

Air emissions accounts: Quarterly and regional perspectives

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Presented by Jane Harkness

Overview of presentation

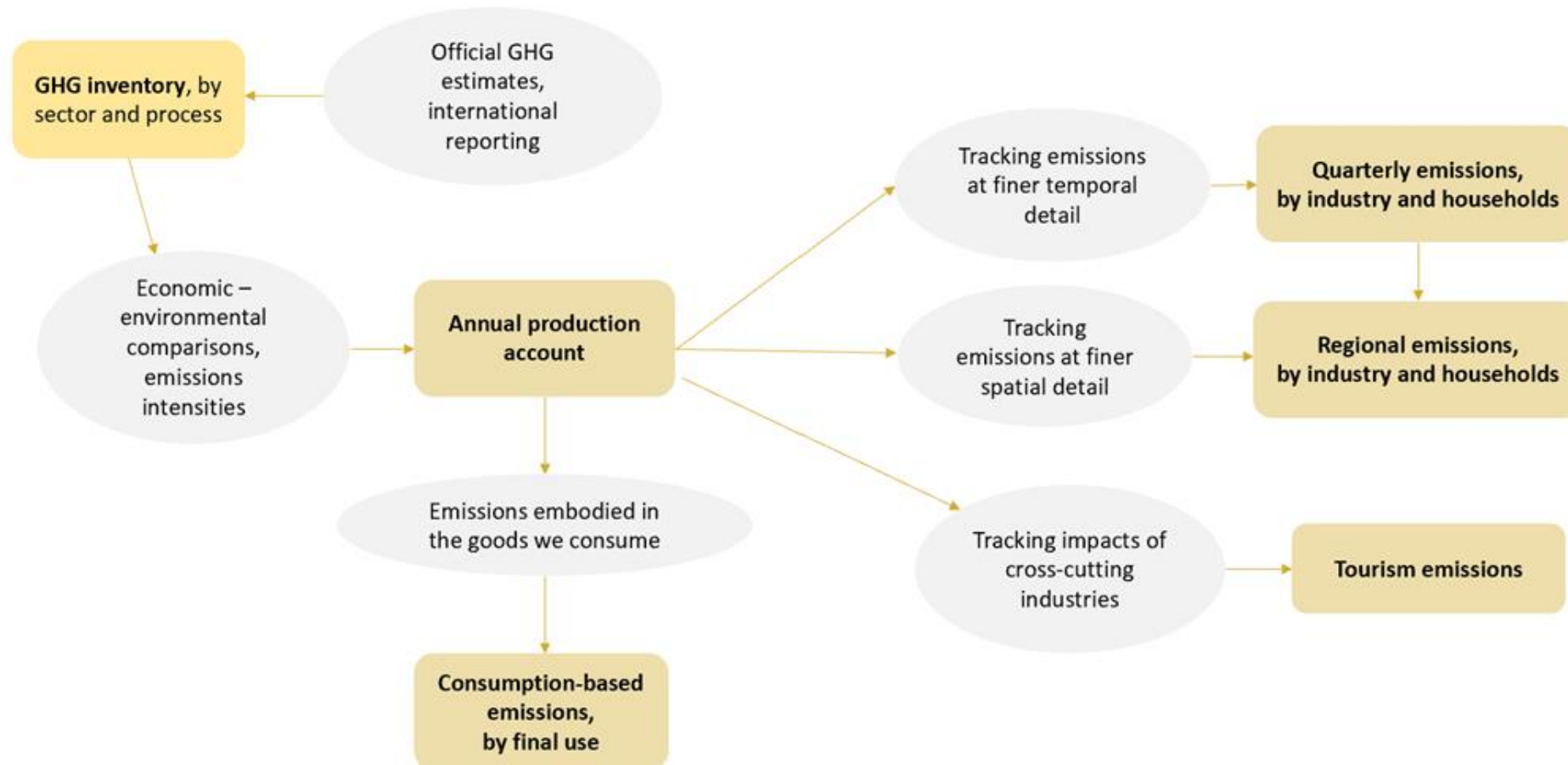
Quarterly emissions accounts

- New and growing area of statistics.
- Used in NZ for reporting against government targets and in tracking progress towards reducing road transport emissions.
- Improves the timeliness of the regional emissions account.
- Seasonal adjustment is a key challenge to address for quarterly emissions production.

