

PhD in Urban Carbon Emissions Reduction At the University of Auckland, New Zealand

PhD Title: An Analysis of the Socioeconomic Impacts of Reducing Urban Carbon Emissions in Aotearoa

Fossil fuel burning in Aotearoa's urban areas accounts for 40% of its gross emissions, while urban vegetation, through photosynthesis and respiration, potentially offsets 10-60% of these emissions. However, data on this offset in Aotearoa and globally is limited, though urban planning significantly influences both emission sources and sinks. As Aotearoa aims for net-zero emissions by 2050, especially post-Cyclone Gabrielle, strategic urban development and land management could substantially contribute to this goal, potentially saving up to \$2 billion annually in carbon credits. Our collaborative effort unites top local CO₂ researchers, data and emissions experts, energy economists, climate communication specialists, and international experts in econometric and flux modelling to optimise urban growth and emissions mitigation.

Recently, the main contractor of our team, [GNS Science | Te Pū Ao](#), received an MBIE Endeavour grant for a five-year project dedicated to collaborating with central and local government, industry, and iwi. The aim is to develop and disseminate emissions data, enhancing their ability to comprehend and assess overall and sector-specific emissions, thereby facilitating informed actions to mitigate them. As the subcontractor of this research, the University of Auckland's team (Dr Selena Sheng and Dr Le Wen) will lead the creation of a data-driven estimation of carbon emissions and sinks for every town and city in Aotearoa. The programme will map urban CO₂ sources and sinks in space (down to areas of approximately 500m), time (hourly) and by sector, e.g. transportation, residential, industrial, and urban vegetation. The maps will be developed from a combination of cutting-edge atmospheric observations and modelling tools. The results of this programme will enable Aotearoa to be the first country in the world with real-world emissions data for every urban centre to guide future development across Aotearoa's varied urban environments.

As part of this larger project, the socioeconomics group has one fully funded PhD opportunity available to research the socioeconomic analysis of urban carbon emissions reduction, focusing on econometric modelling of societal and economic drivers of emissions in Aotearoa and policy pathways. This successful applicant will work within this multidisciplinary team.

Areas of focus for potential students:

- Conduct an in-depth literature review focused on the topic of interest.
- Assess and compile the social and economic datasets that are available and viable for this study. Considerations for appropriate datasets include the level of spatial information, nationwide vs regional/local datasets, availability of temporal information, format and accessibility, and independence from the flux modelling input data. Documentation to support dataset selection provided to GNS Science.
- Apply econometric models to analyse the impact of the social/economic factors on urban emissions at the sectoral, city and national levels. Spatial emissions information will be highly useful in examining 1) whether regional heterogeneity exists in Aotearoa due to differences in geographical conditions, energy demand and economic development levels and 2) whether carbon emissions among neighbouring regions are highly correlated.
- Assess the dynamics of urban emissions due to government interventions such as the enactment of environmental policies and exogenous shocks like fuel price change, with the

availability of a 10-year dataset of fossil fuel emissions (CO₂ff) and biogenic emissions (CO₂bio).

- Use time-series data to forecast future urban emissions and undertake causal impact studies under different scenarios.
- Assist the project team in allowing iwi and government stakeholders to use real-world examples to understand how past development choices have affected the carbon cycle, moving beyond mere assumptions about human behaviour in development planning.

Financials Details:

- A tax-free stipend plus tuition fees* is provided for 3 years. Details are available below; all figures are in New Zealand dollars:

Year 1:
Stipend: \$30,240
Fees: \$7,827

Year 2:
Stipend: \$31,752
Fees: \$8,218

Year 3:
Stipend: \$33,340
Fees: \$8,629

* Please be aware that there may be a difference between the fees covered by the scholarship and the actual University fees required. The student is responsible for paying any such difference.

Qualifications:

- A postgraduate degree in MCom or BCom with 1st class honours in Economics is required
- Experience in econometric modelling is required
- Experience in advanced data analysis and/or spatial econometric modelling is highly desirable
- Evidence of an outstanding academic track record, research skills and technical writing

How to Apply:

Applications should follow the [doctoral application](#) procedure at the University of Auckland. Contact Dr Selena Sheng (m.sheng@auckland.ac.nz) or Dr Le Wen (l.wen@auckland.ac.nz) for further information. The successful applicant will be under the supervision of Dr Selena Sheng (60%), Dr Le Wen (40%), and Emeritus Professor Basil Sharp as an advisor.