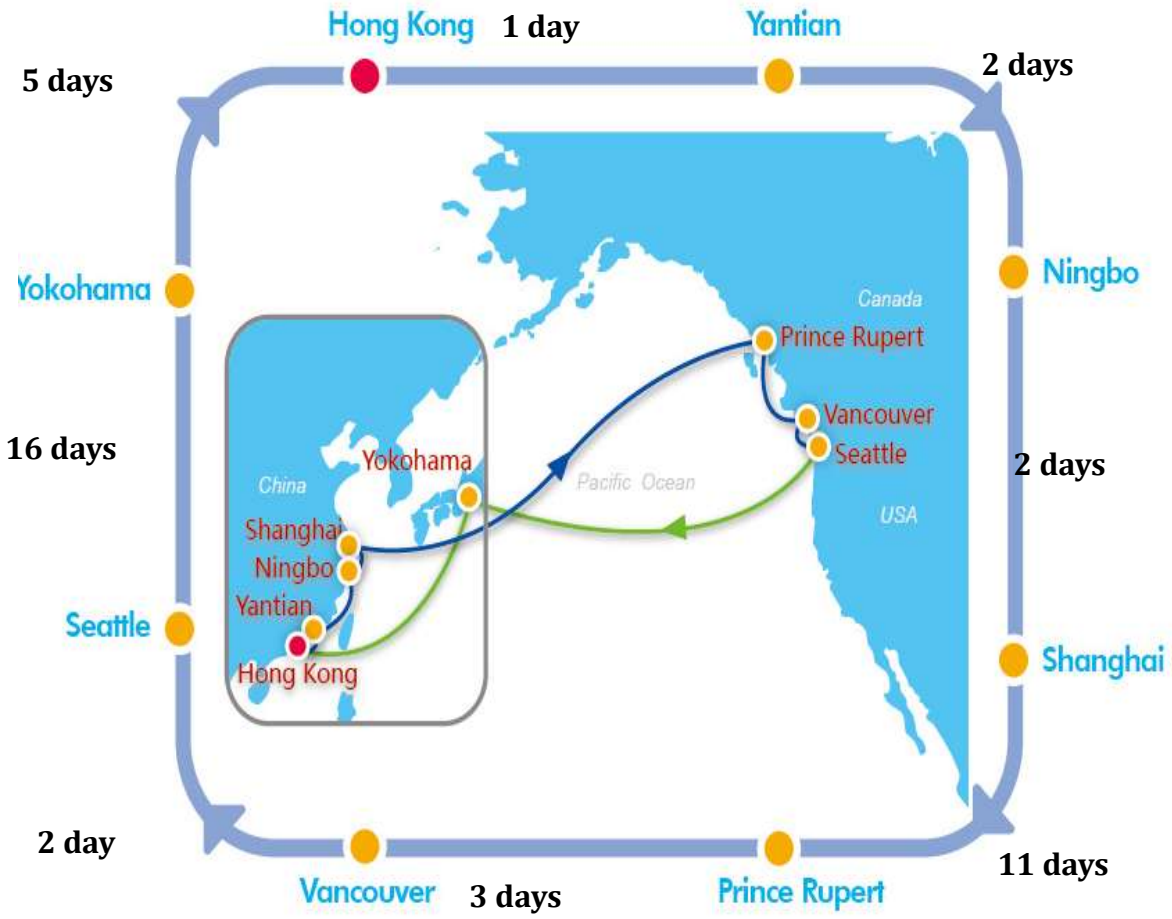

Port Rotation

Port	Eta	Time	Etd	Time
Hong Kong	Thu	0	Fri	1
Yantian	Fri	1	Sat	2
Ningbo	Mon	4	Mon	4
Shanghai	Tue	5	Wed	6
Prince Rupert	Sat	16	Mon	18
Vancouver	Tue	19	Wed	20
Seattle	Thu	21	Fri	22
Yokohama	Sat	37	Sat	37
Hong Kong	Thu	42		

Transit Time (Day)