Regional emissions accounts

- Only Sweden and NZ produce regional emissions accounts, but methodologically feasible to produce on a SEEA basis.
- Used by regional councils for reporting and policy advice.
- Majority of users describe the regional accounts as being essential/critical to their work.
- Application of the residency principle is a key challenge to address for compilation.

Emissions: Inventory and account linkages



Greenhouse gas emissions (industry and household) - the annual production account

- The annual production account dataset provides the foundations for all other accounts – quarterly, regional, and consumption.
- Estimates 116 industries, households by category, and tourism as a cross-cutting industry.
- Can be extended with the December quarter annual.
- Retained metadata, and GHG inventory classes, increases the usefulness of the main output dataset.

Quarterly emissions: Overview of methods and requirements

- Uses same methodological approach as quarterly GDP
 - Combines annual benchmarks (emissions levels) and quarterly indicators (for movements) in established statistical techniques
 - Imputation to obtain complete coverage
- Seasonal adjustment
- Based on residency principle for consistency with the national accounts
- Revisions expected over time
- [Quarterly greenhouse gas emissions \(industry and household\): Sources and Methods - Stats NZ DataInfo+](#)

Resources

- 6 FTE, 6 months for methodological development
 - 2-3 FTE ongoing
- Programming capabilities (eg SAS)
- Access to X-13 ARIMA SEATS and national accounts macros

Challenges in measuring quarterly emissions

- Volatility
- Compilation level and availability of indicators
- Validation of indicators
- Revisions
- Communication

