

March 2022

CLIMTRADE

Economic impacts of climate regulation
in trade

Mats Marquardt

CLIMTRADE was developed under the Ambition to Action project

The tool is an output of the Ambition to Action project, which supports NDC implementation through technical assistance and thought leadership. The second phase of the project is implemented collaboratively by NewClimate Institute and Xander van Tilburg, over a two-year period until March 2022. Project funding is provided by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU). Ambition to Action's technical assistance aims to support the mainstreaming of climate and development goals at the sector level, through the development of evidence on social, economic and environmental benefits of mitigation actions and pathways.

www.ambitiontoaction.net

clim
trade

Detailed instructions and explanatory guidance to help use the **CLIMTRADE** model are included within the tool itself

A2A – Advancing from Mitigation Ambition to Action

2016-2019 / 2020-2022



- Project funded under German International Climate Initiative (IKI)
- Implemented by NewClimate Institute in cooperation with ECN/ TNO and Xander van Tilburg

Partner countries:

- Phase I (2016-2019): Argentina, Indonesia, Kenya, Thailand
- Phase II (2020-2022): Argentina, Indonesia, Kenya

CLIMTRADE

Methodology overview

Download here: [CLIMTRADE](#)

Excel tool to quantify **economic impacts** resulting from carbon tariffs, e.g. CBAM

Partial equilibrium modelling based on [World Bank](#) model & **Input-Output** module

High level example questions:

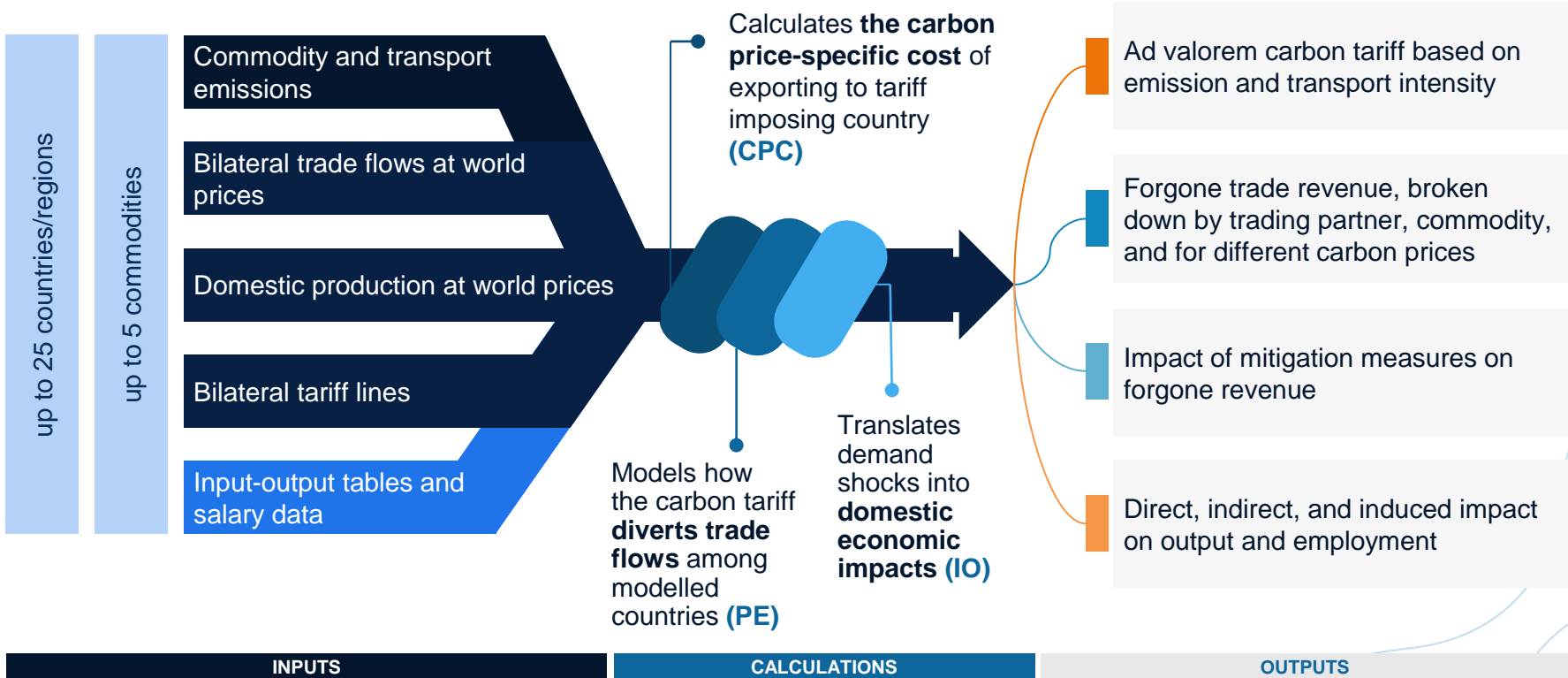
- How does a carbon tariff applied to different commodities **impact export revenues of different countries?**
- How does **reducing the emission intensity** of a commodity (mitigation) constitute a **competitive advantage for exporting countries?**
- How does a carbon tariff-induced demand shock affect **domestic output and employment?**

