IN THIS ARTICLE

Accessing data to measure and track environmental performance can be a challenging process. Furthermore, a complex data ownership landscape or the lack of standardised processes would pose more difficulties to the endeavour. This commentary explores the development of the Resilient Sydney Platform to address these challenges. Additionally, it looks at the use cases and impact of the Platform, from tracking and monitoring of city-scale environmental footprints to its role as a performance management tool.
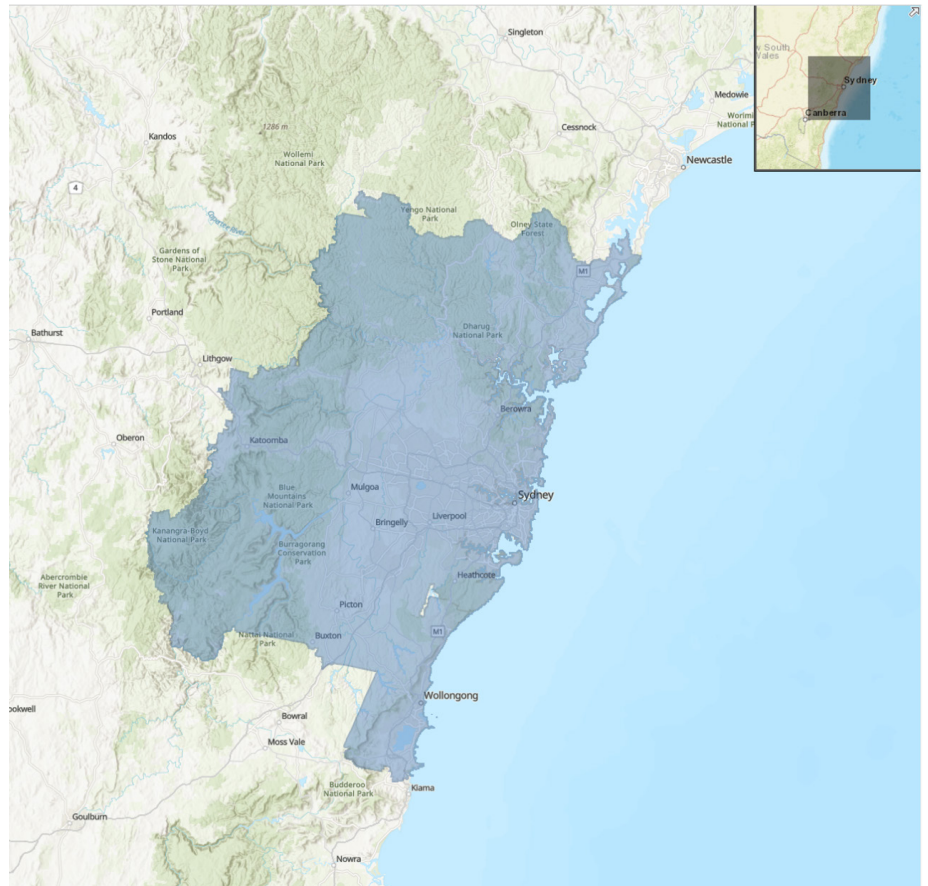

Figure 1 - Map of Greater Sydney Metropolitan region. Source: CLC

Digital Platforms for Tracking Environmental Performance: A Case Study of the Resilient Sydney Platform

The Resilient Sydney Platform is an online data portal that allows for the visualisation of city-scale environmental footprints for use in the strategic planning of climate actions at the city council level. The development and implementation journey of the Platform provides a useful framework and learning opportunities for cities and districts looking to improve their capacity to track their environmental performance.

Overview of Metropolitan Sydney

Metropolitan Sydney adopts a multi-layered system of governance, consisting of three levels—federal, state, and local. The Australian Commonwealth Government is responsible for defence, foreign affairs, trade and commerce, immigration, telecommunications and broadcasting, postal services, and most social services. They have also developed national level resilience policy and critical infrastructure resilience strategies. At the state level, the New South Wales (NSW) state government is responsible for health,

education, the environment, transport and infrastructure, and police and emergency services.