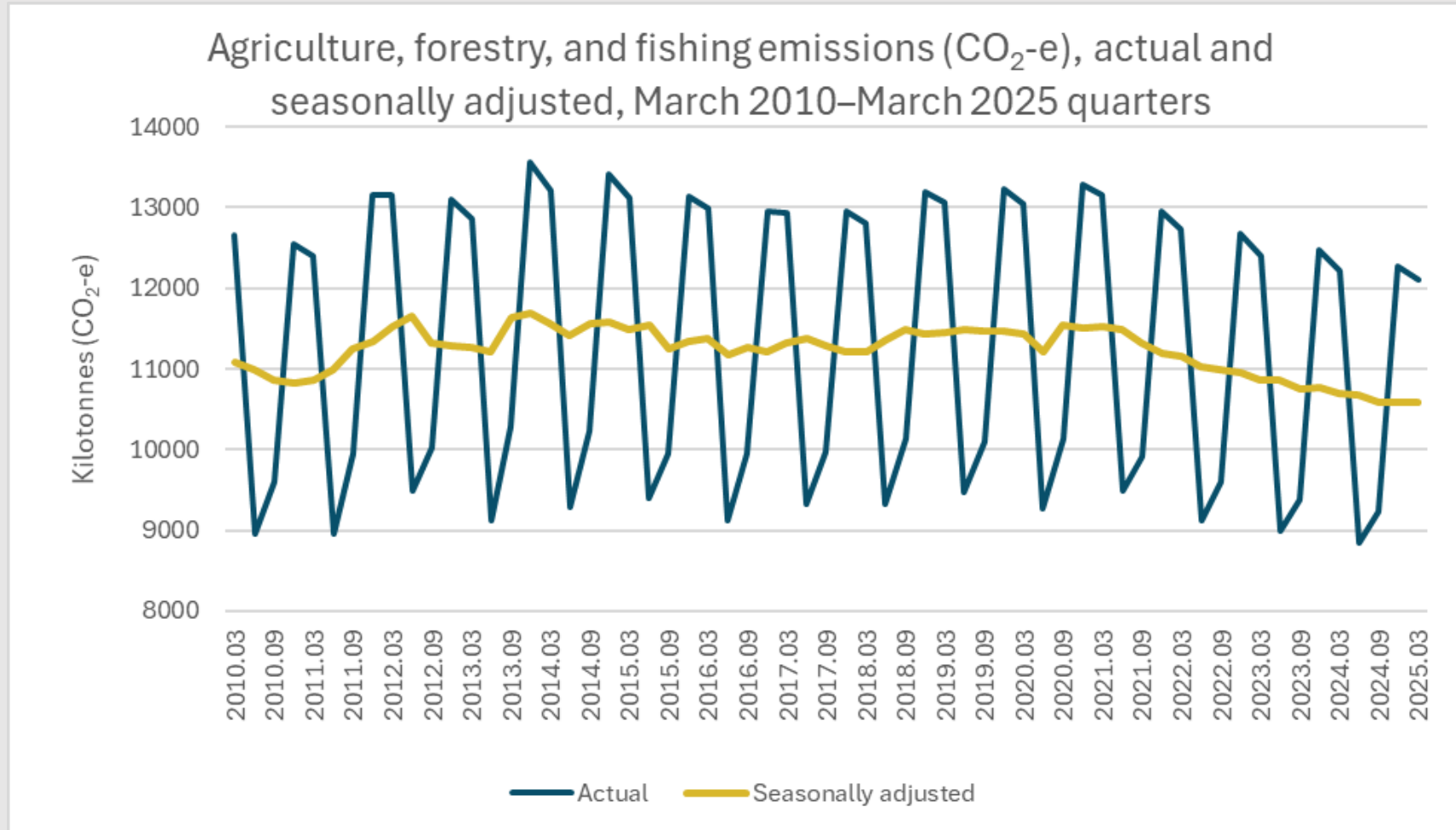
Seasonal adjustment

- Quarterly emissions show a strong seasonal pattern.
- The rationale for seasonally adjusting is to 1) make meaningful quarter on quarter comparisons 2) enable comparisons to seasonally adjusted economic statistics.
- A quarterly time series consists of three components:
 - The trend, the seasonal component, and the irregular component.
- The seasonal adjustment method used by Stats NZ for quarterly GHG emissions