INSTITUT DE L'ÉNERGIE TROTTIER

ESMIA Energy Super Modelers and International Analysts

Pôle e3 HEC MONTRÉAL | Expertise en énergie et en environnement

Canadian Energy Outlook 3rd edition

The Energy System and GHG Sources

Report #1

The IET's mission

- The **academic training** of a new generation of engineers, scientists and innovators with a systemic and trans-disciplinary understanding of energy issues;
- The **research** for sustainable solutions for our energy future, while supporting knowledge generation and innovation in the energy sector to help face the coming decades challenges;
- The **dissemination** of knowledge on energy related topics, to fuel societal dialogue on energy issues.

POLYTECHNIQUE MONTRÉAL
UNIVERSITÉ D'INGÉNIERIE

FONDATION FAMILIALE TROTTIER FAMILY FOUNDATION

Collaborations and initiatives

Canadian Climate Institute / L'Institut climatique du Canada

The Transition Accelerator / L'Accélérateur de transition

CCEI

Carrefour de modélisation énergétique | Energy Modelling Hub

Ouranos

Chaire en Transformation du Transport

IVEY foundation

Énergie et Ressources naturelles Québec

Chemins de transition — Ensemble pour un futur souhaitable — Espace pour la vie | Université de Montréal

Natural Resources Canada / Ressources naturelles Canada

Publications

Canadian Energy Outlook 3rd edition

New structure

- Report #1: The Energy System and GHG Sources
- Report #2: Modelling of net-zero scenarios

After which:

- Series of reports on strategic challenges or themes identified from the modelling results

Today: webinar outline

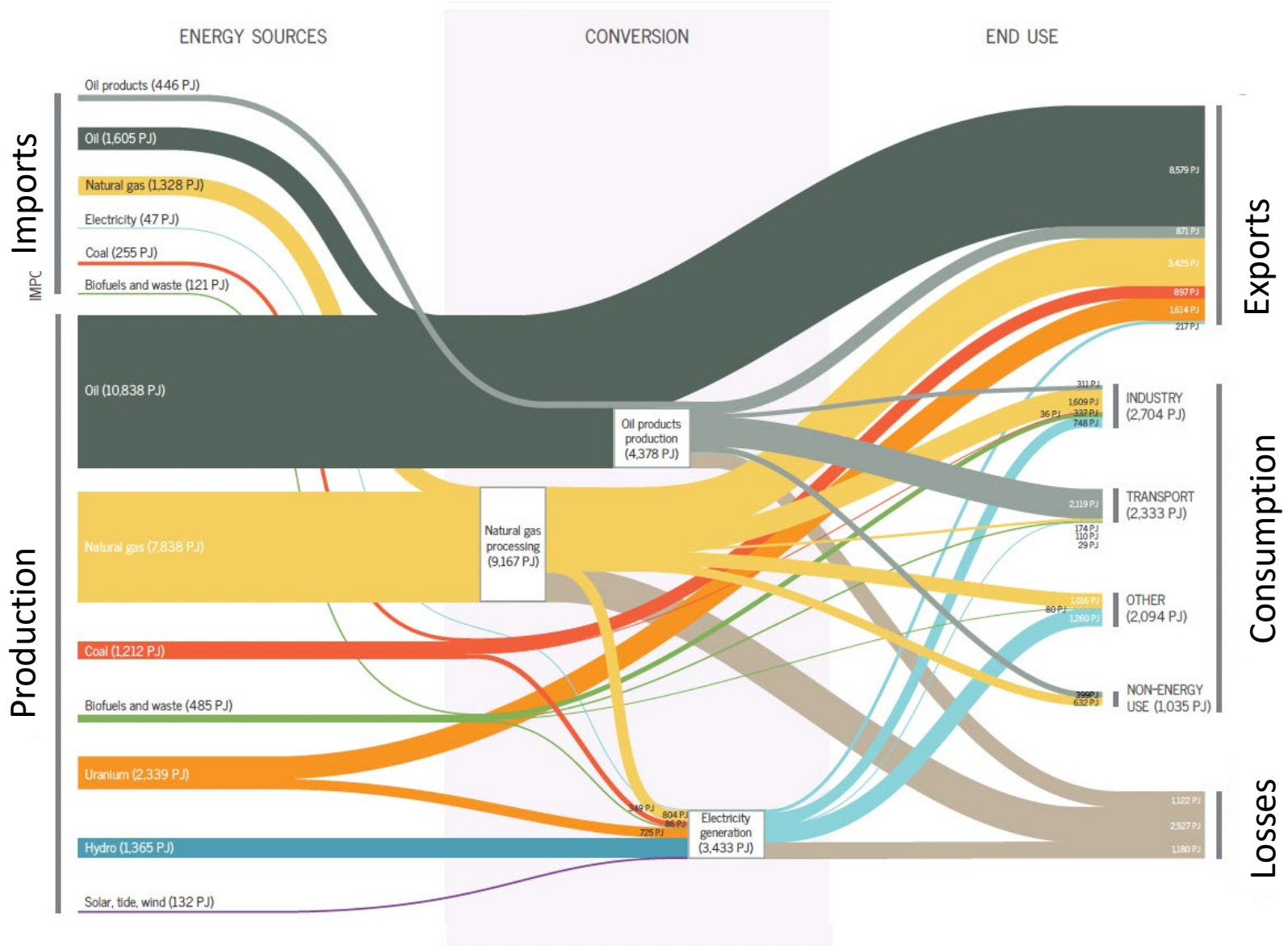
The main features of the energy system across Canada:

- Energy production and its role in the economy
- The evolution of consumption
- Sources of GHG emissions

Cross-cutting themes in the discussion:

- The evolution and recent trends
- The measure of the pandemic’s impact
- Changes to sources of GHG emissions