Advantages:

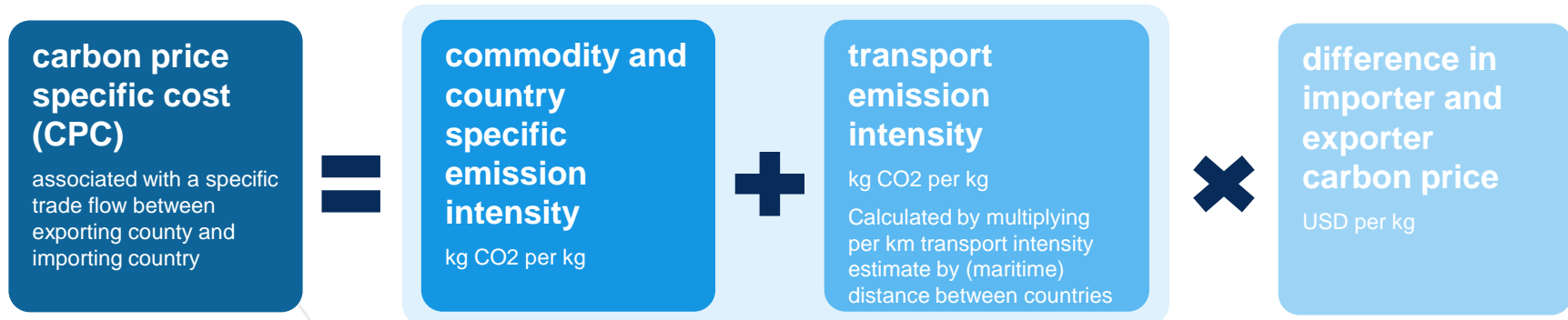
- Manageable data requirements
- Transparent, accessible and adaptable
- Easy to implement
- Open source

Limitations:

- Snap shot analysis, no longitudinal modelling, no feedback effects
- No cross-product substitution / industry links
- Not a forecasting tool



Carbon price specific cost (CPC)



CPC (USD per kg traded) is then converted to ad-valorem terms using [UNCTAD](#) methodology



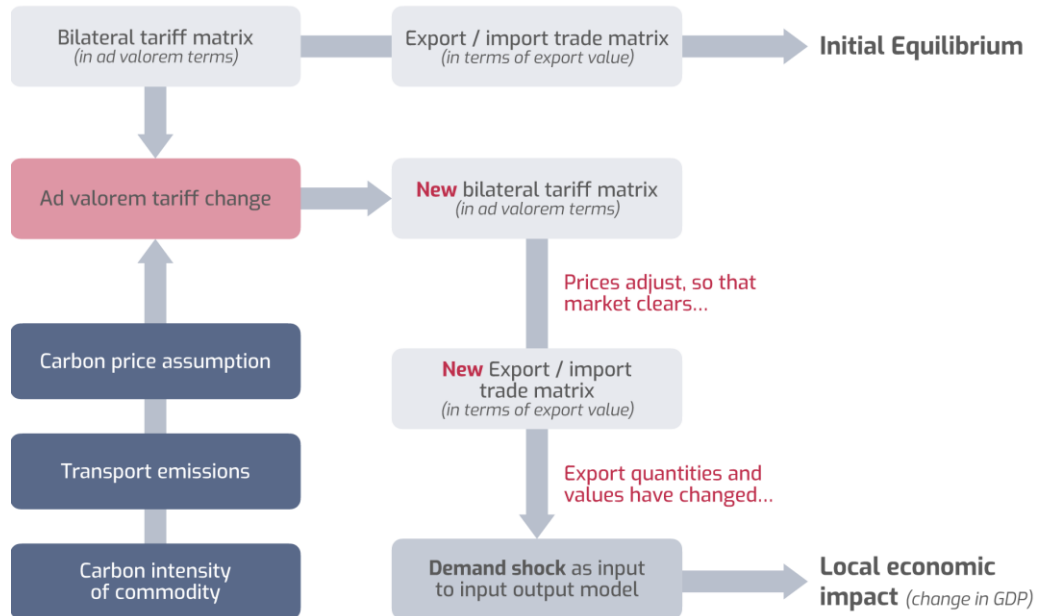
We model the introduction of a **carbon tariff** by exogenously defining a tariff increase for imported commodities.

