Freight Modelling Training Session

14:30 – 17:00
Introduction

Dr Guineng Chen
Team Lead
International Transport Forum
FRAMEWORK AND RESULTS OF THE ITF PHILIPPINES FREIGHT MODEL

Mr Till Bunsen, Policy Analyst
International Transport Forum

Supported by:

- IKI - International Climate Initiative
OUTLINE

1. BACKGROUND & OBJECTIVES
2. STUDY APPROACH
3. RESULTS
4. CALLS-TO-ACTION FOR POLICY MAKERS
Background & Objectives
Regional studies

- Assess infrastructure programs’ scope in Central Asia and Southeast Asia to improve connectivity and reduce environmental costs
- Suggest strategies to finance investments to close infrastructure gaps
- Benchmark national freight transport policies against best practices

National studies

- Develop sustainable transport roadmaps in partnership with national stakeholders
- Identify for which locations, transport sub-sectors, modes and technologies policies can be most effective
- National studies: Mongolia, Philippines, Uzbekistan
Take stock of the national freight transport system.
- Contextualise the sector structure, identify policy priorities and collect data

Asses impacts of alternative low-carbon pathways.
- Quantify how policy choices could shape activity and emissions across sector segments

Disseminate best practices for low-carbon freight.
- Recommendations for effective emission reduction strategies
Study approach
Data collection

• International and domestic trade flows by mode, trade partner and commodity
• Airport and port capacity
• Nautical highways
• Rail and road network
• Infrastructure development plans

National partners: DOTr, ICTSI, MARINA, NEDA, PSA, UNDP, UP, others
Scenario projections provide insights into sector trajectory

**Evaluate the impacts of the current policy framework.**

- Identify announced policies and infrastructure projects that will influence the emission trajectory.

**Assess the saving potential of additional measures.**

- Select additional policy options viable in the local context in consultation with national partners.

**Define two alternative scenarios with higher ambition.**

- Scenarios with increased ambition explore possible outcomes of adopting additional measures.
Evaluating sector trajectory in Current Ambition Scenario

- This scenario presents the evolution of CO₂ emissions if the current measures are implemented as planned but no further actions are considered.

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This policy has the potential of reducing CO₂ emissions by 1-2.5% in 2030 and by 5% in 2050.
Assessing two Climate Ambition Scenarios

**Green fleet:**
- Vehicle technology improvements through truck fleet renewal
- Stricter fuel economy standards for diesel trucks
- Fleet renewal/vessel refurbishment to reduce the share of fuel-oil-intensive ships

**Seamless Intermodality:**
- Infrastructure improvement to increase port capacity
- Infrastructure improvement to reduce dwell times
- Asset sharing to increase load factors
Results
Freight transport is set to more than quadruple until 2050

Trade will exceed 2 trillion tkm by 2050

Economic growth in the SEA region drives trade

International transactions present increasing share

Total Freight Transport in Current Ambition Scenario (tkm)
Trucks and ships remain the main transport modes

- Trucks set to increase domestic modal share
- Cargo rail is expected to remain uncommon
- Aviation crucial for time-sensitive, valuable goods
- Maritime dominates international trade

Freight transport modal share by year (based on tkm)
Tank-to-wheel emissions to reach 50 million tCO$_2$ by 2050

- Road emissions to increase stronger than maritime despite lower traffic growth
- Decarbonising road transport is a priority

CO$_2$ emissions by transport mode and year (ttw)
Vehicle replacements and intermodal transport do not oppress sector growth

Freight transport by scenario and year (tkm)

- 2022
- 2030
- 2050

Billions

- Current policy
- Green fleet
- Seamless intermodality
Ambitious freight policies can halve sector emissions

Investing in more efficient trucks and ships can reduce emissions by 61% in 2050, below current levels.

Zero-emission trucks are the most effective measures to decarbonize road freight.

Savings from intermodal transport are lower than in the green fleet scenario, at 22%.
Modal shares do not vary significantly between scenarios

Modal share by year and scenario (based on tkm)
Calls-to-action for policy makers
Green Fleet Scenario: Calls-to-action

Follow international best practices in adopting fuel economy or CO₂ emission standards for trucks.

Identify use cases for early adoption of zero-emission trucks in the Philippines and incentivise fleet conversions.

Promote efficient ships, for example, with differentiated port fees depending on the environmental performance of vessels and investment incentives.
Seamless Intermodality Scenario: Calls-to-action

- Invest in port capacity expansions and maximise utilisation of existing assets to enable maritime transport to capture a higher modal share.

- Streamline and digitalise processes to reduce dwell times at cargo transfer points.