The Canadian energy system as a whole



Highlights

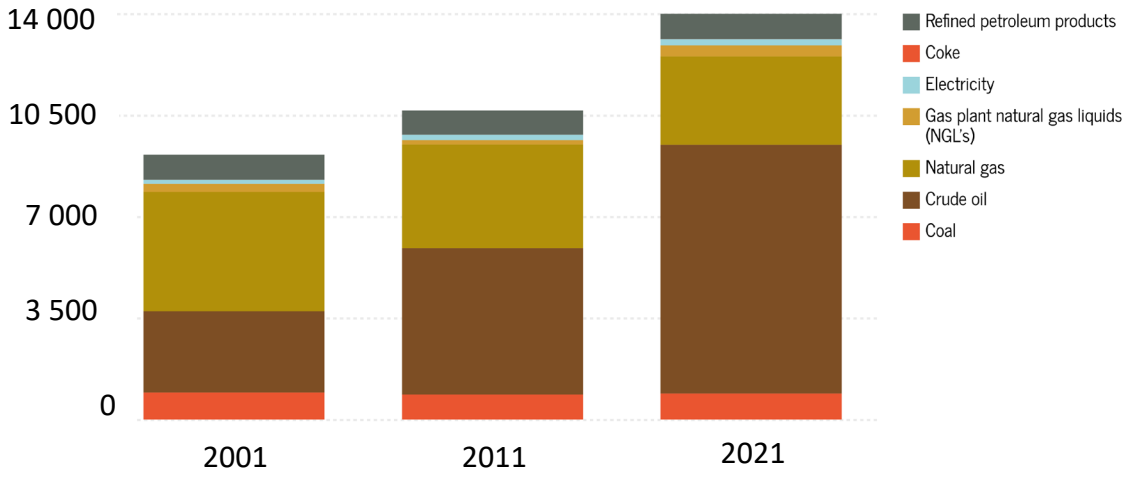
- Domination of fossil sources in production
- Importance of exports
- Losses in transformations

Fossil fuels production

Production in 2021 (PJ)

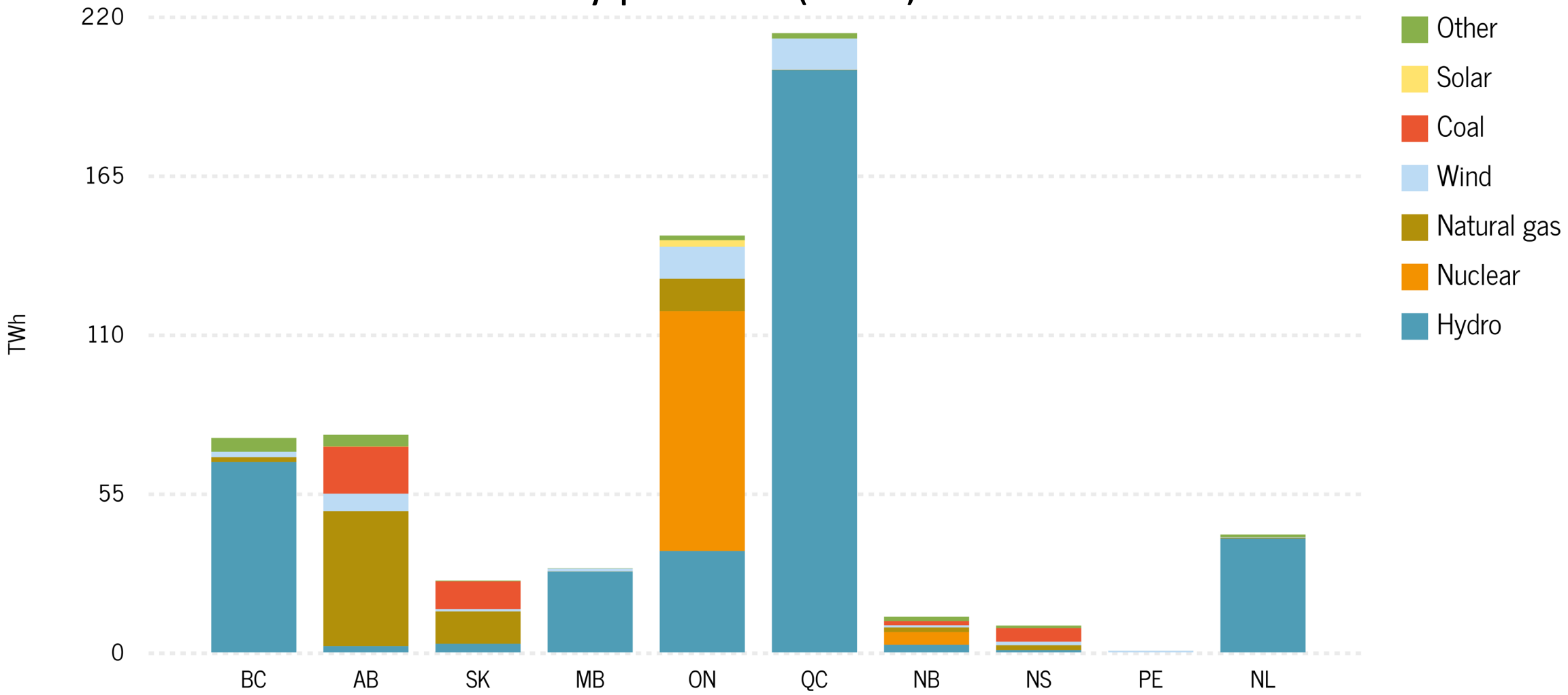
Source	2001		2019	2020	2021
Crude oil	4 777		10 735	10 222	10 838
Natural gas	7 196		6 823	6 660	6 927
Coal	1 666		1 205	1 149	1 212
NGL's	674		919	891	911

Exports (PJ)