From/To	Prince Rupert	Vancouver	Seattle
Hong Kong	15	18	20
Yantian	14	17	19
Ningbo	12	15	17
Shanghai	10	13	15

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KEY ASPECTS OF METHODOLOGY

- Applicable to any marine route serving the Asia-Pacific region calling at multiple ports on a single trip
- Compatible with the International Maritime Organization's current approaches, including Energy Efficiency Design Index, Energy Efficiency Operating Index, and Ship Energy Efficiency Management Plan
- Practical and easy-to use tool for APEC member economies to measure and allocate emissions from ocean-going vessels
- Capacity to establish CO_2 emissions baseline for vessels, types of cargo or ports as well as capacity to provide regular reporting on CO_2 emissions on per vessel, on a per port or per cargo basis

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MATH BEHIND THE METHODOLOGY:

- Similar mathematical principles are widely used for calculation of fees allocation in road and aviation transportation
- Existing solutions that can be applied for CO_2 emissions allocation include a range of methods, some of which are based on cost allocation and game theory
- As this project is one of the first attempts to look at the CO_2 emissions allocation in marine sector, an optimal methodology needs to be chosen out of existing ones
- Individual Delivery (ID) method was chosen as it was the optimal approach for this task, based on evaluation against several mathematical criteria
- For this specific project, the evaluation was based on the following criteria: tonnes/nautical mile causality, location-in-tour causality, efficiency, fairness, empty core robustness, ease of application and set robustness.

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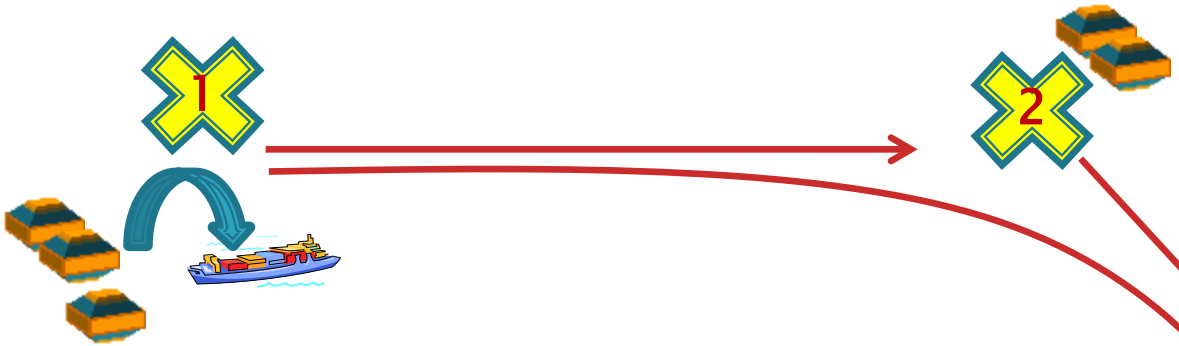
- Ship leaves Port 1 to Port 2
- Consumes Fuel F1
- Cargo A is dropped off at Port 2



Cargo A: allocated Emissions due to Fuel F1

- Ship leaves Port 2, to Port 3
- Ship has now consumed Fuel Ft
- Cargo B is dropped off at Port 3

Cargo B: allocated Emissions due to Fuel Ft

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INDIVIDUAL DELIVERY METHODOLOGY:

- Considers the direct distance between each port on the voyage, the volume of cargo and the allocation weight of each port's emissions
- The allocation weight assigns emissions to each port on the basis of its relative contribution to total emissions
- The allocation weight, $\mathcal{W}_i$, for port *i* is calculated by dividing its own emissions, *e(i)* , by the sum of each port's own emissions

$$w_i = \frac{e(i)}{\sum_{i \in N} e(i)}$$

- The allocated emissions amount, $I\mathcal{D}_i$, is obtained by multiplying this weight by the total emissions $\mathcal{E}$

$$ID_i(e) = E \times w_i$$

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CALCULATIONS VIA ONLINE TOOL:

- Based on allocation per cargo
- Data entered into an easy to use calculator
- Requires information on Fuel Consumed per voyage and cargo movement
- 2 options (carrier or port), based on fuel data availability

EXAMPLE: Ship travels from Shanghai to Prince Rupert to Seattle with cargo

- 1. At Prince Rupert: fuel consumed and cargo dropped off is recorded
- 2. At Seattle: the fuel consumed from Shanghai to Seattle and the cargo dropped off in Seattle is recorded.
- 3. Data is entered into calculator
- 4. Calculator provides the carbon emission (tons/TEU) per cargo, per port.