- Incentivise and enable asset sharing, for example through promoting digital technologies and platforms to connect logistics operators.
TECHNICAL TRAINING ON MODELLING AND SCENARIO BUILDING

Dr Guineng Chen, Team Lead
Mr Diego Botero, Data Officer
International Transport Forum

Supported by:
Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection
IKI INTERNATIONAL CLIMATE INITIATIVE

based on a decision of the German Bundestag
OUTLINE

1. ITF PASTA GLOBAL FREIGHT MODEL
2. MODEL UPDATES
3. PRESENT THE VISUALISATION TOOL
ITF PASTA global freight model
What is ITF PASTA?

ITF’s freight model is one of five models that make up the ITF Policy Ambitions and Sustainable Transport Assessment (PASTA) framework.

Model inputs
- Global assumptions
- Scenario variables

Demand models
- Urban passenger model
- Urban freight model
- Non-urban and interurban passenger model
- Domestic and International non-urban freight model

Fleet model (all modes)

Output
- Tonne-km; Vehicle-km; Passenger km; Costs; Emissions (CO2eq); Connectivity
ITF non-urban freight model components

It is a fully integrated multi-modal network model that assigns freight flows on all major transport modes to specific routes, modes, and network links.

Model inputs:
- Economic and demographic data
- International trade forecasts
- Port and airport capacities
- GIS network by mode
- Spatial discretisation

Fleet model:
- Carbon intensity by mode

Scenarios:
- Policy measures levels

Non-urban freight model:
- International freight
- Domestic freight
- Equilibrium assignment

Output:
- Freight volume by link, node and commodity
- Port and airport throughputs
- Transport emissions
International Freight Model

International centroids

- Freight centroids are used to discretise regional origin-destination trade flows
- The model assumes a proportionality of trade to GDP
- Commodity shares are calculated according to the GDP created within the respective economic sector
- The conversion of value units (US dollars) into weight units (tonnes) of cargo was formulated as a Poisson regression model
- The mode share model for international freight flow defines the transport mode used
Domestic Freight Model

Domestic centroids

- The model follows a gravitational model to understand how total trade splits into an OD matrix between domestic freight centroids.
- Total surface freight activity is estimated by country, encompassing transport of international and domestic nature.
- Urban freight transport is included in the estimation.
- Domestic freight activity is estimated in alignment with international freight activity estimates and domestic freight weights.

Equilibrium assignment

The model uses an iterative equilibrium assignment procedure with travel time cost updates at every iteration (5 years). Freight transport activity is assigned to the shortest or least-costly path.
Outputs

Transport output
- Freight flows by origin-destination links, commodities and transport modes
- Throughputs by node
- Utilisation rate of infrastructure and potential bottlenecks
- Modal split by country, region or total

Environmental output
- CO₂ well-to-wheel emissions
- Local pollutants
- Activity and emissions by vehicle type and distance

Connectivity output
- Connectivity index of a country
- Assessment of the access to world markets

Policy output
- Evaluation of current policies
- Projection of the impact of alternative policy pathways
- Relevant and quantifiable policy recommendations
Projects mobilising this model

Executive Summary

ITF Transport Outlook 2021

Sustainable Infrastructure Programme in Asia
ITF PASTA global freight model updates
Trade updates

- The stakeholder consultation phase was of the highest importance to identifying data requirements for the national study and determining data ownership.
- Trade data are a central pillar in the global freight model that must be updated frequently to capture new trends and changes.
- International trade data by country is used to calibrate the model and serve as a benchmark for its results.

**Step 1:**
Data collection and validation

**Step 2:**
Match major types of goods in the model with those identified by national statistics authorities

**Step 3:**
Update international trade by commodity type and transport mode
The number of centroids was re-evaluated to increase possible origin-destination links for international trade and maximise the use of data provided by local stakeholders.

There are currently three international centroids in the archipelago, each representing one group of islands. Thus, there are three centroids: Manila (Luzon), Cebu City (Visayas) and Davao (Mindanao).

Domestic centroids were equally updated. Using data from stakeholders, the ITF team updated the capacity of the existing domestic centroid in the model.
One of the most important updates to the model consists of the inclusion of the three main nautical highways of the Philippines. These key roll-on-roll-off corridors are an essential component of the country’s connectivity and are vital for domestic trade.

The **western** nautical highway comprises approximately 130 nautical miles and 535 km of road and links 8 ports in the model. It connects the islands of Luzon, Mindoro, Panay, Negros and Mindanao.

The **central** nautical highway extends approximately 190 nautical miles and 260 km of road. It connects a total of 11 ports in the model, distributed in Luzon, Masbate, Cebu, Bohol and Mindanao.

The **eastern** nautical highway includes about 53 nautical miles and 415 road km. Being the shortest one, it links 4 ports in the model. This highway connects Luzon, Samar, Leyte and Mindanao.
Transport infrastructure updates encompassed three main tasks: road capacity, the number of ports and airports, and rail infrastructure.