The NSW State Government also defines the jurisdictions and boundaries of the 33 local government areas (LGA) in Greater Sydney. The LGAs vary greatly in size and population, and have an average land area of 123 km^2 (max: 455 km^2, min: 5.7 km^2) and average population of 156,322 (max: 373,931; min: 14,909). Each LGA has a local council led by a mayor, who is responsible for town planning, waste management, local roads, parks, local
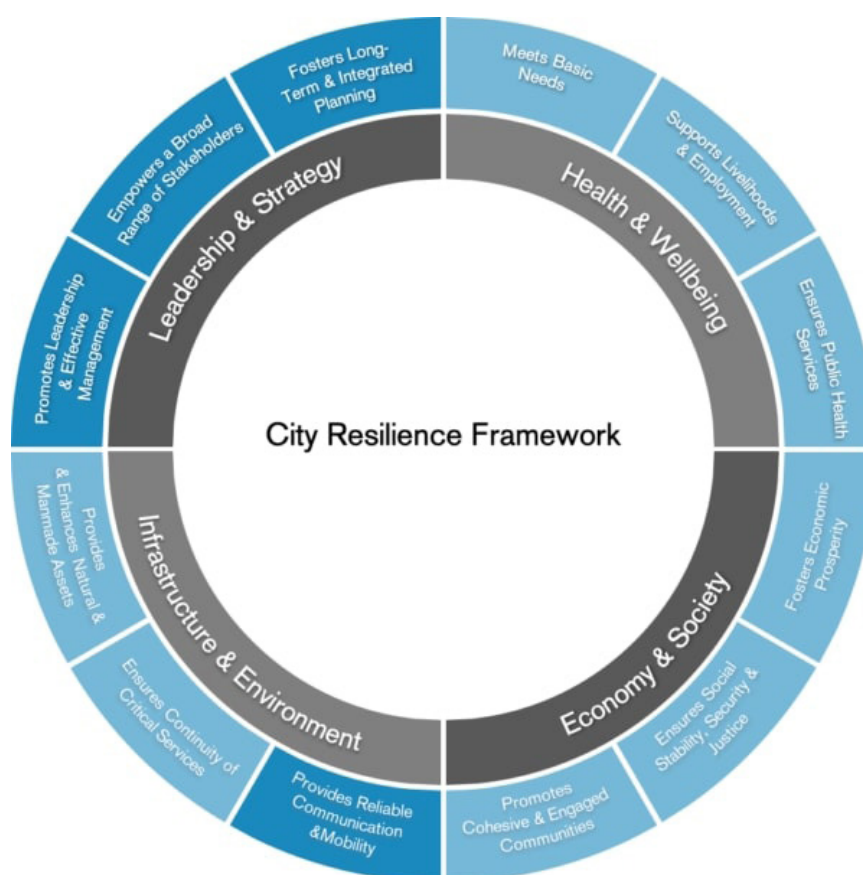
Figure 2 - City Resilience Framework. *Source: Resilient Cities Network*

environmental issues, public recreation facilities, and other community services. Local government elections are held every four years.

These 33 LGAs are further grouped into districts by the Greater Sydney Commission, for metropolitan level planning of the Greater Sydney region. The region has also been envisioned as an integrated and connected plan, envisioned as A Metropolis of Three Cities.

Resilient Sydney

In 2014, Sydney was chosen to be a part of the 100 Resilient Cities (100RC) network (now called the Resilient Cities Network (RCN)), and received funding and support from the network to kickstart the development of a resilience strategy at the

metropolitan level. Resilient Sydney began as a collaboration between the City of Sydney, metropolitan councils of Sydney, the NSW State Government, and 100RC. Today, it continues to be hosted by the City of Sydney. Resilient Sydney is supported by 100RC and each of the 33 participating local councils.

In a city context, resilience refers to the capability of the city's individuals, communities, businesses, and systems to survive and thrive despite the chronic stresses and acute shocks they may experience. Chronic urban stresses—such as climate change, structural inequity, and homelessness—can weaken a city on a day-to-day or cyclical basis. In contrast, acute shocks are sudden threats to a city, such as floods, bushfires, pandemics, and cyber-attacks. However, anticipating and

planning for these disruptions can allow a city to turn them into opportunities that offer financial, social, and environmental benefits.