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Capabilities of the online tool

- System includes up-to-date information on fuel types, emission factors and vessels' engine types to provide robust calculations when actual fuel data is not available
- IMO and Lloyd's Registry information is used to ensure resulting calculations are coherent with industry standards
- Online tool designed to be updated when required to include any new regulatory requirements, fuel types, etc.

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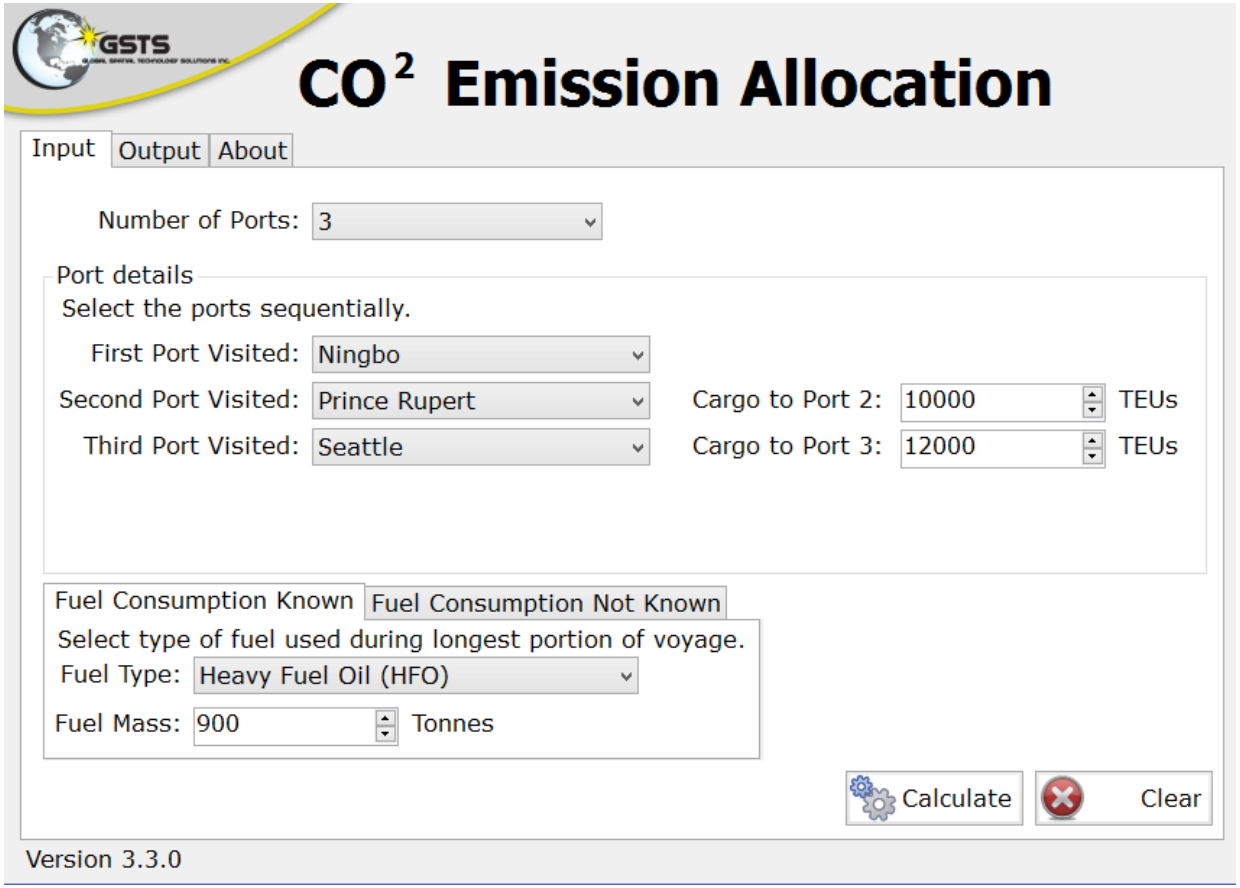
Option 1: Fuel data available