Electricity

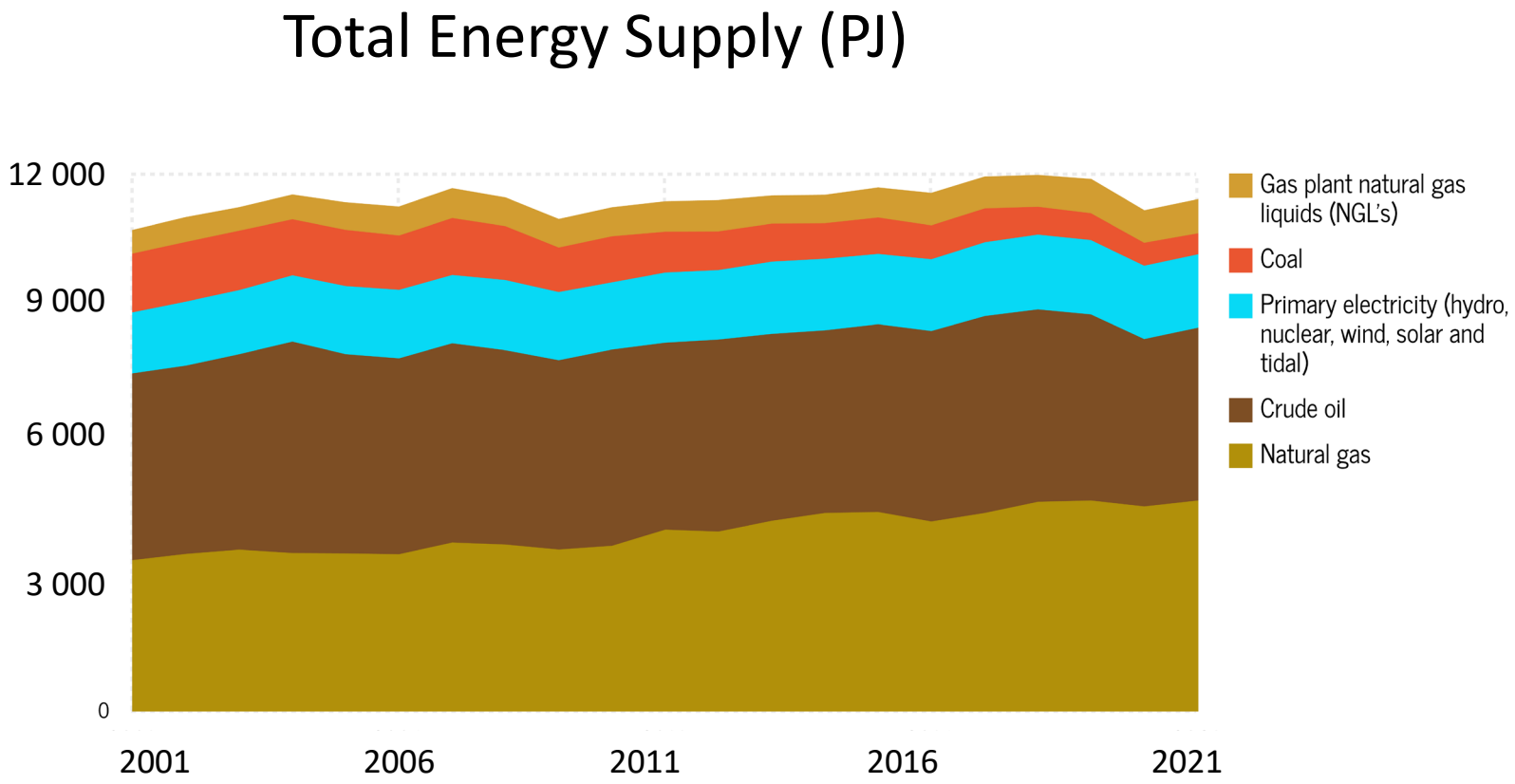
Total production: 640 TWh
Exports: 60 TWh
Interprov. trade: 56 TWh



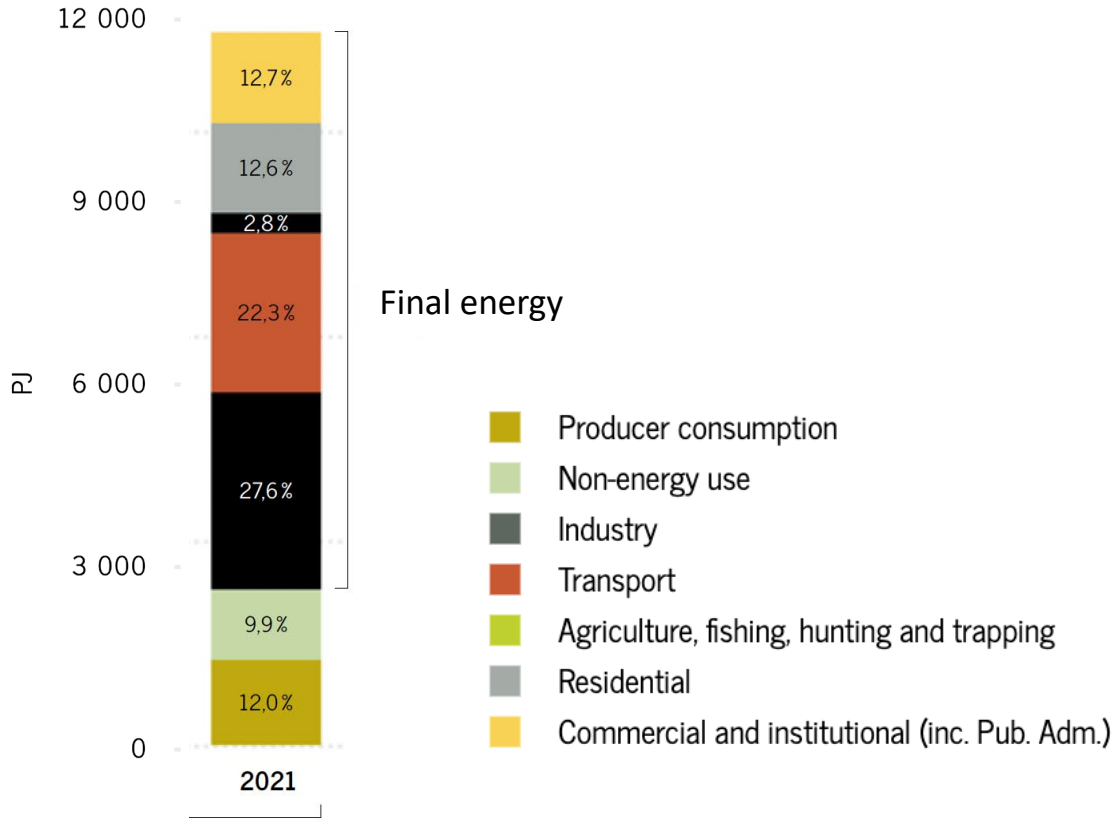
The evolution of consumption

Energy supply:

- Domination of fossil fuels (82% of the total)
- Relative stability of the total over time, despite notable changes