is the X-13 variant of the seasonal adjustment programme developed by the United States Census Bureau.
- The standard X-13 ARIMA SEATS procedure used has been shown to be applicable to greenhouse gas emissions data by Pegoue et al (2023).

<https://www.stats.govt.nz/methods/seasonal-adjustment-in-stats-nz/#underlying>

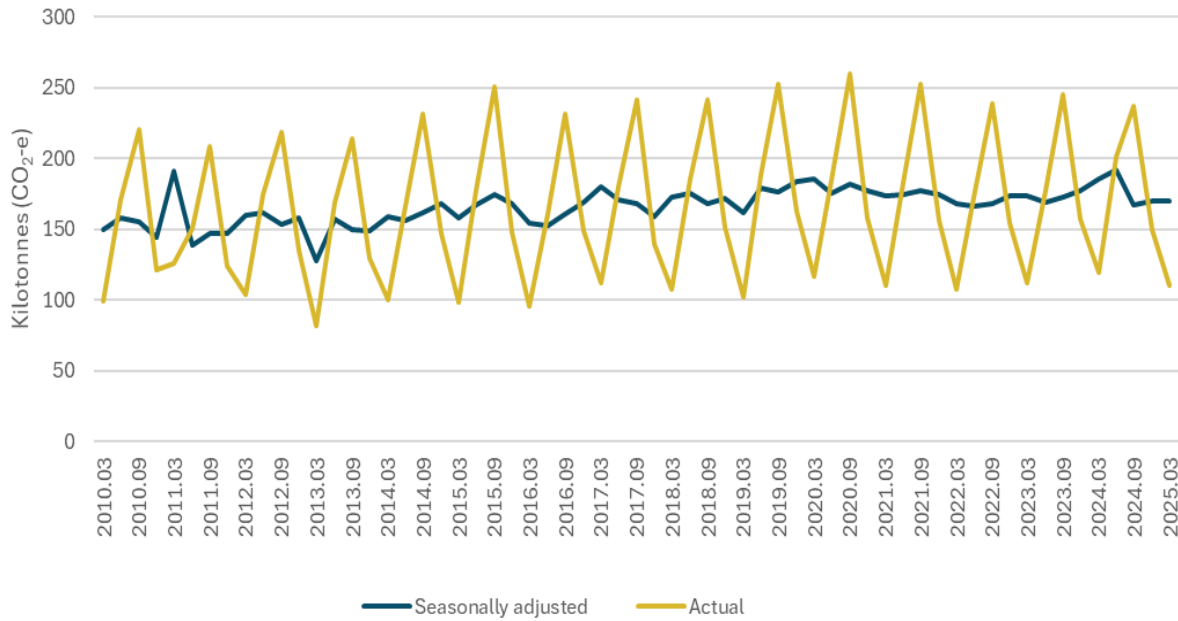
<https://www.stats.govt.nz/methods/seasonal-adjustment-and-automatic-outliers-in-time-series-after-covid-19/>