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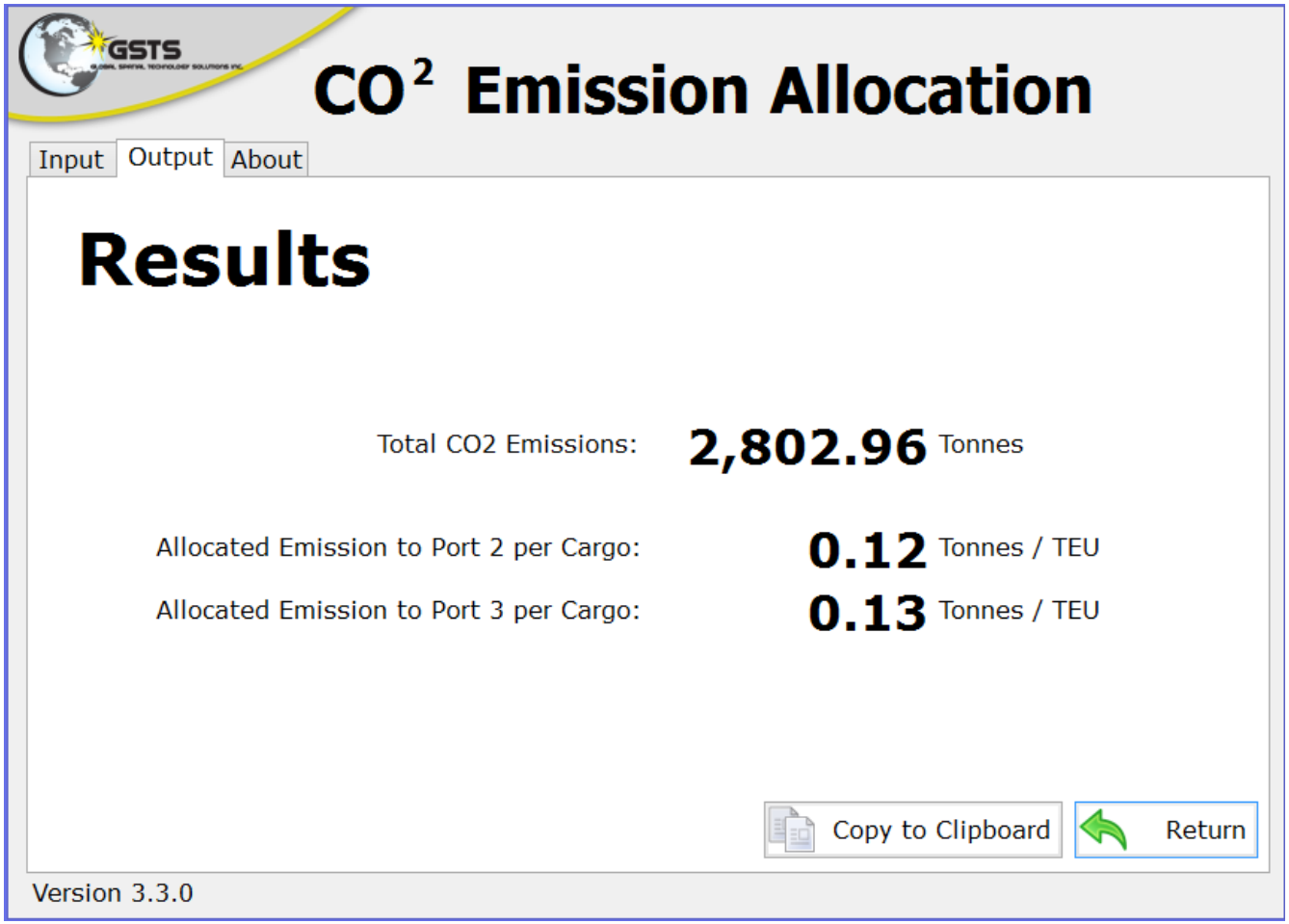