The Resilient Sydney team worked with stakeholders to develop the Resilient Sydney Strategy in 2018, which acts as a five-year action plan (see Figure 3). The Strategy comprises 35 flagship actions and supporting actions for each direction, one of which includes the Resilient Sydney Platform. These actions were developed with the complexity of city systems in mind, and provided solutions and interventions at various scales (i.e. community, industry, policy levels).

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Figure 3 - Resilient Sydney strategy, including directions and actions. *Source: Resilient Sydney*

Resilient Sydney Platform – Measuring the Performance of LGAs

Data Challenges

The Resilient Sydney Platform was planned as an aligned action, "Action 13: Measure metropolitan carbon emissions and report on progress", of Resilient Sydney's "Direction 2: Live with our climate", as a response to challenges faced by local councils to obtain, ingest and report data.

During the engagement process, the team found that despite the high volume of environmental data being collected within Sydney, the process of accessing the data was challenging and complex for local councils. This was mainly due to the disparate ownership of data, as data was owned or developed by many different levels of government and private organisations. The problem was compounded by a lack of standardised processes and portals for obtaining data by the public or other organisations. Furthermore, due to the privatisation of several assets at the time, the ownership of infrastructural data was moved outside of the government. Once obtained, local planning councils also faced issues with utilising and managing the data.

Development of the Data Platform

The Resilient Sydney Platform was developed to be a standardised metropolitan-wide tool for measuring and reporting environmental footprint, and allowed local councils to visualise and compare data. As more sophisticated data were collected, the Platform evolved into a performance management tool, enabling decision makers in each council to create localised targets and action plans.

The Platform was based on a solution developed by Kinesis, a Sydney-based urban analytics company (see Figure 4). The Kinesis platform was chosen due
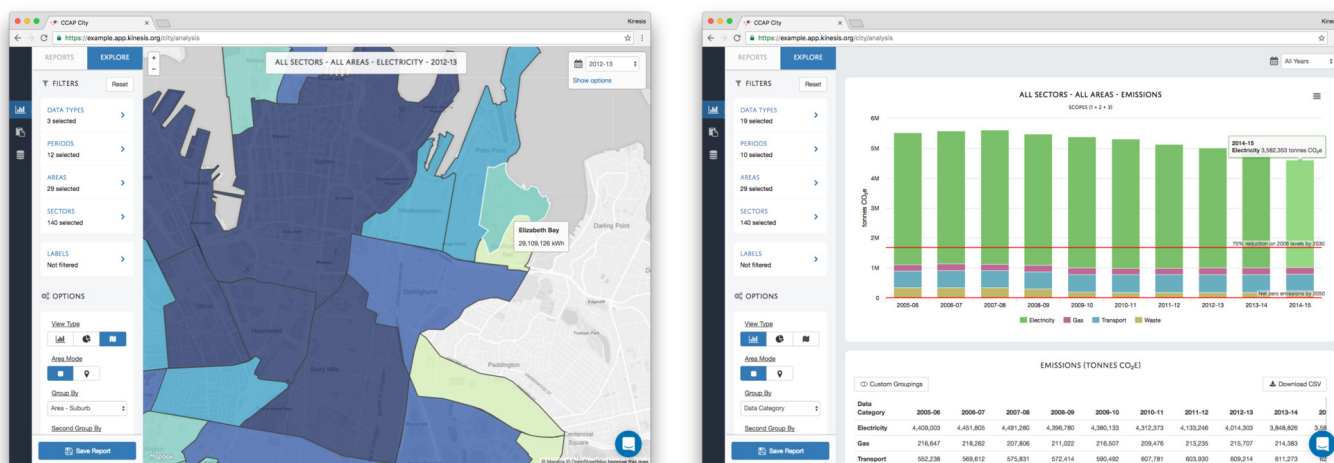
Figure 4 - Kinesis data platform. Source: Kinesis Platform, www.kinesis.org

to similarity in use cases—Kinesis had a background in urban policy and city making, and their platform had been in use by the City of Sydney council and the Greater Sydney Commission for 10 years prior. These organisations had used Kinesis to create data stories to enable action, and it was determined to be a good fit for Resilient Sydney. Additionally, this experience showed that the Kinesis platform was suitable for making data easily accessible to organisations, such as councils.