Seasonal adjustment



Seasonal adjustment

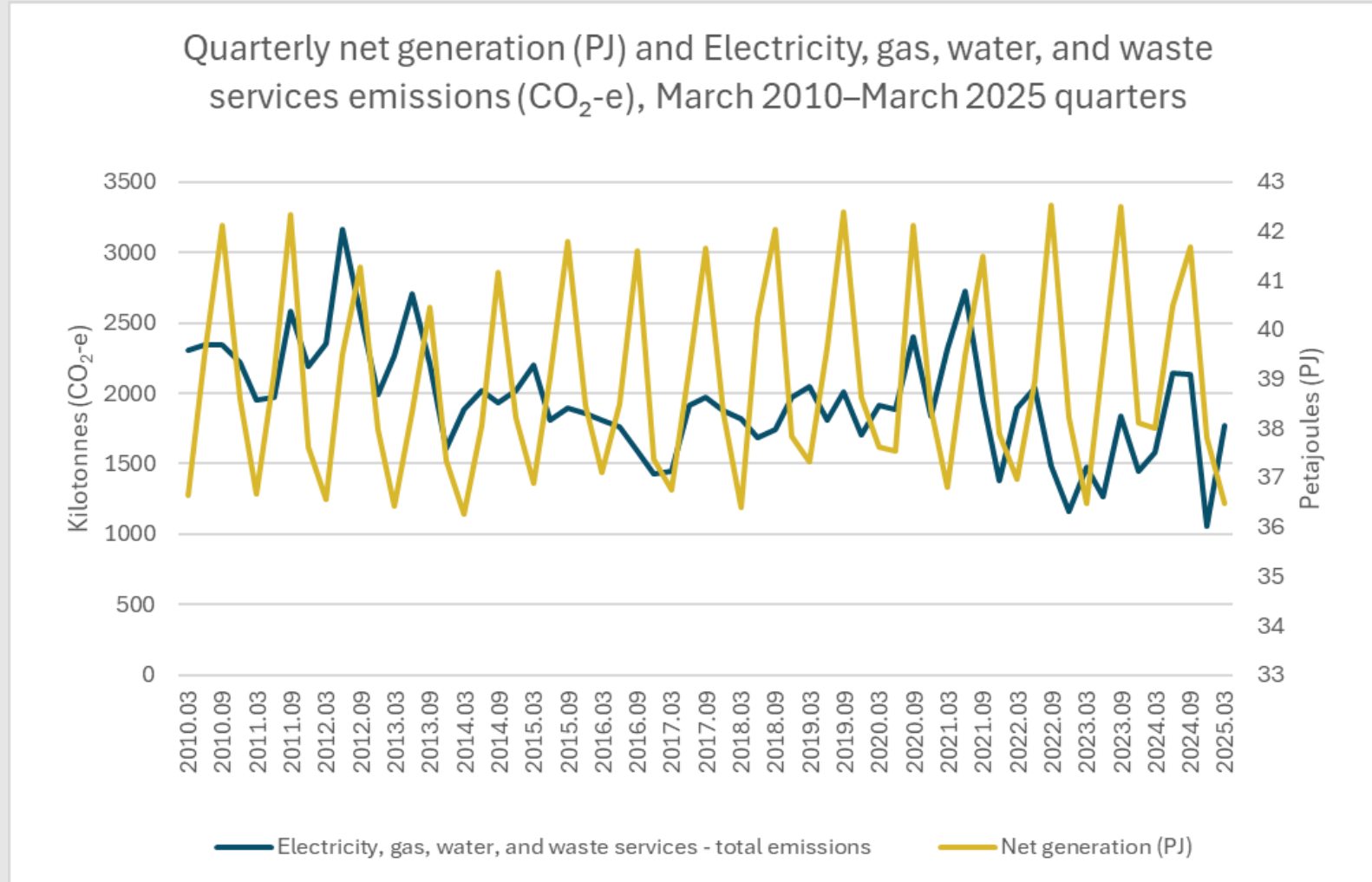
Households heating/cooling emissions (CO₂-e), seasonally adjusted and actual, March 2010–March 2025 quarters