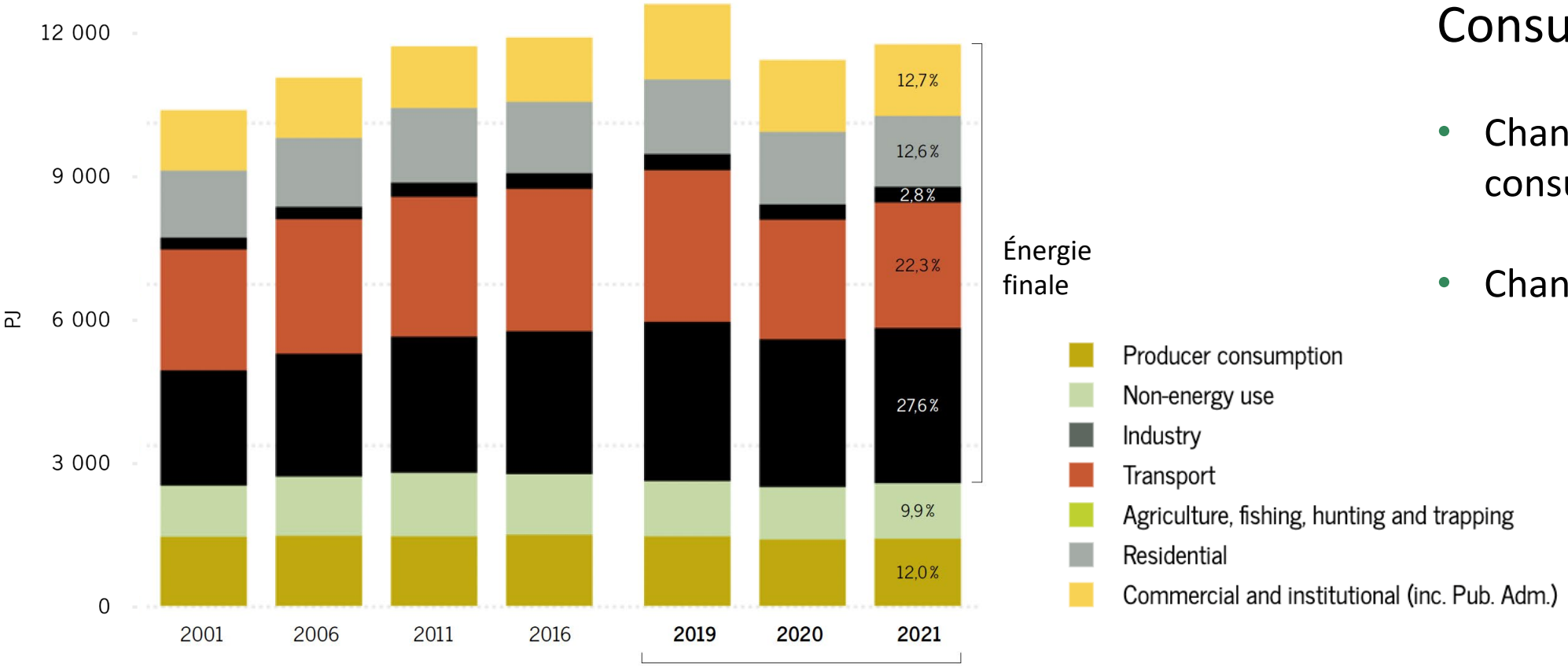
The evolution of consumption



Consumption:

- 22% of energy used outside of final energy consumption
- Sectoral breakdown

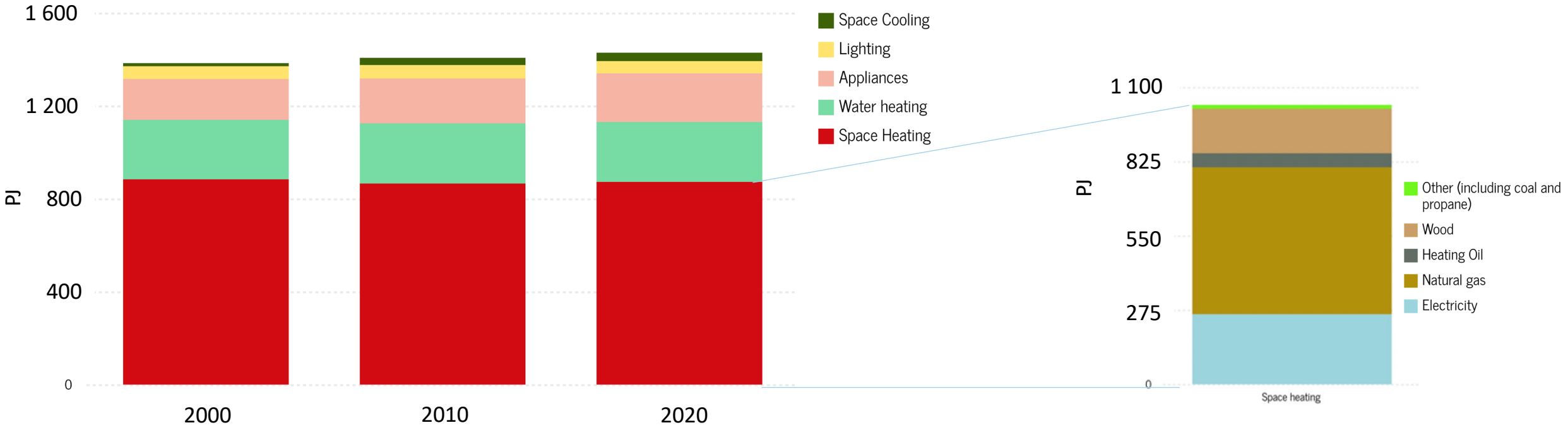
The evolution of consumption



Consumption:

- Changes in industry consumption
- Changes in transport

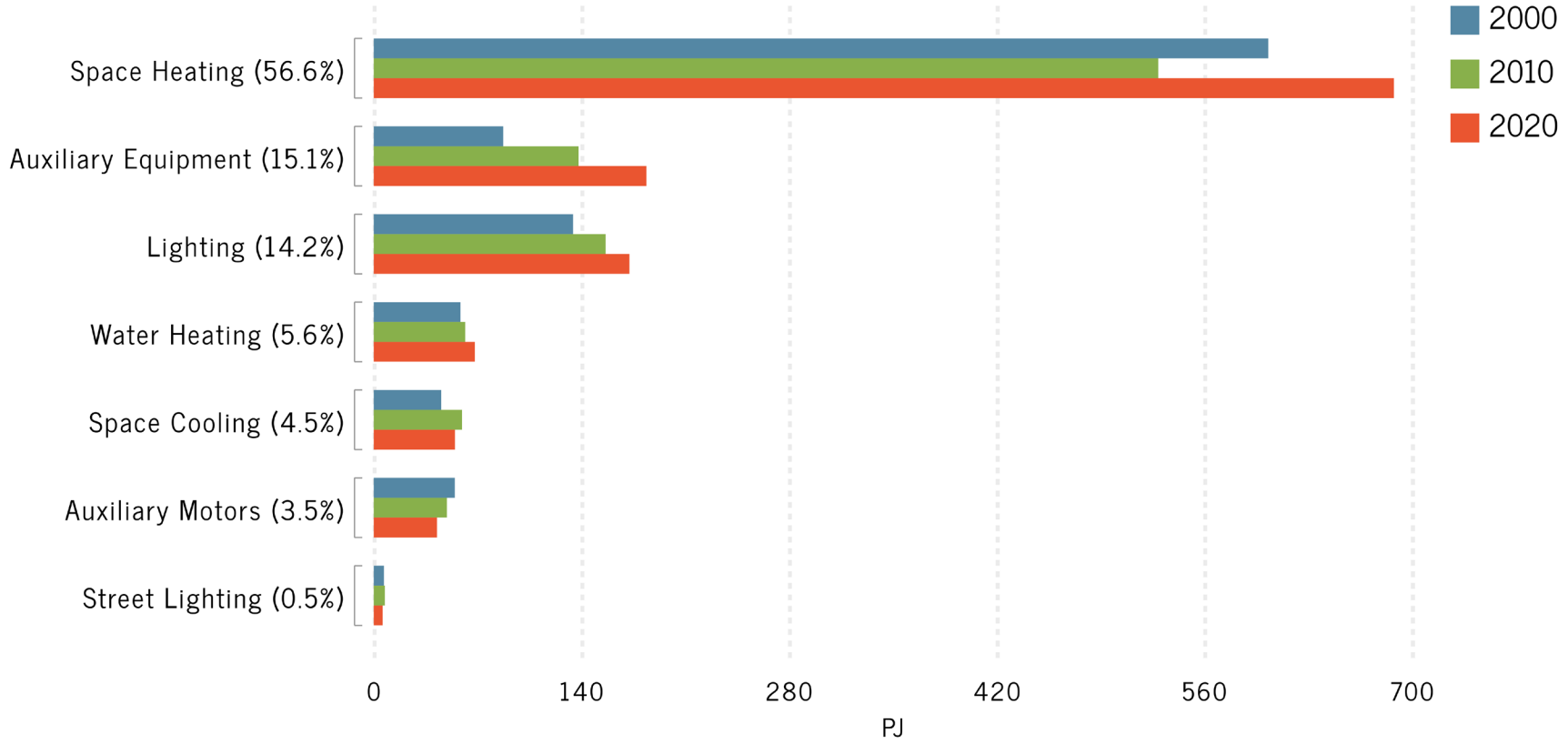
Residential buildings



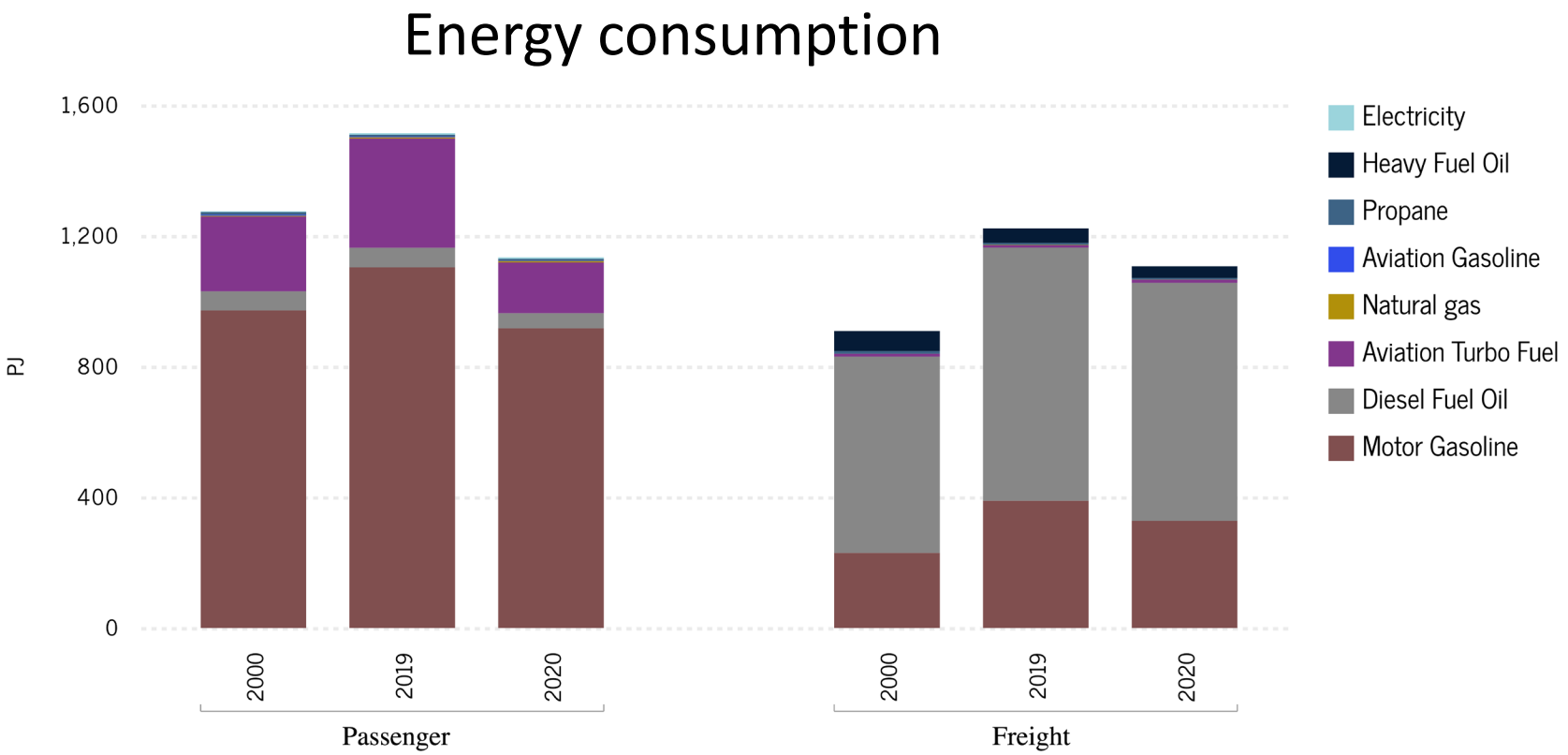
- Modest increase over the past 20 years, mostly due to space cooling and appliances
- Space heating sources: natural gas (53%), electricity (30%), but important variation across provicnes

Commercial and institutional buildings

- Most important relative change: auxiliary equipment
- Sources: 82% of space heating from natural gas