Community engagements during Resilient Sydney's second phase found that as both the councils and the community were concerned about climate change, the priority datasets for the Platform would adopt an emissions profile (i.e. electricity, gas, waste, and transport). Water consumption and solar photovoltaic (PV) indicators were added later.

The Platform is aligned with the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) reporting, which provides a framework for accounting and reporting city-wide greenhouse gas (GHG) emissions. This informed how the initial datasets and measures for the Platform were determined.

Created by the World Resources Institute, C40 Cities Climate Leadership Group and ICLEI – Local Governments for

TYPE	DATA	DETAILS	UPDATE FREQUENCY	SOURCE
Environmental	Emissions (kgCO2e)	Based on GPC standards	Yearly	Utilities
	Energy use (MJ)		Yearly	Utilities
	Waste (kg)		Yearly	Council
	Water use (ML)		Yearly	Utilities
	Transport (km travelled, mode, trip type)			Household travel survey (NSW state government)
	Solar PV installed capacity (kW)		Monthly	Australian PV Institute (Australian Renewable Energy Agency)
Population	Socio-economic	For aggregating and normalising data (by population, jobs, dwellings)		Census

Table 1 - Datasets on the Resilient Sydney Platform.

Sustainability (ICLEI), the GPC uses a "city-induced framework" to measure GHG emissions that are attributable to activities taking place within the geographic boundary of the city. This allows cities to track their overall emissions and understand the contribution of their urban activities, as well as providing consistent comparisons between cities. The GPC has been applied in hundreds of cities globally, including the C40 cities such as Sydney and Auckland, through commitment

via C40 and the Compact of Mayors. Additionally, GPC methodologies applied in the Resilient Sydney Platform have been reviewed and audited by the C40 organisation.

Platform Overview

The Resilient Sydney Platform consists of environmental and socio-economic datasets (see Table 1), with indicators and measures available at a Sydney-wide scale

to allow for comparisons between LGAs. It is also possible to zoom into individual LGAs for a more detailed view. This highlights the opportunities for reducing emissions and environmental impacts, as the issues faced by local councils can be different because of their locations. Users can also access their emission reduction pathway, which shows the gap between council policies and actual emissions.

The methodologies for data collection and processing were developed with input from the state government. The full methodology for each data set is displayed in the Platform for users. This included information about the sources, time period, upload frequency, data quality, data transformation processes, units, and its use in various analyses.

Most datasets are updated yearly and after the financial year to accommodate accounting by the utility companies. Solar PV data is updated monthly. The smallest spatial unit for reporting is the suburb level, which is a level smaller than LGA. However, in some areas with lower population sizes, utility companies may report only at the LGA level or aggregate several suburbs together due to concerns with privacy and identification of the data. Such data would be aggregated or disaggregated as necessary by Kinesis before publishing onto the Platform. Using state government and census projections, Kinesis also provides normalised datasets based on area, population, jobs, and dwelling information. This is available on the Platform for local councils to build their own customised reports. Platform users are also able to download the underlying tabular data for all available datasets, and charts or visualisations created on the Platform.

Data Management and Governance

Data collection was a challenge for the team. Where possible, data were collected from publicly available external sources. For example, solar PV data were web-scraped by Kinesis from the Australian PV institute website. While this was limited to the current solar PV uptake, Kinesis was able to model solar opportunity on the Platform for councils with additional data. Governmental sources of data included the Household Travel Survey for calculating transport-related emissions, and census data.

The team also worked with utility companies to provide cleaned data that would be uploaded to the Platform. Data provided would be checked by Kinesis for anomalies and the inconsistencies found would be highlighted to the data provider for validation. Despite the considerable time lag for data provided by utilities, which could be up to two years, the data were still useful in providing retrospective insights and setting baseline targets.

