Production of alternative marine fuels in Brazil: an IAM perspective

Eduardo **Müller-Casseres**[1], Francielle **Carvalho**[1], Tainan **Nogueira**[1], Clarissa **Fonte**[1], Mariana **Império**[1], Matheus **Poggio**[1], Huang Ken **Wei**[1], Joana **Portugal-Pereira**[1,2], Pedro R. R. **Rochedo**[1], Alexandre **Szklo**[1], Roberto **Schaeffer**[1]

1. Centre for Energy and Environmental Economics (**CENERGIA**), Energy Planning Programme (**PPE/COPPE**), Universidade Federal Do Rio de Janeiro, Brazil

2. Centre for Environmental Policy, Imperial College London, United Kingdom

IMO Alternative Fuel Symposium – 10 February 2021

Speaker: Prof. Roberto **Schaeffer**, Ph.D.

cenergia

Context for this presentation

- This presentation, based on a paper recently published with the same name, has been prepared in the context of a broader research project entitled "**Prospects for the Production of Carbon-Neutral Maritime Fuels in Brazil**"

- The work was split into 3 different phases:
  - **Phase 1**: Comparative Analysis of Alternative Marine Fuels
  - **Phase 2**: Georeferenced analysis, Lifecycle Assessment (LCA)
  - **Phase 3**: Economic analysis, IAM-based analysis

- **Phase 1** will be submitted by Brazil for discussion in the IMO Intersessional Working Group on the Reduction of GHG Emissions (**ISGW 8)**

- This presentation focuses on **Phase 3** (specifically IAM-based analysis)

Global IAMs (OECD and non-OECD)

Our research laboratory at COPPE,
Universidade Federal do Rio de Janeiro

Our IAMs

BLUES

Brazilian National IAM
Partial equilibrium
Energy, land use, materials
5 Brazilian regions