The model solves by imposing **market clearing** (changing prices so that there is no excess supply or demand on the world market) to determine equilibrium prices and quantities imported and exported.

Please refer to [Francois & Hall \(2009\)](#) for a full derivation of **the partial-equilibrium model** on which CLIMTRADE is based.

Modelling methodology

Logic of partial equilibrium modelling of trade dynamics and input-output analysis for the estimation of domestic economic impacts



» We use **input-output analysis** to estimate economic impacts (GDP and employment) countries facing forgone revenue resulting from the introduction of a carbon tariff.

Ripple effects in the domestic economy



Direct impacts

Value and jobs lost as a result of the carbon tariff-induced demand shock

Indirect impacts

Value and jobs destroyed in secondary sectors upstream in the supply chain

Induced impacts

Value and jobs destroyed across all sectors of the economy induced through lower expenditures of those that are directly and indirectly affected

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT **OECD.Stat**

Data by theme Popular queries

Find in Themes

Industry and Services

- Industry and Services
- Enterprise Statistics
- Industry and Service Statistics (ISI)
- Structural Analysis (STAN) Databases
 - STAN Database for Structural Analysis (SDC SHARE)
 - STAN 2018: Database for Structural Analysis
 - STAN: Balance Trade by Industry and End-use
- Input-Output Database
 - IO 2018: Trade in Employment
 - IO 2018: Input-Output Tables
 - IO 2018: Trade-Output Tables
 - IO 2018: Input-Output Tables
 - Carbon dioxide emissions embodied in international trade (IO21.ec)
 - Carbon dioxide emissions embodied in international trade (IO18.ec)
 - TM 2018: Trade in Employment
 - ASSED (PRED by Industry)
- Services Trade Restrictions
- Steel
- Tourism

Input-Output Tables (IOs) 2021 ed.

Customise Export My Queries

Variable	TTL: Total														
Country	AU: Australia														
Time	2018														
Unit US Dollar, Millions															
	D01T02	D02	D05T06	D07T08	D09	D10T12	D13T15	D16	D17T18	D19	D20	D21			
	Agriculture, hunting, forestry	Fishing and aquaculture	Mining and quarrying	Manufacturing and construction	Electricity, gas, steam and hot water supply	Food, drink and tobacco	Textiles, leather and footwear	Chemical and allied products	Non-metallic mineral products	Metals and metal products	Transport equipment	Other transport equipment	Other non-durable consumer goods	Durable consumer goods	Capital goods
To Industry / sector															
From industry / sector															
TTL_01T02: Agriculture, hunting, forestry	9 832.7	1 107.5	54.5	139.4	4.5	21 923.1	781.9	1 229.4	9.1	11.3	83.8				12
TTL_03: Fishing and aquaculture	530.6	136.2	14.7	14.0	1.8	2 202.7	52.2	6.6	1.7	1.8	3.4				5
TTL_04T06: Mining and quarrying, energy producing products	191.7	13.3	2 739.5	1 096.6	33.0	856.9	16.6	140.0	394.7	6 642.2	2 730.6				10
TTL_07T08: Mining and quarrying, energy producing products	162.9	12.6	341.3	7 443.5	51.7	195.2	7.8	23.6	30.6	21.2	264.0				16

Data requirements are **generally limited** (see table). All required input data and sources provided are open source.