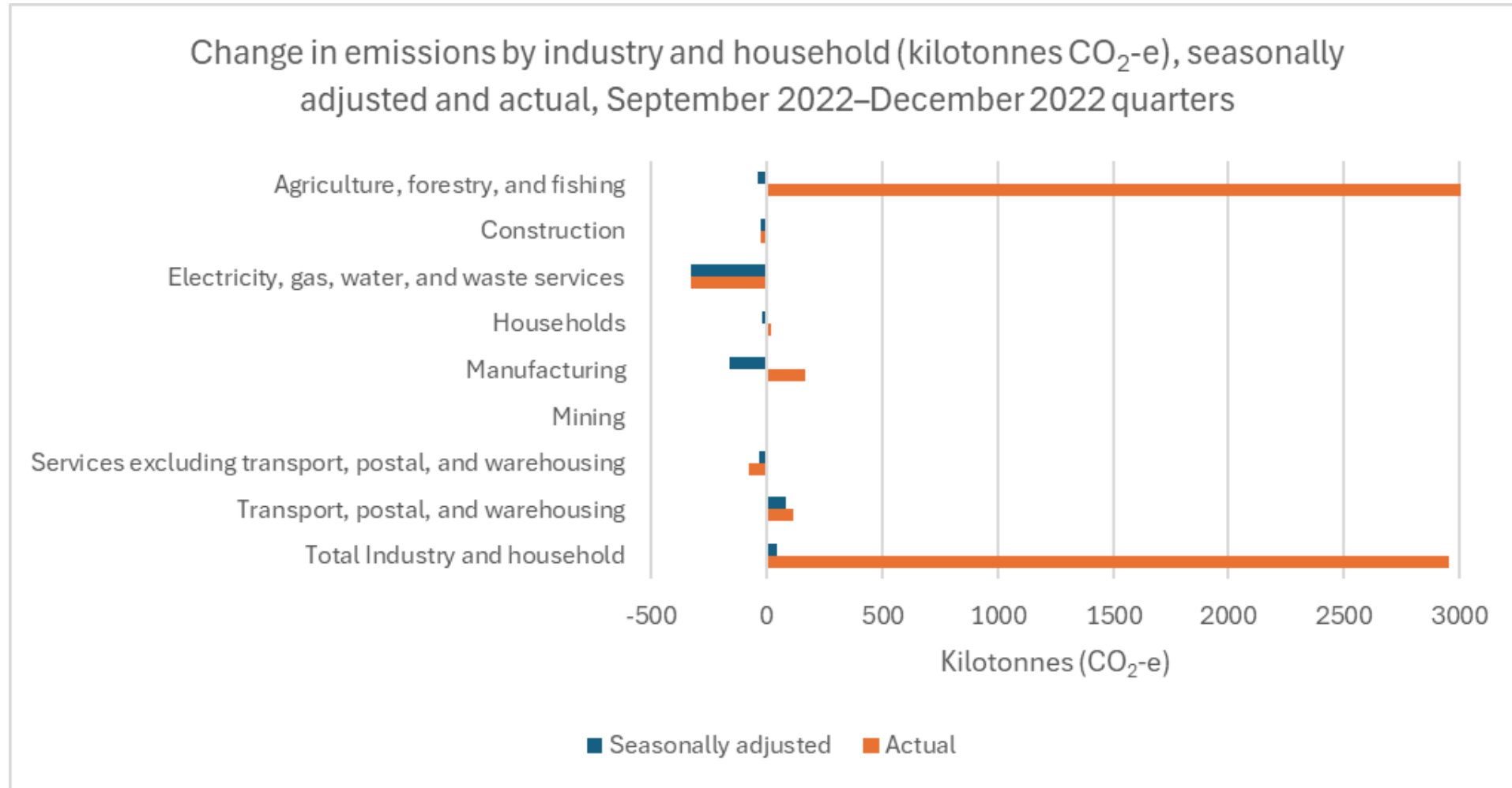
Households transport emissions (CO₂-e), seasonally adjusted and actual, March 2010–March 2025 quarters



