Sustainable Transport Cluster

ECI Open Day 2017
Dr Matt Stocks
Sustainable Transport

Transport is the second largest source of carbon emissions in Australia after electricity production. The transport sector will need to change significantly for Australian and international greenhouse emission targets to be achieved.

Sustainable Transport Policy

Research within the Crawford School of Public Policy involves examining the policy settings required to achieve a sustainable transport sector. A particular focus is given to policies to encourage the adoption of efficient and low-carbon transport technologies.

Ongoing research includes identifying factors that affect the fuel efficiency of aircraft fleets. Work is also being done on the effects of fuel prices on road transport outcomes such as vehicle choices, fuel use, emissions, traffic congestion, and road safety. This research is international in scope.

Renewable Energy for Transport

The 100% Renewable Energy group in the Research School of Engineering researches the deployment and integration of renewable energy working towards carbon-neutrality throughout Australia's economy. Electricity will be the easiest sector to reduce emissions through use of renewable power. As electricity emissions approach zero, electricity is likely to be the primary enabler for reduced transport emissions through electrification of transport.

Electric vehicles

The coming shift to light electric vehicles will dramatically change the energy landscape. While much more energy efficient, electric vehicles will increase electricity consumption. The location and timing of electric vehicle charging could lead to increased stress on the transmission and distribution systems.

Synthetic fuels
Eliminating emissions, sector by sector

- Electricity: 35%
- Land transport: 13%
- Low temperature heat: 7%
- High temperature heat: 11%
- Aviation & shipping: 4%
- Industrial processes: 4%
- Fugitive emissions: 8%
- Land sector & other: 18%
- Fugitive emissions: 8%
- Land transport: 13%
- Low temperature heat: 7%
New generation capacity worldwide in 2016

Net new capacity
1st place: PV
2nd place: wind
3rd place: coal
Eliminating emissions, sector by sector

- **Electricity** 35%
- **Land transport** 13%
- **Low temperature heat** 7%
- **High temperature heat** 11%
- **Aviation & shipping**
- **Industrial processes**
- **Fugitive emissions** 8%
- **Land sector & other** 18%

**55% of emissions**
- PV + wind
- Electric vehicles
- Electric heat pump
- Land transport 13%
Land transport emissions by mode

- Passenger vehicles: 56%
- Articulated trucks: 15%
- Non-freight carrying trucks: 0.3%
- Buses: 2%
- Trains: 0.3%
- Rigid trucks: 9%
- Motorcycles: 0.4%
- Light commercial vehicles: 17%
Global annual sales of light-duty plug-in electric vehicles in top selling markets (2011 - 2016)

- Canada
- Japan
- China
- Western Europe
- United States

Annual sales (light plug-in electric vehicles)
Most drivers don’t drive far

Three quarter of all drivers cover only half the total distance travelled
Charging timing will be critical
Indonesia: Fuel subsidy reform & traffic jams

Easing the traffic: The effects of Indonesia’s fuel subsidy reforms on toll-road travel

Paul J. Burke, Tsenduren Batsuuri, Muhammad Halley Yudhistira

*Australian National University, ACT 2601, Australia

**Institute for Economic and Social Research, Faculty of Economics and Business, Universitas Indonesia, Indonesia
Sustainable Farming

Dr Grace Chiu RSFAS

everonometrics

multifaceted environmental research problems, with evidence-based policy implications.

$2M Ian Potter Foundation Grant

The research within this Initiative will allow examination of cause-and-effect cycles among Australian farming communities’ practices. For example, livestock transport management practices can impact on natural resources, and on famers’ financial and mental well-being.
Eliminating emissions, sector by sector

- Land sector & other: 18%
- Electricity: 35%
- Fugitive emissions: 8%
- Industrial processes: 4%
- Aviation & shipping: 4%
- High temperature heat: 11%
- Low temperature heat: 7%
- Land transport: 13%
Airline Fleet Fuel Efficiency

• Who we are?
  • Zsuzsanna Csereklyei and David Stern of the Crawford School of Public Policy

• What we are researching:
  • The factors that affect the selection of fleet fuel efficiency by airlines
Airline Fleet Fuel Efficiency

• Why is this important?
  • Importance of energy efficiency improvements in limiting climate change
  • The majority of the improvement in energy intensity is seen as coming from improvements in the energy efficiency of energy services
  • Mechanisms enabling the geographical spread of energy saving technological improvements have not been sufficiently investigated
  • Carbon emissions from air transport are of increasing importance
Airline Fleet Fuel efficiency

What we find:
Airline fleet fuel efficiency mostly driven by:

- Aircraft size
- Airline size
- Kerosene and jet fuel prices
- Interest rates
- Regional characteristics, or different technology adoption independent of aircraft size and age
Conclusion

Implications for policy:

Our findings confirm that airline fleet fuel efficiency is quite responsive to changes in fuel prices as well as credit costs and availability. Both of these findings may be considered in designing policies to decrease aircraft emissions and improve the general level of fleet efficiencies.
Renewable Fuels

Research into renewable fuels at ANU takes place at both the Research School of Chemistry and the Research School of Biology.

At the Research School of Chemistry, the research focuses on harnessing the catalytic power of enzymes to enhance biodiesel production. Biodiesel can replace fossil fuels as a renewable energy source, yet its use is limited by our reliance on free fatty acids (FFAs) from plant sources and extravagant water consumption.

The research aims to address both of these obstacles. It proposes a waterless alternative to traditional methods of biodiesel production, where we harness the catalytic power of enzymes. It also proposes using sewage sludge from wastewater plants as a low cost and local source of FFAs. The research aims to repurpose a recently discovered enzyme from the Australian blowfly to survive in the extreme environments of a biodiesel reactor.

At the Research School of Biology, the research has a strong focus on plant science. Research is conducted by world leading researchers in photosynthesis, plant physiology, biotechnology and high throughput analysis.

The research aims to develop high lipid producing microalgal strains for large scale cultivation. The ANU hosts major facilities for structural detection and quantification of molecules (mass spectrometry, NMR) as well as providing world class facilities for the controlled growth of plant and algal materials. Our researchers collaborate with leading European, Japanese and United States groups and the ANU supports the Plant Energy Biology ARC Centre of Excellence.
Researchers

Dr Matthew Stocks
✉️ matthew.stocks@anu.edu.au
📞 0419 370012
Convener

Professor Andrew Blakers
✉️ andrew.blakers@anu.edu.au
📞 +61 2 6125 5805

Dr Paul Burke
✉️ paul.j.burke@anu.edu.au
📞 +61 2 6125 6566

Dr Grace Chiu
✉️ grace.chiu@anu.edu.au
📞 +61 2 6125 7292

Professor David Stern
✉️ david.stern@anu.edu.au
📞 +61 2 6125 0176