CLIMTRADE has all OECD input-output tables **pre-loaded**.

Additional inputs required for the PE model are **elasticities** of substitution, import demand elasticities, and export supply elasticities. Default values, based on [Francois & Hall \(2009\)](#), are provided.

Data	Source
Domestic production data	E.g. FAOSTAT
Bilateral trade flows in monetary terms	World Integrated Trade Solution
Bilateral tariff data	World Integrated Trade Solution
World prices	E.g. GIEWS FPMA
Commodity emission intensities	E.g. Roser & Ritchie (2021)
Transport intensities	ECTA
Transport distances	Mayer & Zignago (2011)
Input-Output tables	OECD (2021)
Salary data	E.g. MTEySS (2020)

Note: Where general data sources are not available, sources used in the Argentina case study (see following slides) are provided as examples.

Example results: Argentina

Analysis of selected agriculture commodities in Argentina

More info: [A2A Argentina](#)



Overview: Impacts across carbon prices

Analysis of the impact of a **EU-wide carbon tariff on agriculture commodities** on Argentina's export oriented agriculture industry.

Analysis of 5 commodities, **modelled for 25 countries/regions.**

Commodity	USD 25 per tonne of CO ₂ eq	USD 50 per tonne of CO ₂ eq	USD 75 per tonne of CO ₂ eq	USD 100 per tonne of CO ₂ eq
Soybeans (k USD)	\$ -293,185	\$ -579,895	\$ -860,329	\$ -1,063,460
Maize (k USD)	\$ -34,533	\$ -68,350	\$ -101,478	\$ -132,097
Bovine meat (k USD)	\$ -69,732	\$ -139,791	\$ -127,257	\$ -114,398
Wheat (k USD)	\$ -9,485	\$ -18,883	\$ -28,195	\$ -37,422
Milk and cream (k USD)	\$ -58	\$ -116	\$ -157	\$ -233
Total forgone revenue (k USD)	\$ -406,993	\$ -807,036	\$ -1,117,433	\$ -1,347,610
Total domestic impact (k USD)	\$ -916,240	\$ -1,817,961	\$ -2,467,919	\$ -2,947,261
Impact on total GDP (%) (2019)*	-0,2%	-0,4%	-0,6%	-0,7%
Impact on agricultural GDP (%) (2019)**	-4,0%	-7,9%	-10,7%	-12,8%
Impact on employment (job years)	-20,247	-40,159	-55,153	-66,248

PE module

IOT module



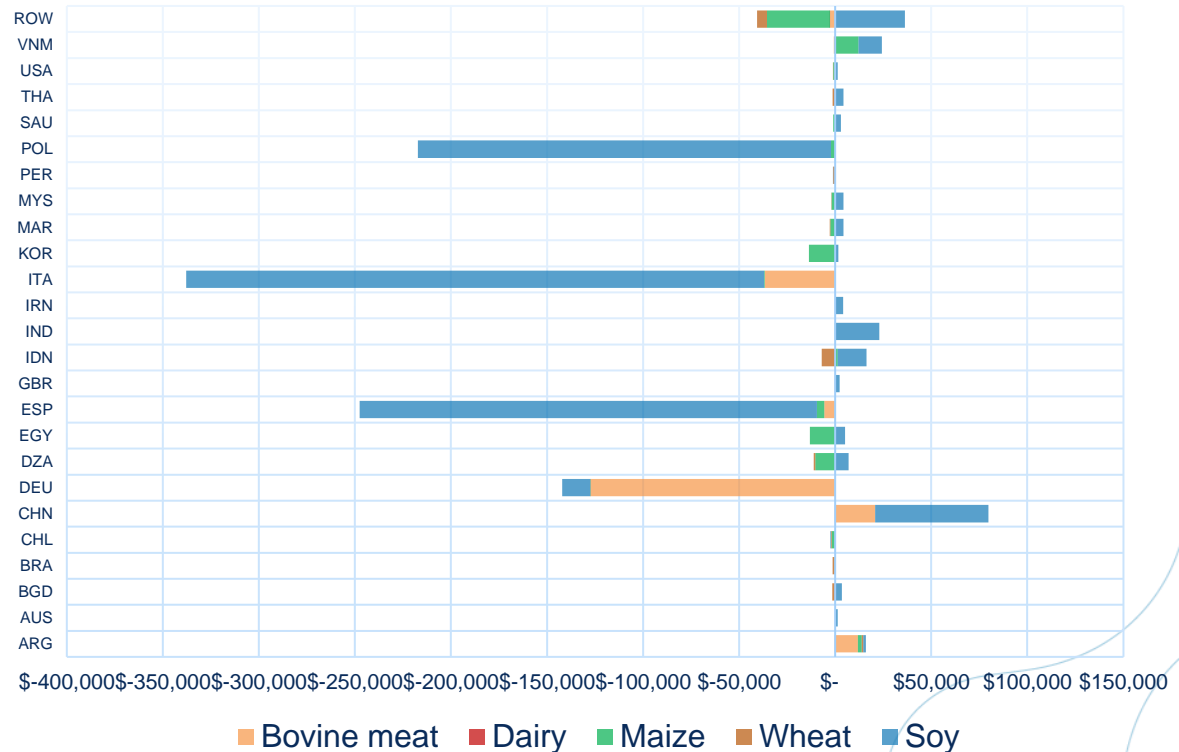
Trade diversion: Cuts in exports to the EU