1. Road-specific characteristics, like the number of lanes and speed limit, were updated. These variables are crucial for the model to assign trade flows throughout the road network. Capacity is measured by the number of trucks that circulate in a specific segment. The national model identifies 4 main road transport corridors distributed on the islands of Luzon, Panay, Cebu and Mindanao.
2. Additional entry/exit points to/from the Philippines for the international movement of goods were considered. In total, 12 new ports were included in the model. These new ports allow the model to capture better international trade and freight transport through nautical highways.

3. Rail infrastructure updates were made based on stakeholder consultations and desk research. Two rail corridor proposals, the SCR and SLH, were kept in the model with additional information on the estimated year to begin operations, capacity, speed and factors influencing costs.
The visualization tool
Introduction to the dashboard

Components

- Background datasheets
  Composed of direct results from the model and divided into tables according to the needs

- Metadata
  Includes the scenario description and the overall framework

- Dashboard
  Showcases 8 interactive figures to explore additional results from the 3 freight transport decarbonisation scenarios

Welcome to the SIPA-T Philippines Dashboard

The present Dashboard facilitates the visualisation of the environmental, trade and transport implications of current freight transport policies in the Philippines.

It also considers the results of alternative scenarios for decarbonising freight transport in the Philippines.

To begin exploring the description of the scenarios and the policy measures included in each one, click on one of the four boxes below.
Visualisation tool zoom in

Environment

Trade

Travel time and costs
Go to the dashboard

https://app.powerbi.com/view/?r=eyJrIjoiZTE2ZjM0MmEtOWU2NzY2UwLTkyZGljNTY1NTg0YjA2ZjQwIiwidCI6ImEzMTRlY2M5LWFlODAtNGQ5ZC1hZjU1LTE1ODRkNTQyZGIxNiJ9
Next Steps

After this meeting

• The ITF team will share with all registered participants of this session:
  – The tool itself
  – This PPT/training manual
  – A methodological note explaining in more detail the methodology on which the tool is based

• The dashboard will be embedded in the SIPA-T Philippines website (https://www.itf-oecd.org/decarbonising-pathways-freight-transport-philippines)

• New results and figures will be included in the dashboard

• The inputs and outputs of this study will complement the future SEA regional study, to be launched in 28 April 2023
DECARBONISING PATHWAYS FOR FREIGHT TRANSPORT IN THE PHILIPPINES

Dissemination Meeting

25 April 2023
8:30–16:30 Manila
Welcome and Introduction

Moderator

Dr Guineng Chen
Team Lead
International Transport Forum
Welcome remarks

Leonel De Velez
Assistant Secretary
Department of Transportation
Welcome remarks

Dr Young Tae Kim
Secretary-General
International Transport Forum
High-level Opening Panel Session

Is the Philippines ready to transition to a low-carbon freight transport future?

10:00 -11:30
Sustainable Infrastructure Programme in Asia - Transport

Regional studies

• Assess infrastructure programs’ scope in Central Asia and Southeast Asia to improve connectivity and reduce environmental costs

• Suggest strategies to finance investments to close infrastructure gaps

• Benchmark national freight transport policies against best practices

National studies

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• Identify for which locations, transport sub-sectors, modes and technologies policies can be most effective

• National studies: Mongolia, Philippines, Uzbekistan
Low-carbon pathways for the Philippines’ freight sector

Take stock of the national freight transport system.
➢ Contextualise the sector structure, identify policy priorities and collect data

Asses impacts of alternative low-carbon pathways.
➢ Quantify how policy choices could shape activity and emissions across sector segments

Disseminate best practices for low-carbon freight.
➢ Recommendations for effective emission reduction strategies
Green Fleet Scenario: Calls-to-action

Follow international best practices in adopting fuel economy or CO$_2$ emission standards for trucks.

Identify use cases for early adoption of zero-emission trucks in the Philippines and incentivise fleet conversions.

Promote efficient ships, for example, with differentiated port fees depending on the environmental performance of vessels and investment incentives.
Seamless Intermodality Scenario: Calls-to-action

- Invest in port capacity expansions and maximise utilisation of existing assets to enable maritime transport to capture a higher modal share.

- Streamline and digitalise processes to reduce dwell times at cargo transfer points.

- Incentivise and enable asset sharing, for example through promoting digital technologies and platforms to connect logistics operators.
Ambitious freight policies can halve sector emissions

Emission trends:
Green Fleet: -61%
Seamless Intermodality: -22%
Is the Philippines ready to transition to a low-carbon freight transport future?