COFFEE

Global IAM
Partial equilibrium
Energy, land use, materials
18 world regions

TEA

Global IAM
Computable General Equilibrium (CGE)
Economic model
18 world regions

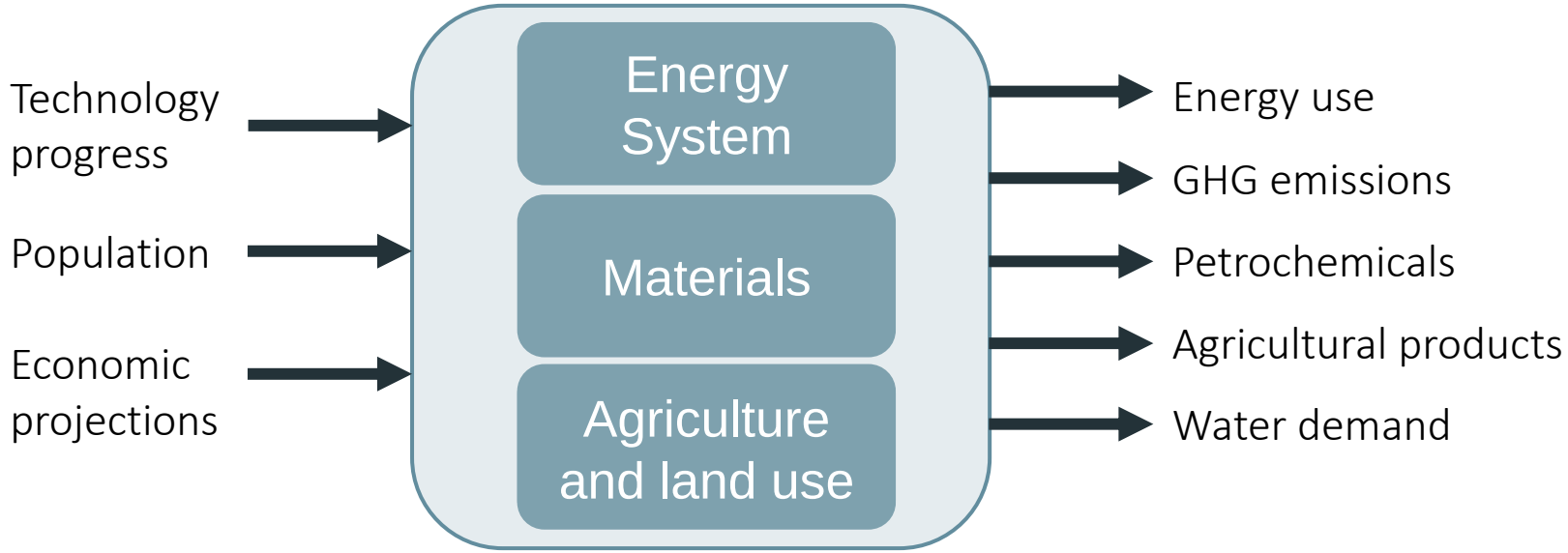
Our IAMs

In this study

BLUES

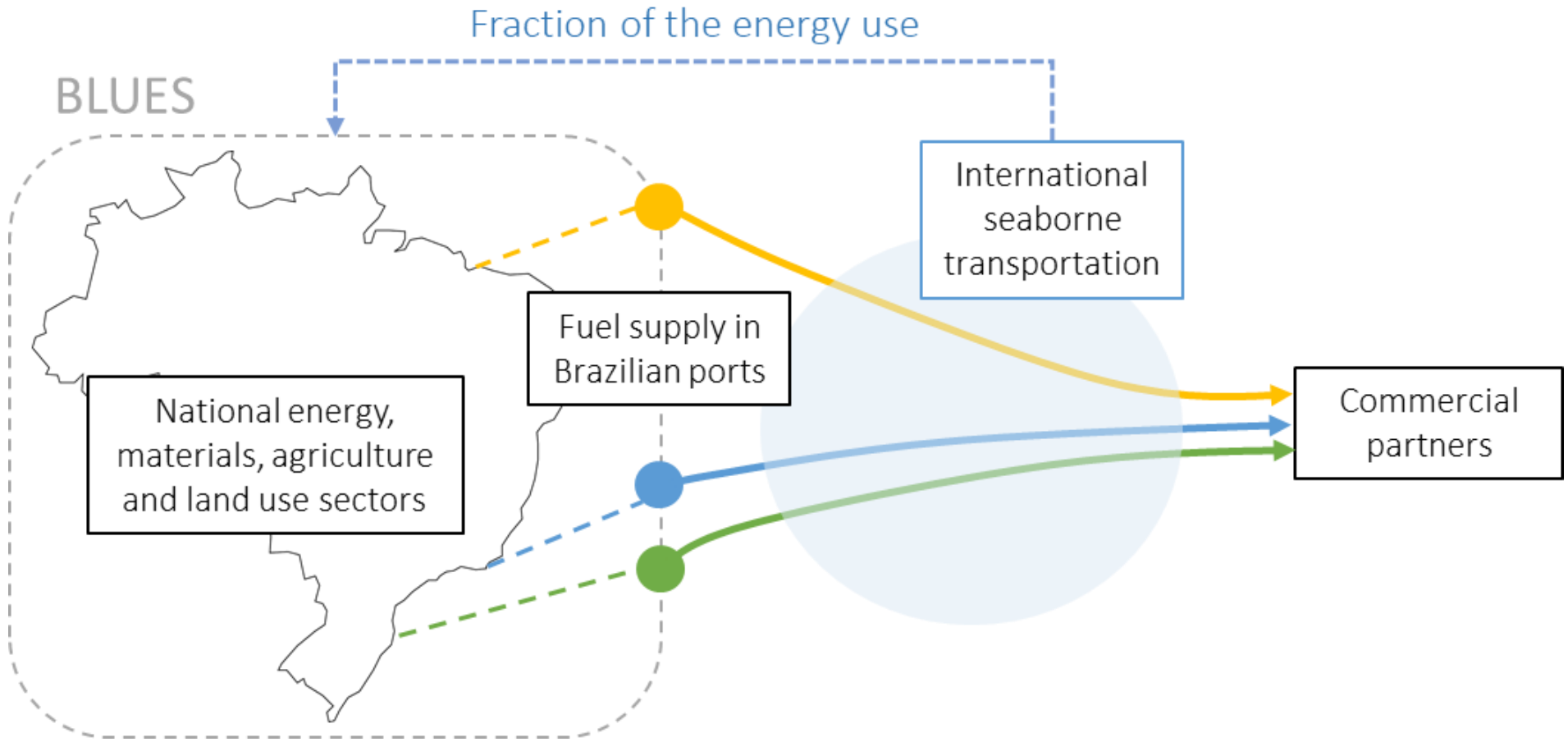
Brazilian National IAM
Partial equilibrium
Energy, land use, materials
5 Brazilian regions