The engagement carried out by the Resilient Sydney team helped to link state government and local council implementation-level teams, so that the local councils had immediate access to local place-based data to develop evidence-based plans respectively. Additionally, this provided considerable cost savings for the local councils, compared to having to source for the data from the utilities and data owners themselves.

Due to the complex layers of systems and responsibilities in a city, measurements and reporting are done in two spheres—council and community. Each local council is responsible for the measurement and reporting of data related to their operations, demonstrating the commitment of the councils to addressing resilience issues. The second sphere for reporting spans the entire community or LGA. At this level, the responsibility over the environmental footprint falls to the entire community, including developers, businesses, councils, the state, and individual households and residents.

To ensure that the Platform could act as a 'Single Source of Truth', control over how data were ingested into the Platform and published was needed—users could only use and publish data to the Platform after agreeing to the terms of use. As all data on the Platform were available to all users, the terms of use also ensured that councils would not be able to publish or use data relating to other councils without permission. This issue was particularly sensitive as inaccurate representations could be made with the data considering the variations in size, population, and land use classifications in each LGA.

Usage of the Resilient Sydney Platform

As part of the operationalisation of the Resilient Sydney Platform, the team conducted a series of introductory and advanced training sessions aimed at policy makers and to train a new generation of environmental accountants. Users were taught how to read and use the data, and how to interpret them in view of planning challenges. These capability building workshops are still conducted multiple times a year. The team also created a comprehensive data methodology document, and guided online tours and workbooks, on which participants could work through practical examples.

Since its implementation, the Resilient Sydney Platform has gained over 200 users, representing all 33 local councils and the NSW state government. Community users were not allowed on the Platform, mainly due to the difficulty for the small Resilient Sydney team to manage a large number of users. However, local councils were allowed to publish their own data to their websites for public access.

The data on the Platform has been used by councils to analyse baseline levels of their environmental footprint, and set targets based on them as part of their environmental sustainability strategy. The Platform has enabled councils to understand the impact of these footprints sector by sector, allowing them to form data stories for community conversations when there were opportunities to reduce emission, and run targeted programmes to drive change (see Table 2).

The in-depth consultation process ensured that the end users (i.e. local councils) had ownership of the solution, and that the platform would be well-utilised.

COUNCIL	ACTION	OUTCOME
Penrith City Council	Used data on solar uptake over time to understand how to engage and support residential and industrial sectors on improving energy efficiency and solar PV installations as a way to save costs and 'beat the heat' by reducing reliance on services that produce GHGs.	Total installed PV capacity increased 300% from 2015 (26,152 kW) to 2020 (104,072 kw).
Campbelltown City Council	During the process of redesigning their city centre, the council used data on travel patterns to understand how their residents travelled, and discover what actions could be taken to encourage a travel mode shift.	Developed the "Reimagining Campbelltown City Centre Master Plan", which commits to redesigning the city to be car-lite and pedestrian focused.
City of Sydney	Used an earlier version of the Platform to identify focus and engagement areas in the commercial real estate sector, resulting in the CitySwitch programme and the Better Buildings Partnership, which helps commercial office-based businesses to improve energy and waste efficiency.	20% of all Australian office space is signed up to the CitySwitch programme, almost three million tonnes of CO2e were avoided or abated in 2020.
Hawkesbury City Council	CitySolar Program increased solar PV installations, 10-year power purchase agreement for renewable energy; Develop EV ready infrastructure, LED Street Lighting Upgrade.	Residential solar PV installations increased to 21% from 2016 baseline of 14%.
Waverley Council	Data from the Platform was used to guide sector focus for environmental action including solar programmes; declared a Climate and Biodiversity Emergency in 2019.	"Solar my School" programme installed solar PV on 60 of 64 schools, producing 7,248 MWh/year. 35% of the council's large sites are powered by 100% renewable energy from the Moree Solar Farm.

Table 2 - Examples of use of data by various councils.

Takeaways and best practices

The development and implementation journey of the Resilient Sydney Platform highlight several learning points and best practices.

Continuously engage towns and communities in target setting and local sustainability plans.