Seasonal adjustment



Quarterly change: Seasonal adjustment vs actual series



Measuring regional emissions

Clear need from regional councils:

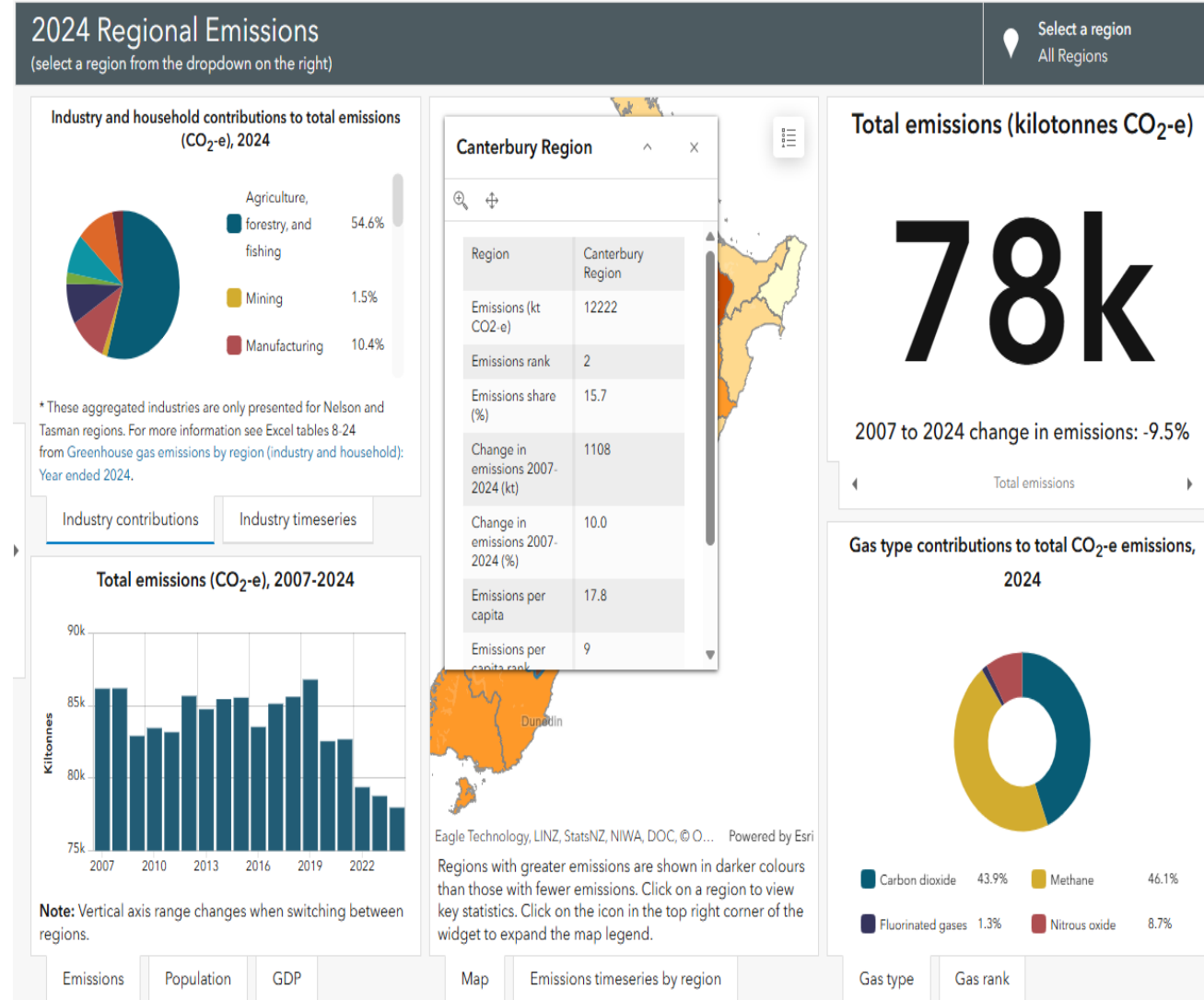
- Inconsistent reporting across regions – incomplete spatial coverage, and no set production schedules.
- Cost a barrier to regular and complete reporting.