Model structure:

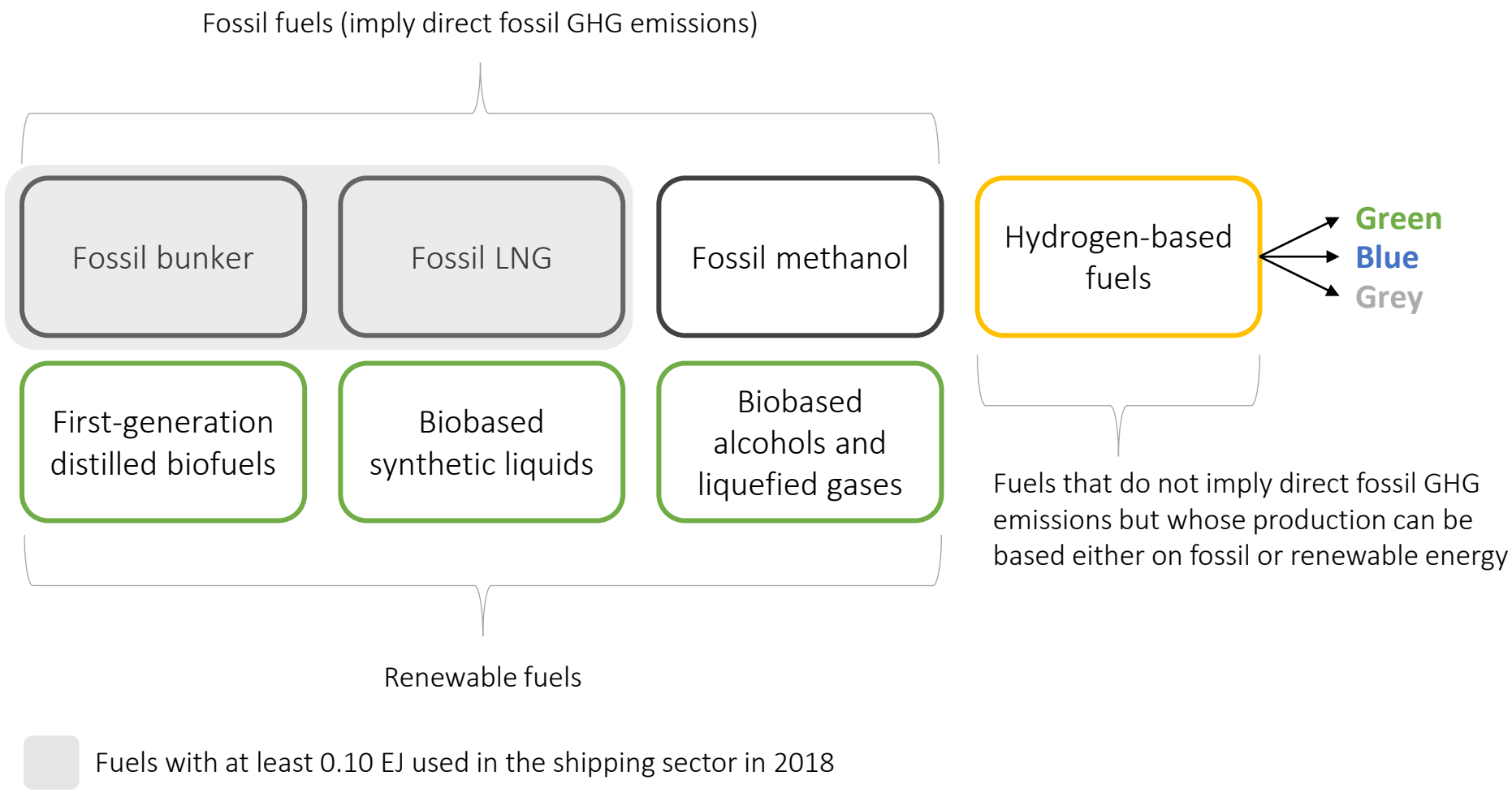


Linear programming
Almost 30.000 technological knots

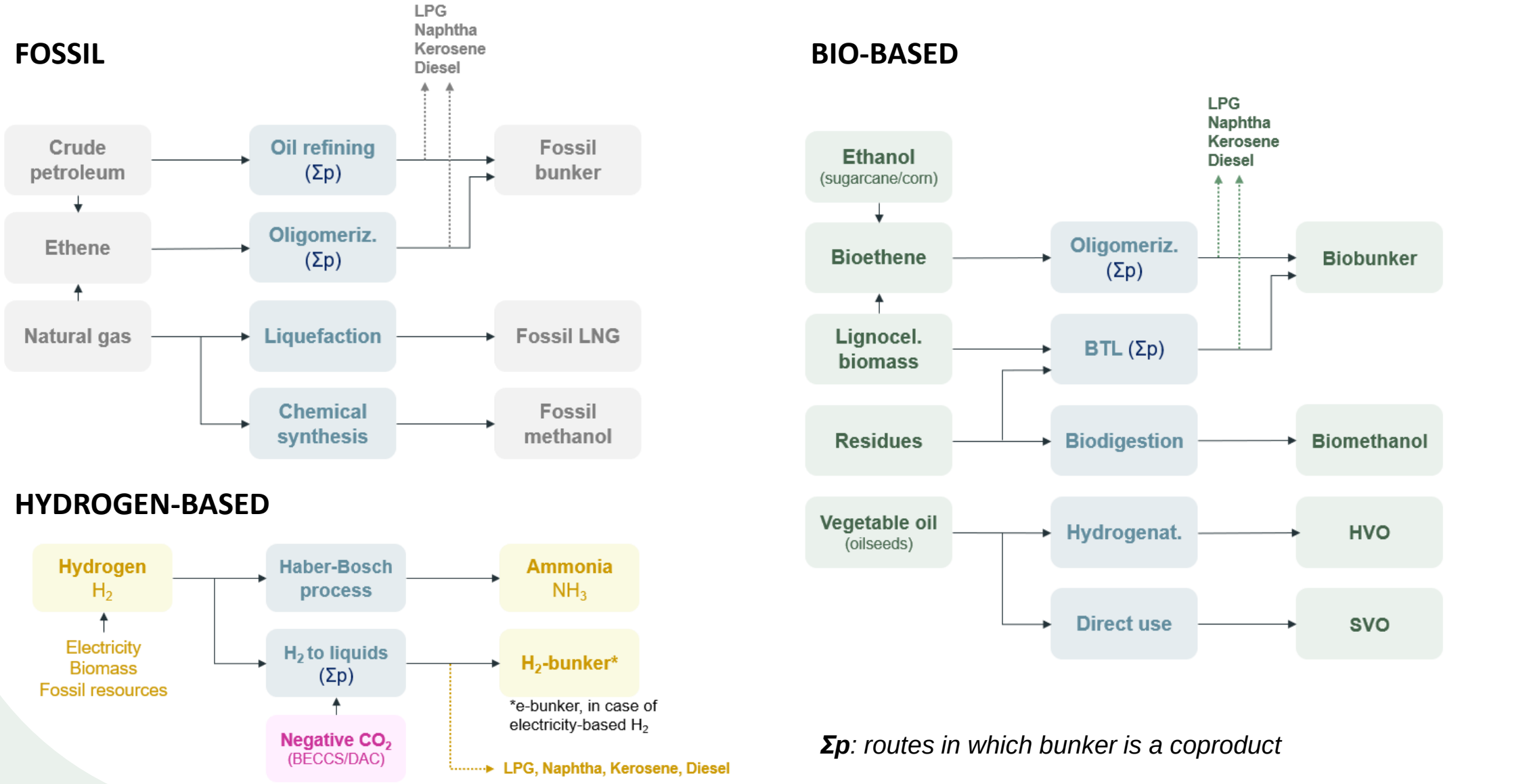
Using the BLUES model in this study