Moderator

Dr Guineng Chen
Team Lead
International Transport Forum

Mr Leonel De Velez
Assistant Secretary
Department of Transportation

Mr James Leather
Chief of the Transport Sector Group
Asian Development Bank

Dr Young Tae Kim
Secretary-General
International Transport Forum

Ms Teresita del Rosario
Chief of Standards Developments
Department of Trade and Industry

Ms Elaine Borejon
Senior Science Research Specialist
Climate Change Commission
Lunch break

11:30 – 13:15
What are the strengths and missing elements of the Philippines’ current decarbonizing freight transport agenda?

13:15 - 14:15
RESULTS OF THE ITF CURRENT POLICIES SCENARIO FOR THE PHILIPPINES

Mr Diego Botero, Data Officer
International Transport Forum
OUTLINE

1. HOW DID WE BUILD THE CURRENT POLICY SCENARIO?
2. CURRENT TRANSPORT POLICIES
3. MODEL UPDATES
4. RESULTS AND CONCLUSIONS
Combining the effects of each measure, we projected the CO₂ emissions of the transport sector in the Philippines between 2019 and 2050

In collaboration with Philippines stakeholders we

- Analysed current transport policies for the Philippines
- Reviewed the planned evolution of the transport network in the coming years
- Updated international trade data by commodity and mode
- Inclusion of the three main nautical highways and other ferry connections
Current transport policies

This scenario presents the evolution of CO₂ emissions if the current measures are implemented as planned but further actions are not considered.

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- Trade will exceed 2 trillion tkm by 2050
- Economic growth in the SEA region drives trade
- International transactions present increasing share

Total Freight Transport in Current Ambition Scenario (tkm)
Trucks and ships remain the main transport modes

- Trucks set to increase domestic modal share
- Cargo rail is expected to remain uncommon
- Aviation crucial for time-sensitive, valuable goods
- Maritime dominates international trade

Freight transport modal share by year (based on tkm)

- Domestic
- International

- 2022 - 2050

- 0% - 100%

- Air
- Pipelines
- Rail
- Road
- Sea
Tank-to-wheel emissions to reach 50 million tCO$_2$ by 2050

Road emissions to increase stronger than maritime despite lower traffic growth

Decarbonising road transport is a priority
In conclusion

1. Freight transport is set to more than triple in the Philippines
2. Maritime transport will be the dominant mode
3. Road domestic transport will represent the main source of emissions in 2050
4. It is essential to decouple freight transport growth and CO₂ emissions
5. Decarbonising trucks and promoting a modal shift towards more efficient modes are priorities for upcoming years
6. Decarbonisation must be done without ignoring the crucial role that sea-born freight represents for the country
What are the strengths and missing elements of the Philippines' current decarbonising freight transport agenda?

Moderator

Mr Till Bunsen
Policy Analyst
International Transport Forum

Ms Anne Mariano
Chief Advisor
Deutsche Gesellschaft für Internationale Zusammenarbeit

Mr Edmund Trazo
Global HSSE Director
International Container Terminal Services

Ms Sofia Fulmaran
Officer Strategic Planning Division
Civil Aviation Authority of the Philippines

Ms Joyce Rivera
OIC Program Manager
Department of Transportation

Mr Francis Ray Almora
Regional Director
Land Transportation Office
Coffee break

14:15 – 14:45
In-Focus Policy Dialogue – Part 2

What is the successful pathway to reaching the climate goal for freight transport in the Philippines?

14:45 -16:15
RESULTS OF THE ITF CLIMATE AMBITION SCENARIOS FOR THE PHILIPPINES

Mr Till Bunsen, Policy Analyst
International Transport Forum
OUTLINE

1. INCREASED AMBITION SCENARIOS
2. RESULTS
3. POLICY RECOMMENDATIONS
Assessing two Climate Ambition Scenarios

**Green fleet:**
- Vehicle technology improvements through truck fleet renewal
- Stricter fuel economy standards for diesel trucks
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**Seamless Intermodality:**
- Infrastructure improvement to increase port capacity
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Vehicle replacements and intermodal transport do not oppress sector growth
Ambitious freight policies can halve sector emissions

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Modal share by year and scenario (based on tkm)
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What is the successful pathway to reaching the climate goal for freight transport in the Philippines?

**Moderator**

Dr Guineng Chen
Team Lead
International Transport Forum

**Mr Arnold Belver**
Development Management Officer IV
Climate Change Commission

**Ms Joyce Rivera**
OIC Program Manager
Department of Transportation

**Mr Marion Alcanzare**
Transport Researcher
Clean Air Asia

**Mr Felicisimo Pangilinan, Jr**
Director for Planning Service
Department of Transportation
SIPA Philippines Wrap up

Dr Guineng Chen
Team Lead
International Transport Forum
Mr Timothy John Batan
Undersecretary
Department of Transportation

Closing remarks
Closing remarks

Ms Anke Reiffenstuel
Ambassador
Embassy of the Federal Republic of Germany
Closing remarks

Dr Young Tae Kim
Secretary-General
International Transport Forum