Benefits from Stats NZ approach:

- Consistency of methodology enables meaningful comparisons across regions.
- Consistent time series and consistent with national totals.
- Enables joint presentation with regional GDP and employment data.

Approach:

- Generally, 'top down' allocation to regions.
- Bottom-up for region specific processes and in specific cases where data allows.
- Regional GDP used for completeness under the assumption of homogenous production functions.



Regional emissions – central principles

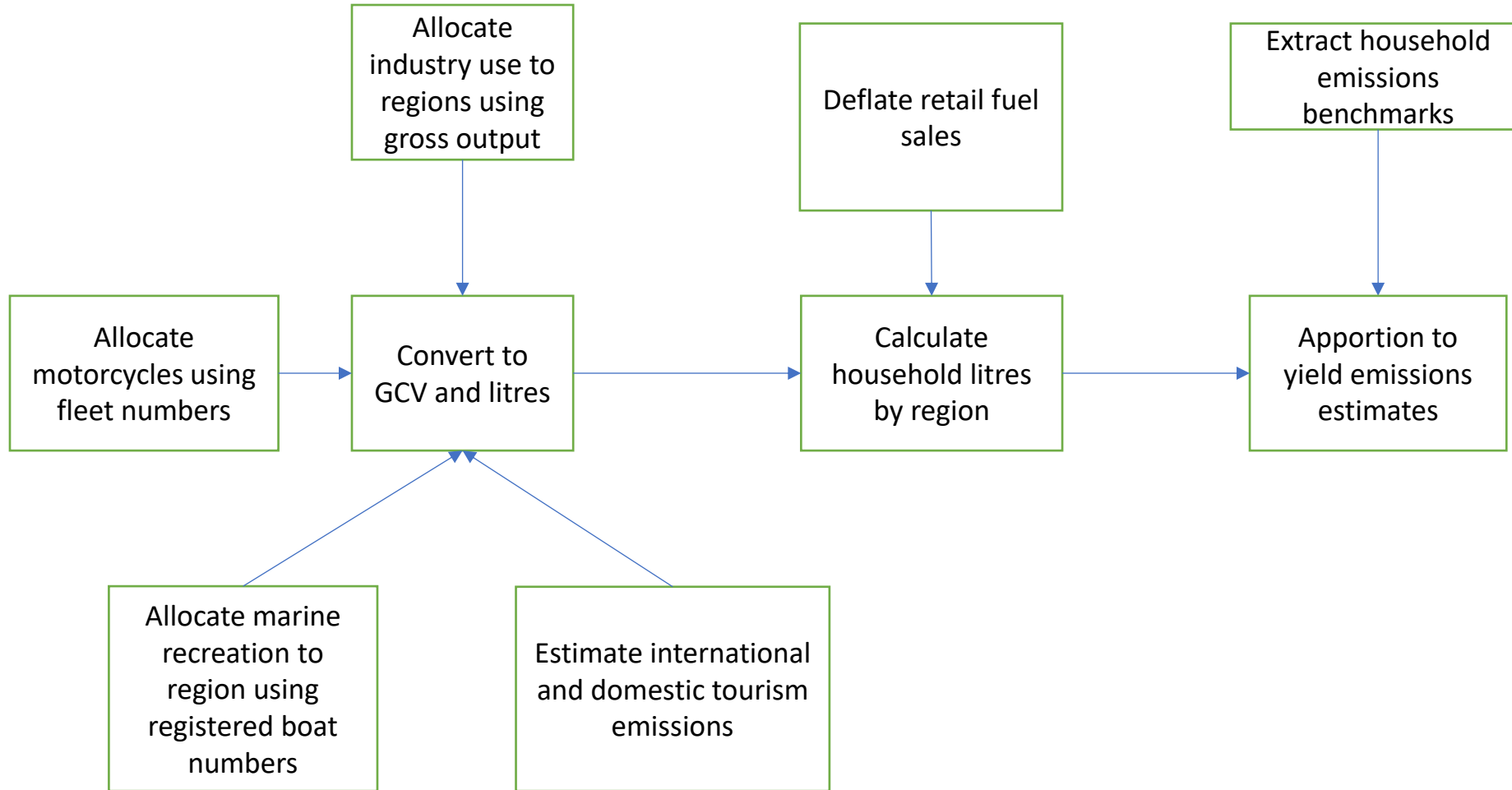
The allocation of emissions depends on the following central principles:

- As emissions are due to either an output from an industrial activity or direct emissions by households, the regional allocation mechanism is to reflect its source and economic unit.
- Unless it can otherwise be ascertained, the production technology for a given industry is the same across regions.
- To link to economic and population statistics, the **residency principle** is applied.
- Emissions are to be attributed to the **operator**.
- To avoid double counting, only **direct** emissions in a defined regional boundary are measured.

Regional emissions – residency principle

- Consistent with the published national (SEEA) estimates.
- The residency principle allocates the activity to where the unit undertaking the activity is based, even though that activity may happen in a region other than where they are resident or even overseas.
- Assessment is based on whether a unit has a centre of economic interest.
- Notional units are sometimes established (e.g. domestic aviation).
- Allocations based on residency and territory principles differ when:
 - there are no actual producer units in the region in which the activity takes place, or
 - an activity spans many regions.
- Emissions from agriculture, IPPU, and waste sectors will generally be from fixed sources. Transportation emissions are more challenging to allocate to residency.

Regional allocation of road transport emissions



Summary

- **Quarterly accounts** can add value to existing estimates by providing timely information on change to emissions associated with economic, technological, social, or environmental shocks.
- Quarterly accounts allow better examination of the response to an event which might otherwise be difficult to observe in an annual series. Seasonal adjustment is important in this regard.
- **Spatialisation of Central Framework accounts** is possible and has been demonstrated for air emissions.
- In most cases, where the emissions source has a fixed location, spatialisation is straightforward and there will be coherency between the residency and territory principles to measuring emissions. However, for consistency with the System of National Accounts, the residency principle can be challenging to apply to transport related emissions and requires great care.