Conventional and alternative marine fuels



Marine fuel production routes – BLUES model



***Σp**: routes in which bunker is a coproduct*

Scenario analysis

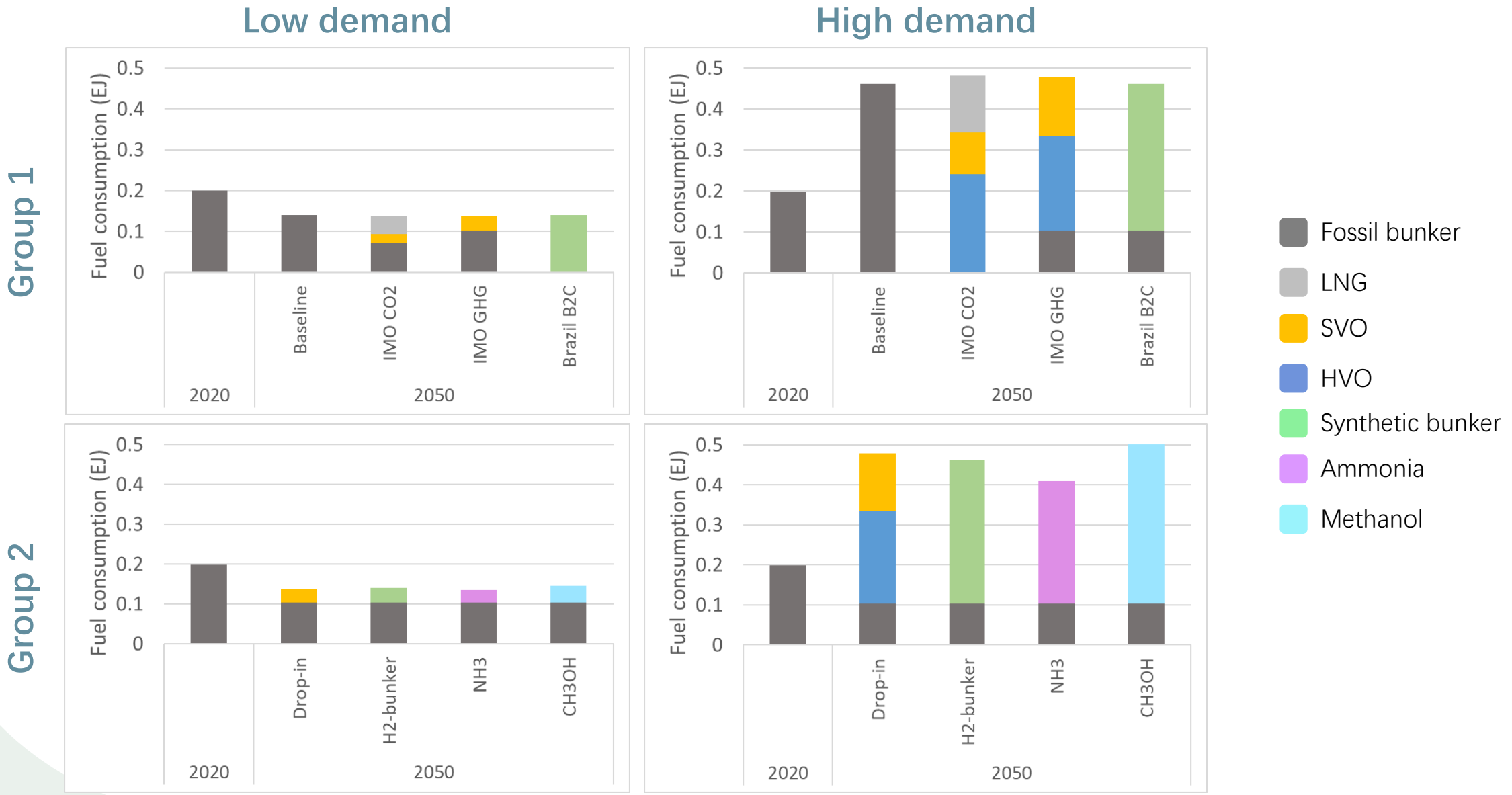
Group 1

Scenario	Carbon metric	IMO2050	National target	Fuel restrictions
Baseline	-	No	No	None
IMO CO_2	CO_2	Yes	No	None
IMO GHG	CO_2eq	Yes	No	None
Brazil B2C	CO_2eq	Yes	Yes	None