Trade diversion effects from the perspective of Argentina, as a result of a EU carbon tariff based on a **USD 50 per tCO2 carbon price**.

Significant **forgone export revenue** from cuts in EU demand for soy and meat.

Increased exports to China and India only **partly offset forgone revenue**.

ARG TO DESTINATION TRADE VALUE CHANGE





Mitigation: Emission intensity reduction

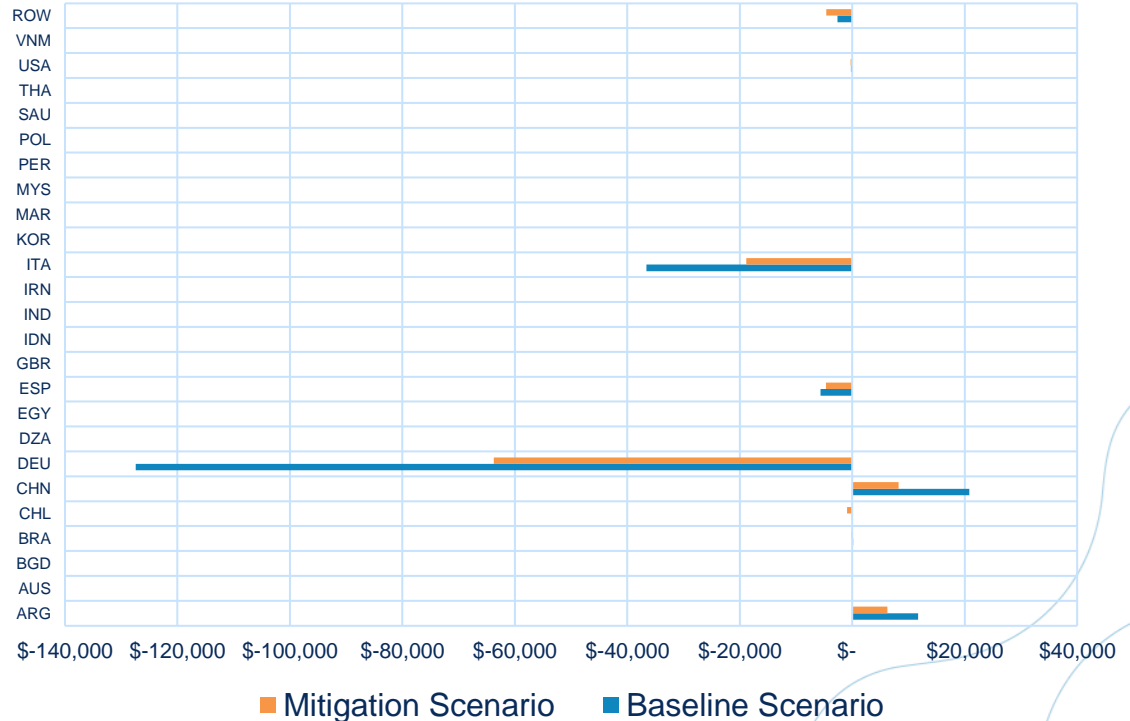
Baseline and mitigation scenario comparison, assuming a USD 50 per tCO2 carbon price.

