Introducing PRECINX™

Landcom's new precinct sustainability tool to drive better design

Landcom is proud to introduce a new planning and design tool that analyses the potential sustainability performance of new development projects. Called PRECINX™, it is a mathematical diagnostic tool that models key environmental, economic and social indicators of large-scale projects – precincts.

Since the introduction of BASIX, the Building Sustainability Index, NSW has seen significant improvements in design for water and energy efficiency of individual homes and home sites. Other site specific rating tools such as NABERS and Green Star are also driving improved sustainability performance.

While these achievements should not be understated, many of the opportunities to make significant sustainability gains occur at the broader scale rather than house by house or building by building. This is particularly so when major infrastructure is involved. This is what drove Landcom to develop PRECINX™.

Landcom is now consulting with its stakeholders to determine the best way to share PRECINX™, to help the industry make a significant leap towards more sustainable development.

LANDCOM

Sustainability is fundamentally about using resources as efficiently as possible to ensure that our society can continue to provide the quality of life we currently enjoy. The challenge is to maintain or improve our quality of life while reducing our environmental impact.

A major part of our economic activity and resource consumption is due to construction. A large proportion of construction is related to the expansion of our cities and urban renewal. However, there is no established, accepted, or commonly used methodology in Australia for evaluating the sustainability of different urban development options. At the moment we are flying blind.

The purpose of PRECINX™ is to pose and answer the questions of carbon intensity and environmental performance, costs and affordability, and evaluate liveability indicators for a range of development scenarios in a given location. It does so by considering decisions that are made at a precinct-wide scale and testing various development scenarios against a business as usual baseline.

A key benefit of the tool is that it enables informed decisions to be made early in the planning stages of a new project, avoiding misdirected effort and unnecessary cost. Drawing on intelligent in-built assumptions, PRECINX™ will give a picture of a project's performance very quickly, with limited upfront inputs. As planning progresses, and more detail on the project is known, the initial assumptions can be overwritten to get a more accurate analysis of the project.

What does PRECINX™ do?

At a precinct scale, answers questions about:

- carbon intensity of new development
- environmental performance
- living costs and affordability
- liveability

Allows testing of development scenarios against business-as-usual baseline

Key benefits for industry

Informs early decision-making

Saves time and money

Quantifies performance and allows comparison of options

Potential platform for consistent industry methodology

Key features

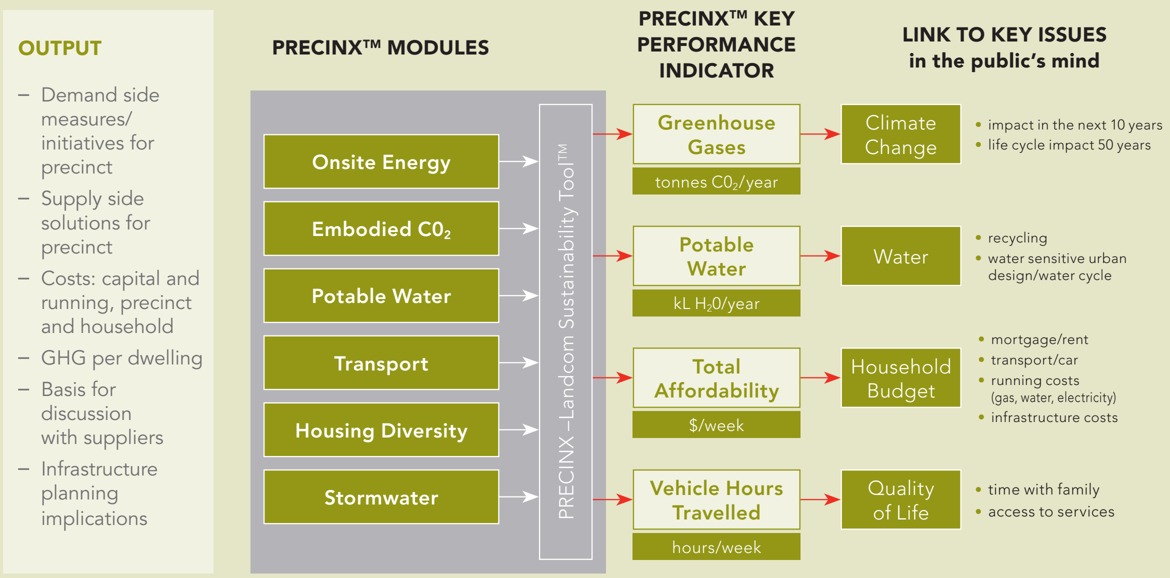
Focuses on measurable, verifiable outputs