Group 2

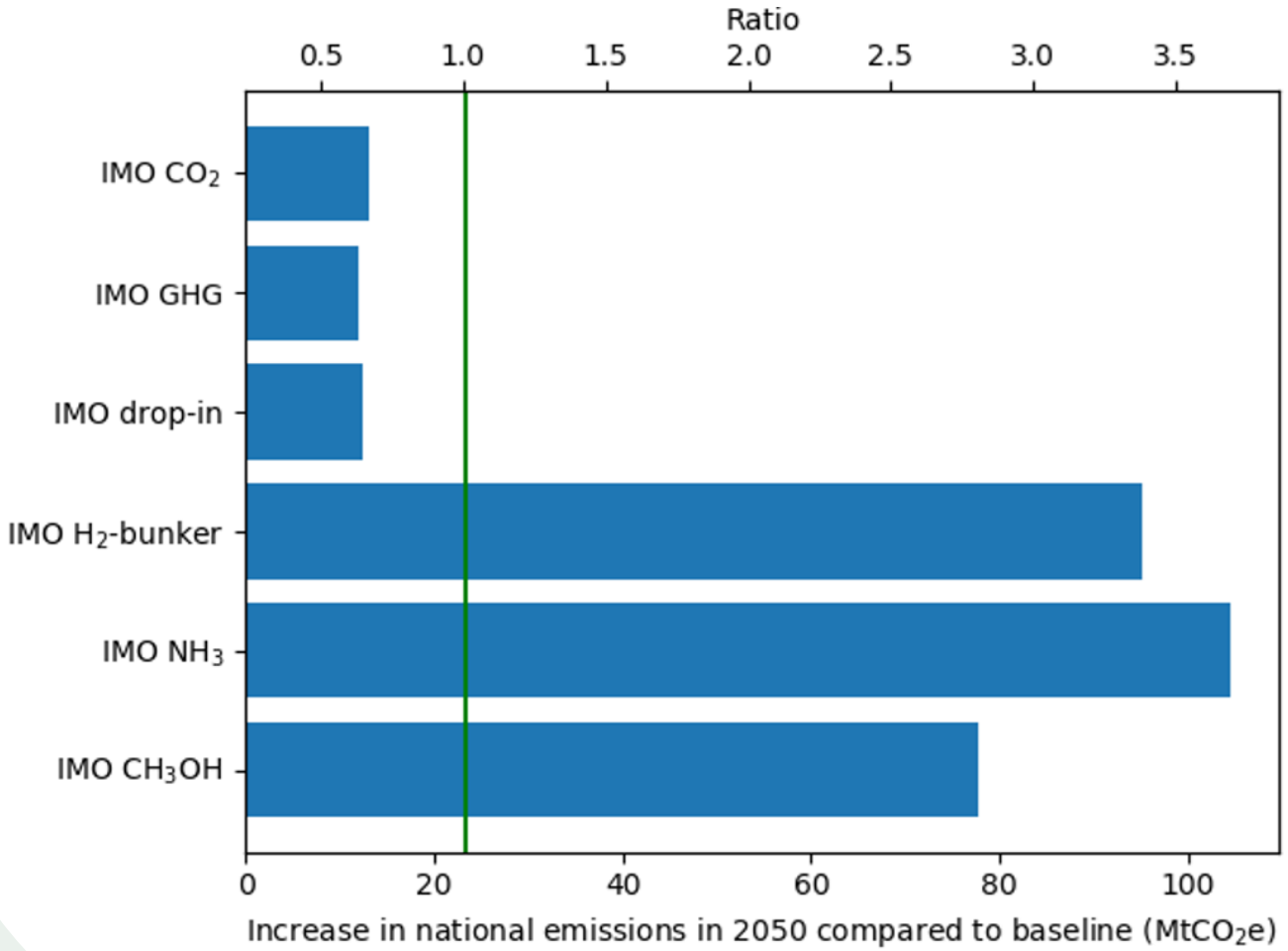
Scenario	Carbon metric	IMO2050	National target	Fuel restrictions
IMO drop-in	CO_2eq	Yes	No	Only drop-in
IMO H_2-bunker	CO_2eq	Yes	No	Only H_2-bunker
IMO CH_3OH	CO_2eq	Yes	No	Only methanol
IMO NH_3	CO_2eq	Yes	No	Only ammonia

Scenario analysis: results



Scenario analysis: spill over effects

For the cases of high demand



In **Brazil B2C scenario**, there is a **significant reduction** in national emissions that **can not be associated with IMO's target**

Ineffective mitigation

Thank you.

Prof. Roberto **Schaeffer** – **roberto@ppe.ufrj.br**

cenergia