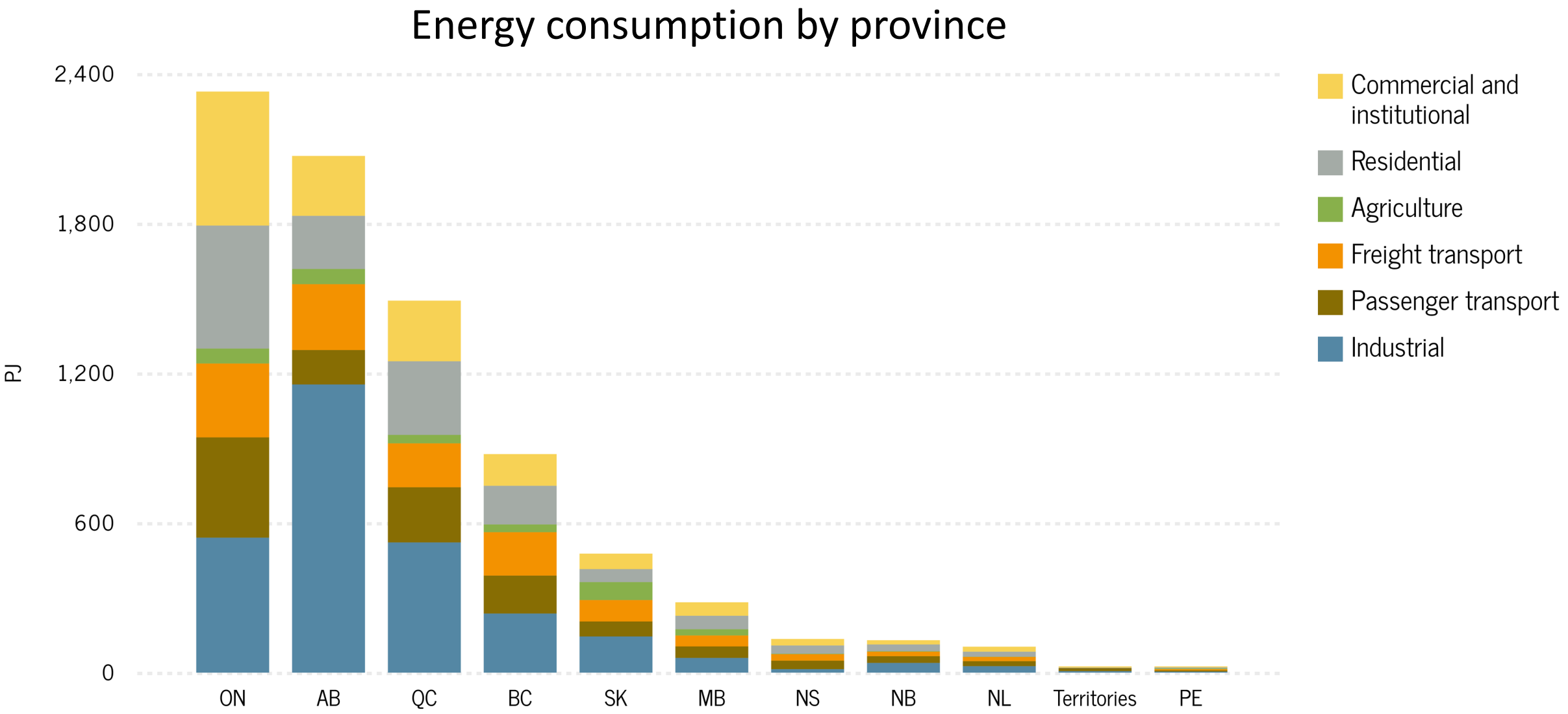


Transport



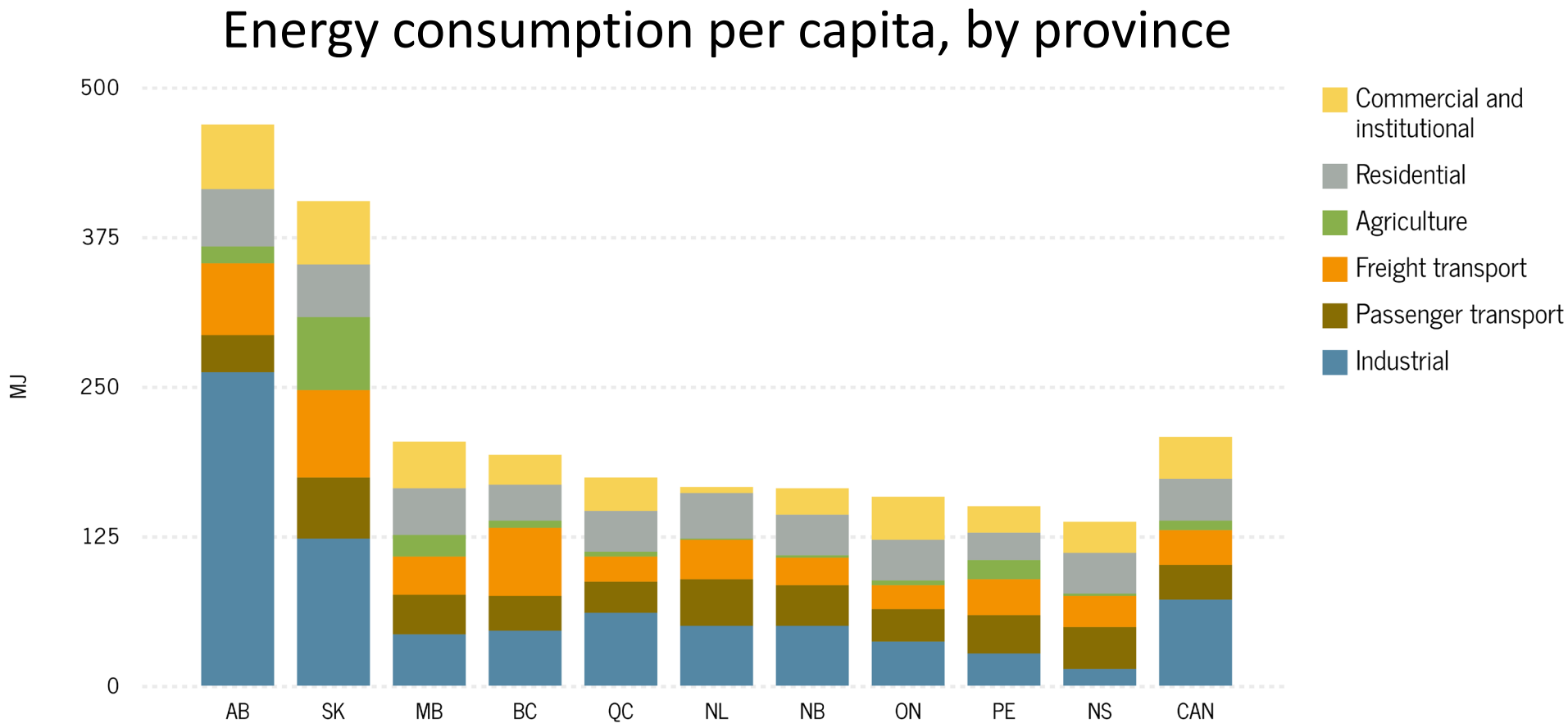
- Marked drop due to restriction measures following the pandemic onset
- Much smaller decrease for merchandise transport
- In terms of the demand for transport services, the decrease came mostly from air transport (63% of the drop)