The Resilient Sydney experience highlights the usefulness of engagement for clearly defining the relevant stakeholders, priorities for action, developing solutions, and implementing them. Both the Resilient Sydney Strategy and the Resilient Sydney

Platform were outcomes of extensive engagement processes where the community and stakeholders identified areas of direct concern (e.g. impacts of climate change, data accessibility) and worked together to develop targeted solutions. Over 300 solutions were proposed, including the Resilient Sydney Platform.

A large variety of community and stakeholder engagement tools were deployed, including resident surveys, semi-structured interviews, in-depth workshops exploring disaster scenarios, collaborative design of opportunities

for potential projects, and deliberative democracy for decision-making. In total, over 1,000 people were engaged via the consultation processes over three years. The in-depth consultation process ensured that the end users (i.e. local councils) had ownership of the solution, and that the platform would be well-utilised. Furthermore, the engagement process allowed the local councils to provide valuable input towards the development of the platform to specifically address their needs. Additionally, local councils regularly engaged with their communities to develop local targets and action plans to tackle sustainability, using data

stories developed from the data on the Resilient Sydney Platform to inform and communicate with the community to meet the various climate targets.

During the post-implementation phase of the Platform, the Resilient Sydney team continued to engage local councils via training sessions to build capacity for understanding, interpreting, and utilising data effectively. Through these sessions, the Resilient Sydney team also helped build capabilities for the next generation of environmental accountants.

The role of 'coordinators'

One of the challenges faced by the Resilient Sydney team was the issue of governance. Sydney's complex system of governance resulted in overlapping jurisdictions, and unclear ownership of projects. As a result, it was difficult to have integrated decision-making processes that aligned with the level of impact required. Additionally, the absence of an established structure for collaboration between levels of government, businesses, and the community effectively siloed information and networks. This greatly constrained the city's ability to tackle challenges, share knowledge and understand the impact of critical decisions. The Resilient Sydney team took a broad-based approach to governance and engaged multiple types and levels of stakeholders to bridge gaps and ensure proactive and aligned initiatives. Resilient Sydney also provided a structure for stakeholders to collaborate and share knowledge and skills.

Use relevant and actionable indicators

As environmental sustainability is multifaceted, there are many possible performance indicators that can be used to measure and track progress. It is important for a data platform to use data and indicators that are relevant and actionable from the end-user's perspective. From their engagement sessions with stakeholders, the Resilient Sydney Platform decided to first focus on emissions-based environmental footprint data on electricity, gas, waste and transport. The team also added datasets for water consumption and solar PV installations. Census data was added so that local councils would be able to project emissions according to the population, jobs, and geography. Additionally, there are plans to include other social and economic data, from other levels of government, to enable performance management in place over time. This data would be presented and prioritised based on how much it enables the local council to take action.

Other similar efforts would need to consider the data needs of the end-users based on well-defined use cases for the platform. Additionally, the Sydney case study shows that prioritising a list of performance indicators is important to ensure that the minimum viable product can still be useful for their local councils, while other sustainability-related indicators can be eventually added to the platform.

Conclusion

The Resilient Sydney Platform demonstrates the usefulness of a city or district-level standardised digital sustainability reporting platform as a tool for towns and districts to measure and track their sustainability progress. It has streamlined the processes for data collection, processing, analysis and reporting. Importantly, the data has enabled local councils to also use the Platform as a performance management tool, allowing decision makers to develop place-based local targets and action plans.

RESEARCH TEAM

Erwan Xiao
Erwan is a researcher at the CLC, where he focuses on topics related to sustainable districts and the environment. Erwan holds a master's degree in Environmental Informatics from the University of Leicester. Prior to joining the CLC, Erwan also worked on the research and development of smart city and Geographical Information Systems platforms.

Huijuan Wu
Huijuan used to lead the Sustainable Districts research cluster at the CLC. She is a scientist by training and her research focuses on cross cutting issues of sustainability including water, energy and urban sustainability solutions. Huijuan holds a doctorate and a master's degree from the University of Oxford, where she was a SPORE (NUS, Peking and Oxford Research Enterprise) scholar and Shell Centenary scholar.