Uses real data to predict potential performance

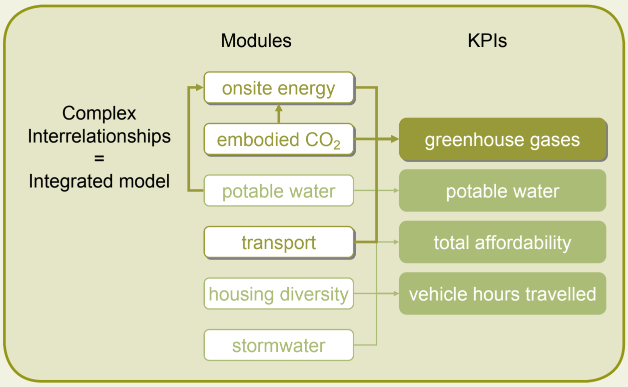
Produces metrics, not ratings

PRECINX™ structure

PRECINX™ comprises six inter-related 'input' modules as illustrated in the structure diagram.
The inputs collectively feed into four key performance indicators: greenhouse gases (tonnes CO_2/year), potable water (kL H_2O/year), total affordability ($/week) and vehicle hours travelled (hours/week).



The modules are linked, recognising that individual performance indicators are influenced by two or more of the input modules and that a positive outcome in one area may produce negative impacts in another. In other words, PRECINX™ is responsive to the dynamic nature of urban development.



Example of links and feedbacks

More about the modules

Onsite energy

The onsite (operational) energy module is designed to quantify and analyse the electricity and gas energy demands, and hence the greenhouse gas (GHG) emissions of a defined precinct. It presents development managers with opportunities for exploring energy efficiency, renewable energy generation and combined heat, cooling and power initiatives.

The tool does this by assembling a ledger of all the energy demands of the residential and non-residential loads that comprise the precinct. In addition to gas and electricity use, this ledger includes a full account of the precinct's thermal loads in the form of residential and non-residential water heating, space heating and space cooling demands. These thermal demands are critical for estimating the extent to which combined heat and power technologies (such as cogeneration) or simple solar-thermal power could be used to provide fuel-efficient alternatives for significant greenhouse reduction.

Various characteristics of the development influence the energy account, including: the number, type, floor area and likely occupancy of the dwellings; the thermal rating of the individual dwellings; the efficiency of appliances and fixtures within the dwellings; the existence of private photovoltaic (PV) installations; the car space provision in any multi-unit housing; and the hot water demands that are derived from the PRECINX™ water analysis.

Various development scenarios can be compared. For example:

- any advantage that a central cogeneration hot water supply for apartments might have over more efficient appliances and fittings
- the relative benefits between individual PV installation or gas-boosted solar hot water systems, or
- the energy and greenhouse savings from increased housing density with all hot water and space conditioning serviced by a community cogeneration plant.

By using an hourly account for energy supply and demand, the module is also able to provide information relating to plant sizing and the interaction of the precinct with the grid (e.g. peak power demand and the quantity and timing of any exported electrical power).

Embodied CO_2

The embodied greenhouse module is designed to quantify and analyse the greenhouse emissions that are embodied in the development of a defined precinct. It presents development managers with opportunities for exploring dwelling forms, construction types and choice of materials.