The mitigation scenario assumes a **30% reduction in the emissions intensity** of bovine meat production in Argentina.

Total forgone revenue in baseline scenario: **USDm 139.8**

Total forgone revenue in mitigation scenario: **USDm 78.8**

Change in ARG's Bovine meat Export Flows

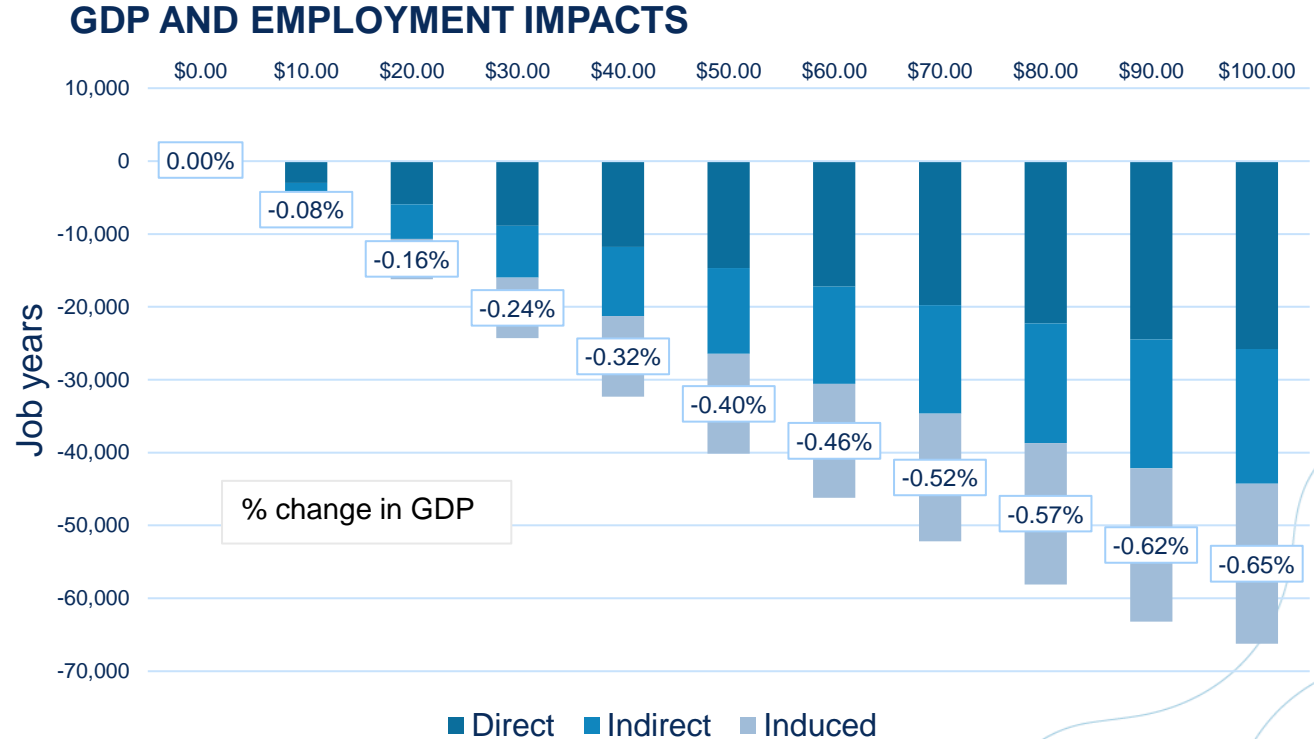




Domestic impacts: GDP and jobs

Input-output analysis capturing direct, indirect, and induced **GDP** (label) and **employment** (y-axis) impacts for different **carbon prices** (x-axis).

Aggregated results for all commodities modelled.



Thank you

Mats Marquardt

✉ m.marquardt@newclimate.org

NEW
CLIMATE
INSTITUTE



Ambition
to
Action