

# AN INTEGRATED DEMAND AND CARBON FORECASTING TOOL FOR ENERGY, TRANSPORT, WASTE AND WATER

## PROJECT FACTSHEET



## KEY POINTS

- Estimating and managing demand for energy, transport, waste and water services are critical components of sustainable urban development.
- We have produced a tool that can both forecast the demands of these services as well as their carbon impact as they interact and vary according to the number of buildings, their structure and use, as well as the number of residents.

## THE OPPORTUNITY

Energy, transport, waste and water (ETWW) services are significant contributors to carbon emissions. By assessing the ETWW needs of a building or precinct, we can forecast their associated carbon footprint and implement measures to reduce it.

Driven by industry planning needs, we developed a unique integrated toolset that can assess the sustainability of buildings and precincts.

## OUR RESEARCH

We have developed an integrated tool that forecasts ETWW demands and the associated carbon impacts at the building level. This estimate can be adjusted according to various scenarios and development plans.

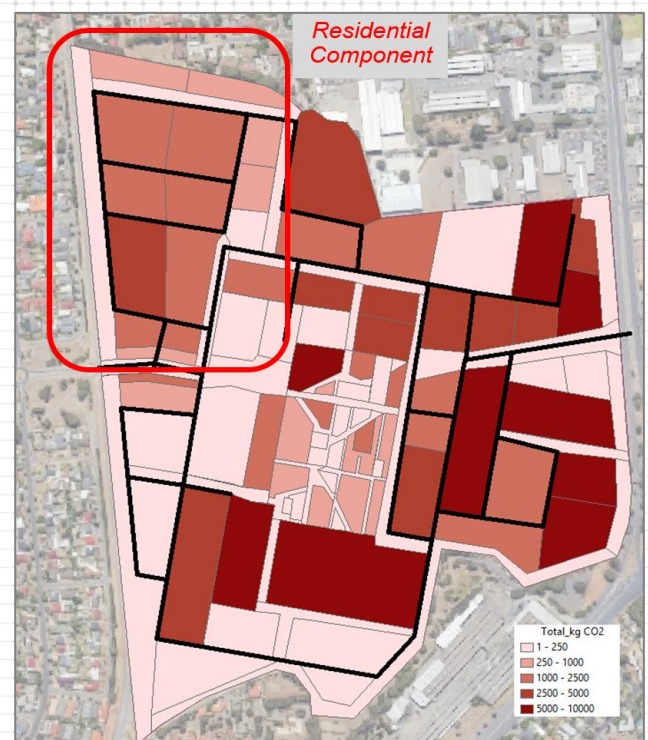
Our model is unique in that it was developed by combining existing state-of-the-art models with a number of newly developed models.

Research and development of the tool focused on residential precincts in a multi-purpose precinct context. This enabled us to create a tool that assesses the overall impacts of both existing and new developments.

### CRC for Low Carbon Living

The CRC for Low Carbon Living (CRCLCL) is a national research and innovation hub that seeks to enable a globally competitive low carbon built environment sector and is supported by the Commonwealth Government's Cooperative Research Centres programme.

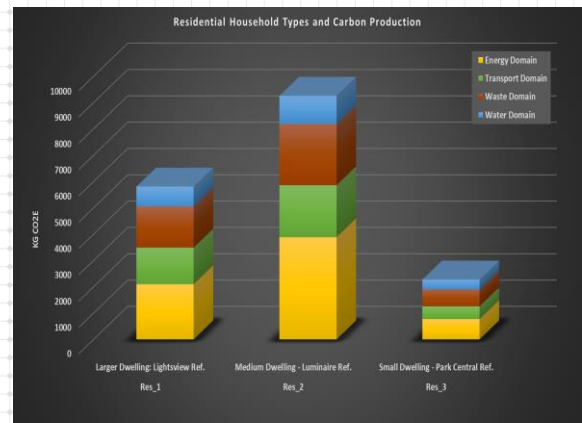
With a focus on collaborative innovation, the CRCLCL brings together property, planning, engineering and policy organisations with leading Australian researchers. It develops new social, technological and policy tools for facilitating the development of low carbon products and services to reduce greenhouse gas emissions in the built environment. For more information visit [www.lowcarbonlivingcrc.com.au/](http://www.lowcarbonlivingcrc.com.au/)



## OUTCOMES

Our demand estimation model can forecast ETWW demands and associated carbon impacts as they interact and vary according to the building structures, occupant numbers and types of activities within a precinct. This is a unique approach to demand estimation as the tool allows for:

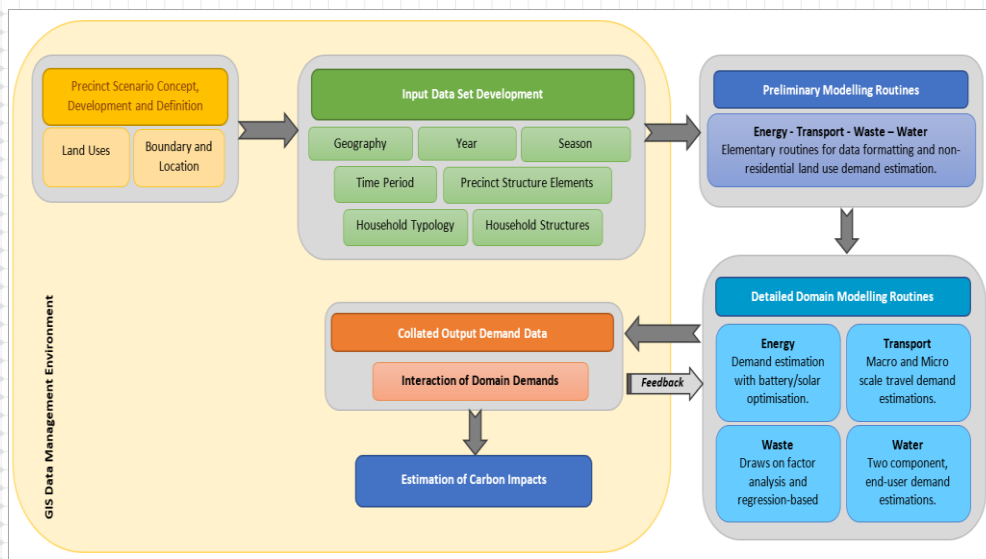
- Highly accurate estimates of the main ETWW demands and associated carbon impacts at both the household and precinct level.
- Analysis of a variety of forecast scenarios.
- Adjustments to the forecast demands in response to population changes, socioeconomic variables and household behaviour.
- Calculations of a range of influences, including solar energy generation and battery storage, water recycling and rainwater use, alternative transport fuels (e.g. electric vehicles), and recycling and waste transport efforts.
- Estimation of the effects of climate change using projected temperature and precipitation, and through climate-related changes to seasonal demands and local water supplies.
- Interactions with external facilities, such as transport networks, off-site waste disposal, water supply locations and grid-based energy supplies.
- Spatial presentation of results within Geographic Information System (GIS).



## HOW YOU CAN BENEFIT

Our tool is highly useful in urban development because it helps planning agencies and infrastructure providers, operators and developers to both project and deliver sufficient and sustainable ETWW services to urban precincts.

Our tool can be used to estimate the carbon impact of various household structure types; the effectiveness of carbon-friendly technologies; and the effects of climate change. The tool also allows practitioners to investigate 'what-if' type scenarios, which is useful in policymaking and planning for future urban development.



## PROJECT TEAM

*Supervisors, leadership team and researchers:* Em. Prof. Michael AP Taylor, Prof. Rocco Zito, Dr. Nicholas Holyoak, Prof. John Boland, Prof Peter Newton

*Research team:* Mr Steven Percy (PhD candidate), Dr. Michalis Hadjidakou, Mr He (PhD candidates) and Dr. Ivan Iankov;

*Partner organisations:* AECOM, CSIRO, SA Water South Australian Government's Department of Environment, Water and Natural Resources, South Australian Government's Department of Planning, Transport and Infrastructure, South Australian Urban Renewal Authority (RenewalSA), Sydney Water, The University of New South Wales and The University of South Australia.

## FURTHER INFORMATION

**For more information about this project, please contact:**

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## REFERENCES

[Taylor, M.A.P. Holyoak, N., Zito, R., Percy, S., Hadjidakou, M. Iankov, I. and He H. \(2017\) Energy, Transport, Waste and Water Demand Forecasting and Scenario Planning for Precincts: Final Report, CRCLCL.](#)

Holyoak, N., Taylor, M.A.P, Hadjidakou, M. and Percy, S. (2017) *An Integrated Demand and Carbon Impact Forecasting Approach for Residential Precincts*, In CUPUM 2017: Planning Support Science for Smarter Urban Futures, Springer, pp. 295-315