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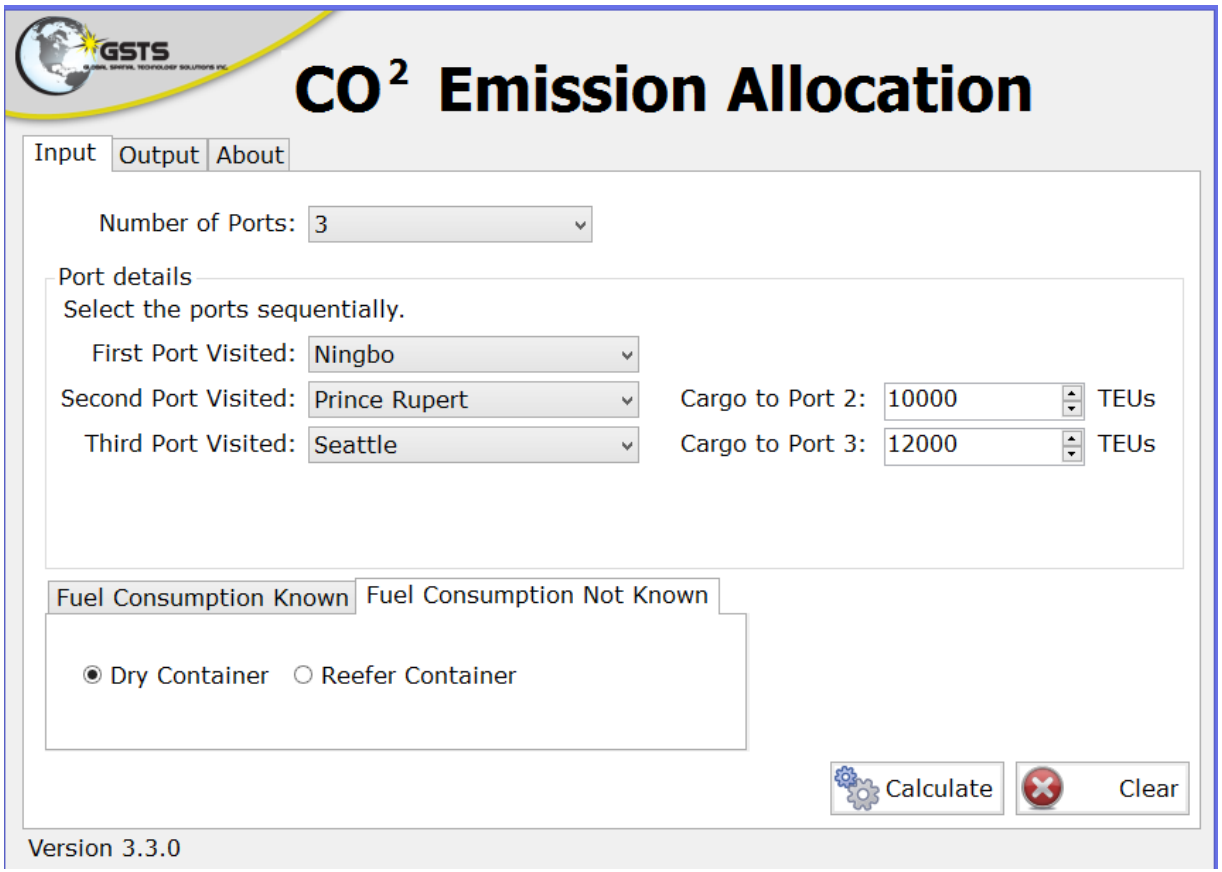
Option 2: fuel data is NOT available