The energy mix by province

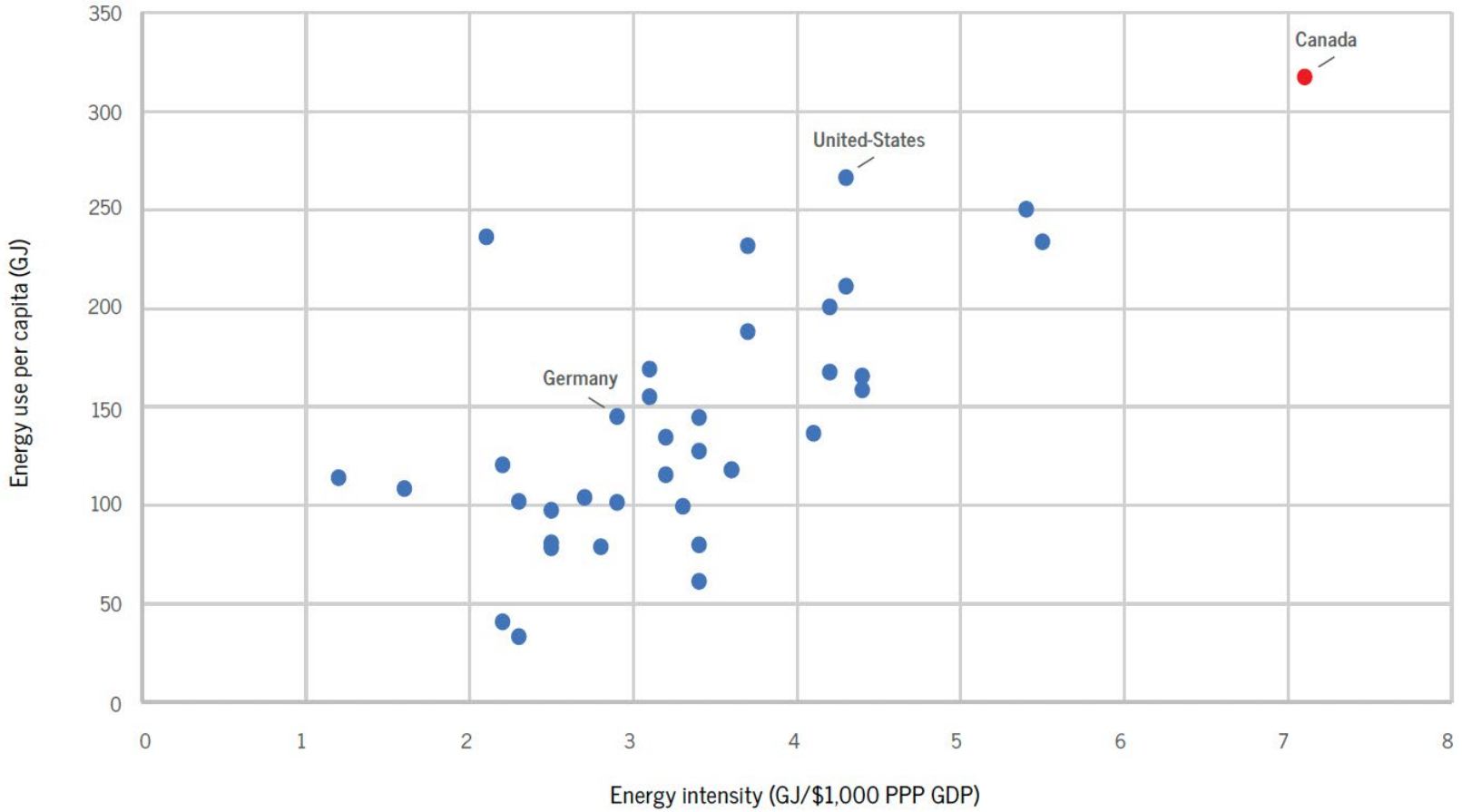


The energy mix by province

- Several other differences in consumption profiles



Energy productivity

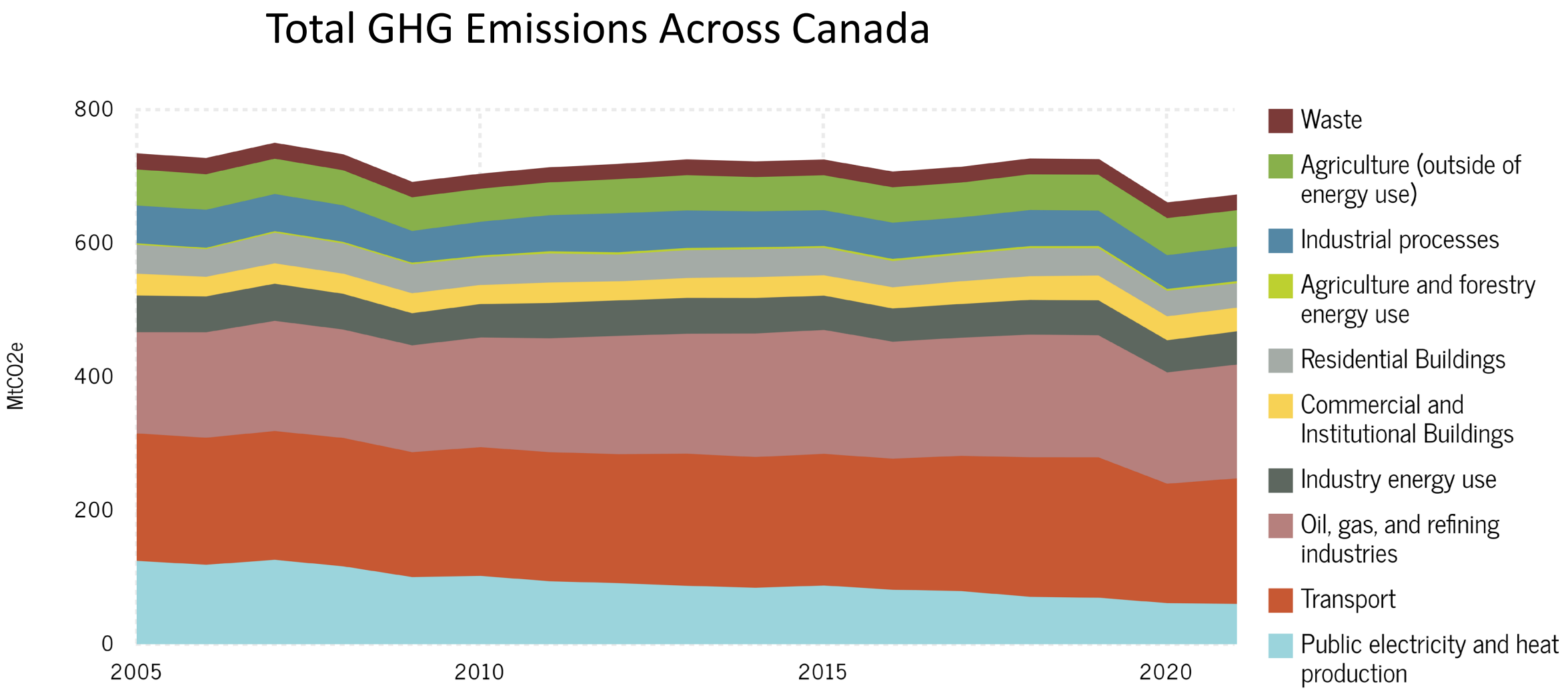


Very low energy productivity across Canada, despite a 20% drop in energy intensity since 2000

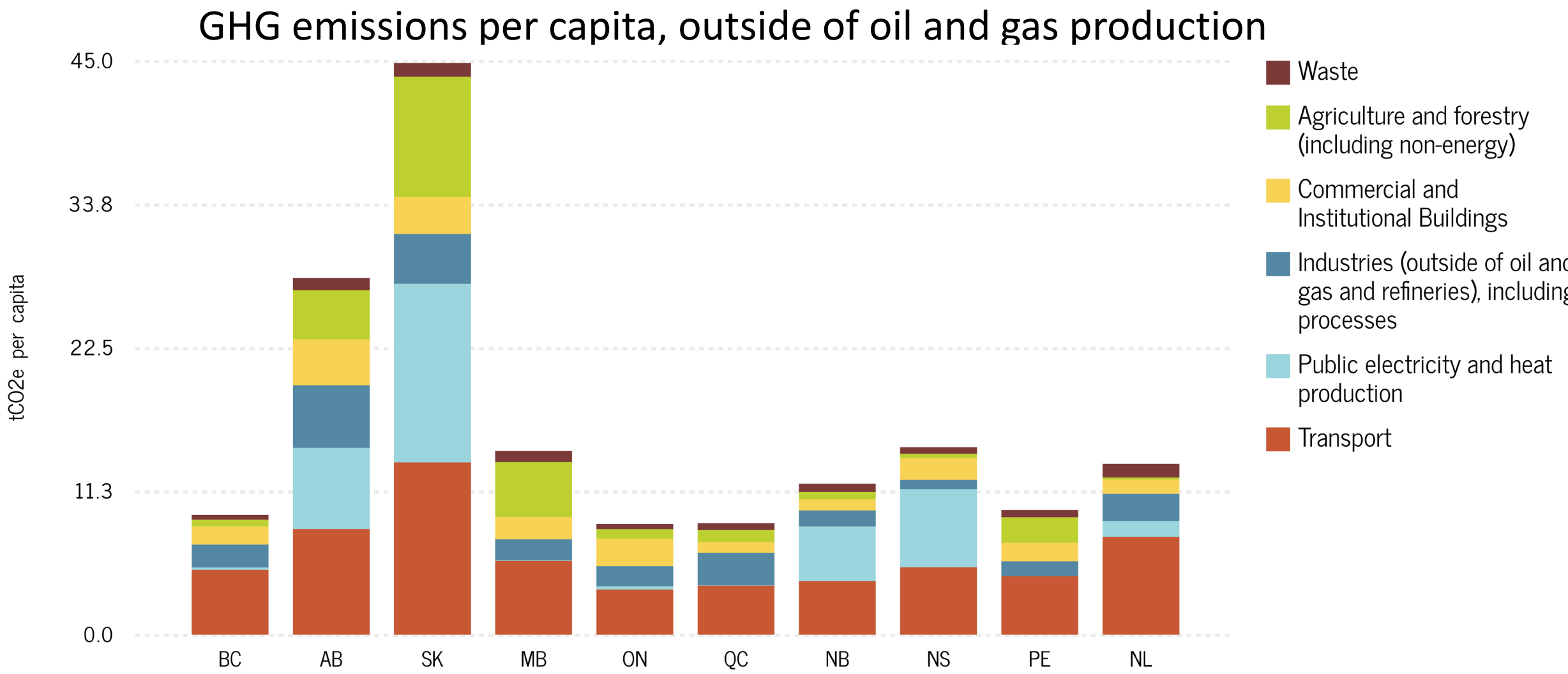
What explains this poor performance?

- Industrial structure?
- Energy productivity of commercial actors?
- Consumption preferences of households?

GHG sources


Total GHG Emissions Across Canada
MtCO2e
800
600
400
200
0
2005
2010
2015
2020
Waste
Agriculture (outside of energy use)
Industrial processes
Agriculture and forestry energy use
Residential Buildings
Commercial and Institutional Buildings
Industry energy use
Oil, gas, and refining industries
Transport
Public electricity and heat production

GHG Sources


GHG emissions per capita, outside of oil and gas production
45.0
33.8
22.5
11.3
0.0
tCO2e per capita
BC
AB
SK
MB
ON
QC
NB
NS
PE
NL
Waste
Agriculture and forestry (including non-energy)
Commercial and Institutional Buildings
Industries (outside of oil and gas and refineries), including processes
Public electricity and heat production
Transport

Conclusions: observations from recent trends

- *Canada's dependence on the US market continues to grow, and will not disappear throughout the energy transition*
- *The impact of the pandemic was negligible on consumption and GHG emissions, with the partial exception of transport; no effect on production*
- *Data lags prevents an evaluation of the impact of policies implemented since 2020, and even less of the ERP*

Perspectives for upcoming transformations

- *The challenges with regard to decarbonization vary across provinces, but the combination of these challenges makes them even more complex to meet*
- *Inadequate pace for reaching net-zero et lacking planning compared with the needs of the transition*
- *Still very few structural changes, with however several important regulations being implemented in the next few months*

Q & A

Thank you!

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https://iet.polymtl.ca/en/energy-outlook/