The module accounts for the one-off release of GHG in the minerals extraction, manufacture, transport and assembly of materials that constitute the residential dwellings and the infrastructure that comprise the precinct. It does this by drawing on an assemblies list for the principal components of the dwelling. Various assembly alternatives can be chosen to describe the completed dwellings. A similar approach is taken for infrastructure where, for example, various footpath construction methods and materials can be specified.

The greenhouse gas sequestered by wood from sustainably harvested forests is also able to be recognised and quantified.

Water (potable and stormwater)

The water modules are designed to quantify and analyse mains potable and alternative water demands of a precinct. It provides the user with opportunities for exploring end-use efficiencies, rain/storm water harvesting and water recycling.

Like the onsite energy module, the water modules adopt an hourly account of demands and supplies. Water demands include: internal and external residential consumption; non-residential (e.g. commercial/retail) internal water consumption; irrigation demands for parks, ovals and other vegetated surfaces; and cooling tower and other water consumptions for heat rejection (including private evaporative coolers).

The water consumption consequences of a range of possible scenarios can be assessed. The hourly modelling ensures that periods of high water demand (from irrigation or heat rejection, for example) are properly reconciled with alternative water availability. Scenarios that could be tested include, for example:

- the water savings from variously-sized private rainwater tanks
- the comparative savings of private rain tanks supplying household irrigation, toilet, laundry and hot water needs versus connection to a recycled water supply
- the optimum sizing of a community water recycling facility.

The tool also models flow-rates for waters discharged from the precinct, and is able to estimate storm water detention needs and assess the impact of some common treatment measures.

The water modules are integrated with the onsite energy module to ensure that any energy consumed for private or community water pumping and treatment is captured and recognised in the energy account.

Transport

The transport module calculates: the GHG emissions from travel by precinct residents (tonnes CO2 –e); and vehicle hours travelled, a social measure of the amount of time a resident will spend driving to work, leisure, and to access goods and services (hours/week).

The module can also quantify: predicted travel distances and times by all modes, the impact of on and off street parking controls, and the expected car-share take-up rate.

The transport module draws on key spatial, land use and socio-demographic variables to assess the transport emissions and vehicle hours travelled. These key variables include land use mix, housing density, local employment, distance to regional centre, walk and wait time to the nearest high frequency public transport, and household vehicle ownership.

Using the NSW Transport Data Centre's Vehicle Kilmometres Travelled (VKT) regression model and the best available transport data from the NSW Household Travel Survey, each variable is used to determine a travel profile for the average resident in the precinct. This travel profile and average travel speeds for the area determine the average vehicle hours travelled for residents of the precinct.

Spatial, land use and building form variables can be modified to determine the impact of various development forms and the impact of improving local public transport, changing parking rates and introducing car sharing.

Housing Diversity

Housing diversity, including housing that is affordable for a range of household types, is fundamental for sustainable communities. The PRECINX™ housing module measures the relationship between the mix and price of housing proposed in a particular development, and the purchasing capacity of households in that location.

PRECINX™ defines 22 NSW property sub-regions and draws on real time property data and the latest census data to analyse a proposed development relative to other new house price distributions and household earnings within that sub-region.

The tool also provides a detailed analysis of housing diversity and affordability by household type and tenure (private and public rental, mortgage and fully owned).

Project consultants and partners

Landcom engaged sustainability consultants Kinesis to develop the model, with sub-consultants Simpson + Wilson Architects and SGS Economics and Planning. The team includes the same people that developed BASIX for the NSW Department of Planning.

The PRECINX™ project has been guided by a group that includes representatives of the NSW Department of Environment, Climate Change and Water (DECCW), Sydney Water, Department of Planning, Energy Australia and Integral Energy. Sydney Water and Planning, in particular, provided significant data for the model, and DECCW made a substantial contribution to the project through its Climate Change Fund. The Ministry of Transport provided the transport data.

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November 2009