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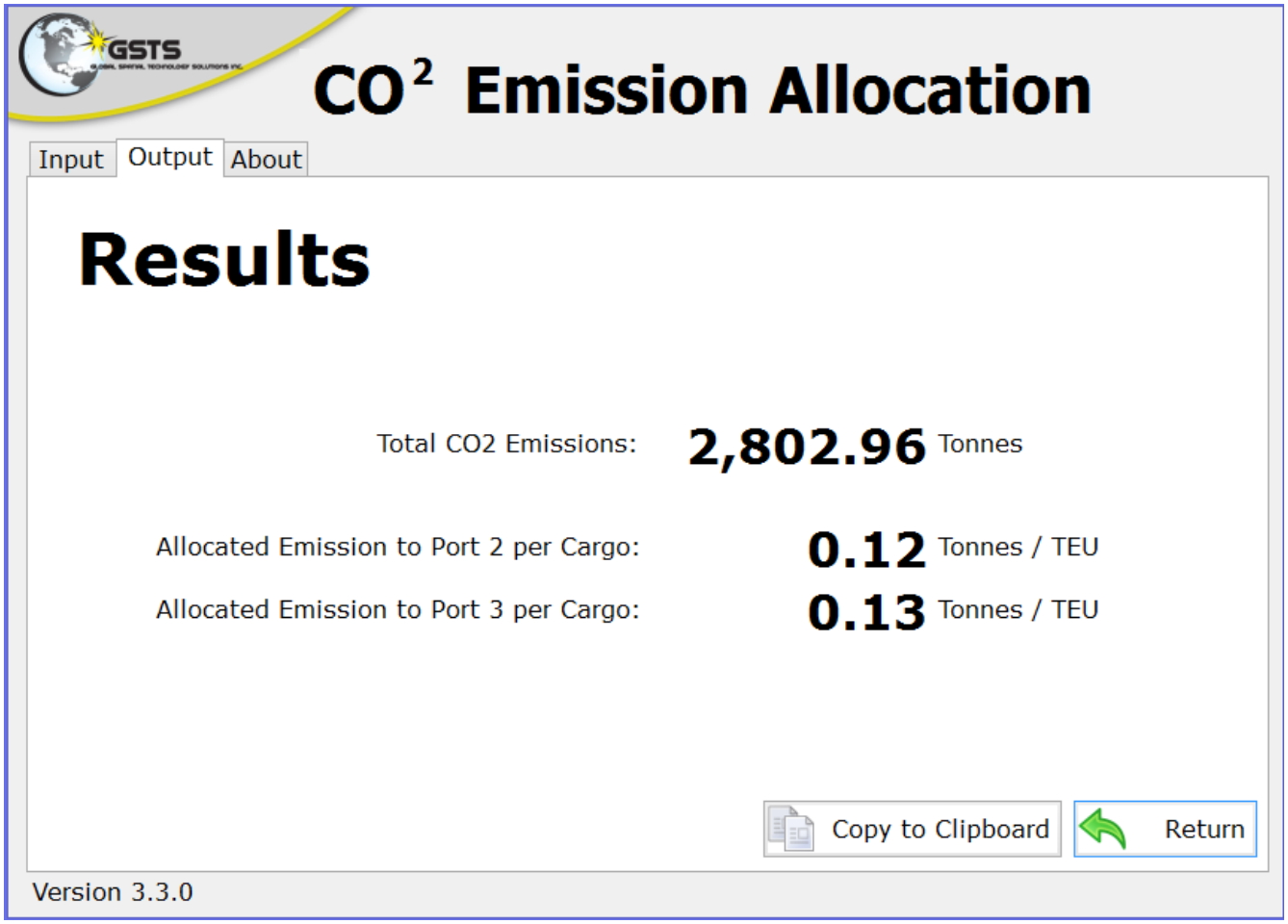

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NEXT STEPS:

- Fall 2014: Final version of the online tool, amended to incorporate recommendations submitted by member economies
- November 2014: presentation on the methodology and online tool at EWG-48
- December 2014: Final Report to APEC Secretariat
- Downloadable tool to be distributed via USBs and/or ftp site

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ONLINE RESOURCES

- FTP site: ftp.gsts.ca
- user name: apecworkshop@gsts.ca
- Password: kunming200514

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Questions?

Please contact
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