



Guide to Using STEPS

Guide to Using STEPS

1 Overview

Thank you for being a part of the Sustainable Tools for Environmental Performance Strategy (STEPS) project.

The Council Alliance for a Sustainable Built Environment (CASBE) is committed to creating an environmentally sustainable city. A critical component in achieving this commitment is ensuring that new residential development meets appropriate environmental standards.

STEPS has been developed by Moreland City Council as an easy to use, web-based tool that provides an assessment of the environmental impact of dwellings.

1.1 What is STEPS?

STEPS is a tool for assessing the environmental impact of dwellings. It has been developed to enable designers and councils to assess the impact of dwellings with the view to reducing environmental impacts.

Who is STEPS for?

STEPS is aimed primarily at the designers of new dwellings. It can also be used to assess the environmental performance of existing dwellings and is also equipped to be used by other Victorian councils.

It is intended to implement the STEPS sustainability assessment process by way of a Local Planning Policy in the Victorian Planning Scheme. This implementation will be subject to the normal statutory processes.

Guide to Using STEPS

What elements are covered by STEPS

STEPS awards scores for the five most critical elements in constructing environmentally sustainable dwellings:

- Greenhouse emissions from operating energy
- Peak energy use
- Mains (drinking) water use
- Stormwater quality impacts
- Building materials impacts.

It also provides a calculation for the number of bicycle spaces required and the areas needed to provide for waste recycling services.

Guide to Using STEPS

1.2 How does a designer use STEPS?

Using STEPS involves entering data about the proposed design into the STEPS assessment tool found at www.sustainablesteps.com.au – a score for the environmental performance of each ESD element is then calculated and summarised in the STEPS Report generated by the tool.

Designers can use STEPS to see first-hand whether their proposed designs will meet the environmental performance targets set in the tool. If the initial designs do not achieve the set targets, then necessary modifications can be made in the early planning and design stage to ensure that the plans submitted with the planning application do satisfy Councils' requirements.

Early integration of sustainable design initiatives is strongly encouraged by CASBE. It has been proven that early integration is far more cost effective in terms of costing a project accurately and in terms of streamlining the planning approvals process by eliminating the need for later, expensive re-design or requests for further information.

When submitting a planning application, a copy of the STEPS Report and a copy of each of the environmental modules completed in the tool is to be submitted with the planning application documentation. Design commitments made in each of the STEPS modules should also be reflected in the plans to be endorsed and in supporting documentation, where appropriate. Further details regarding submission documentation are detailed further in Section 3 of the Guide.

Guide to Using STEPS

1.3 Scoring the elements

How are elements scored?

The expected physical environmental impacts for the dwelling or development is calculated based on the data entered into the STEPS assessment tool. The physical impact is then converted to a points score by comparing the impact of the proposal against conventional development and a 'perfect' development.

Dwellings are scored from 1 to 100, where:

- 100 equals the 'perfect development' – that is, no adverse off-site impacts for that element, for example no greenhouse gas emissions from energy use, no mains water consumption. Except for Stormwater where 100 equals meeting best practice.
- 0 equals the estimated average performance of a conventional design. The environmental performance of dwellings is improving rapidly and so the '0' score is the starting point for environmental improvement based on typical development not above minimum building standards.

A highly inefficient building could receive a negative score, and a building that made a positive contribution to the environment (say by generating more solar energy than it used) could score more than 100.

What do positive and negative scores mean?

The point score measures the environmental improvement compared to a conventional dwelling. A positive point score means the outcome is better; a negative score represents a negative outcome.

For example:

- a water score of zero points, means the estimated water consumption calculated is the same as a conventional dwelling.
- an energy and greenhouse score of +10 points means the dwelling is predicted to cause greenhouse gas emissions 10% lower than the benchmark figure for Victorian residences with the same number of bedrooms.

Guide to Using STEPS

- a peak demand score of –50 means the peak electrical demand for the dwelling is estimated to be 50% higher than the benchmark figure for maximum electrical demand. A score of –100 would mean the impacts from the dwelling were 100% higher – that is the proposal would have twice the impacts of a conventional dwelling of the same number of bedrooms.

What about innovative approaches not covered by STEPS?

Because the technology and understanding of sustainable design is advancing all the time, it is impossible to include all of the available ESD initiatives in STEPS. If a designer has an innovative alternative that meets the environmental aims of Council, then Council will consider that alternative as part of the assessment of the development.

Do smaller or larger dwellings get better scores?

Dwellings that provide accommodation for more residents using fewer resources are to be preferred to dwellings that cater for fewer residents. The total impact of a dwelling is adjusted against the number of bedrooms. This is to be used to derive scores under each element.

Does STEPS apply to apartments?

STEPS applies to **all** dwellings.

For apartments, STEPS will use values for the whole building to determine the following areas:

- Stormwater quality indicator
- Materials sustainability indicator
- Recycling and waste bin area
- Bicycle storage.

STEPS will draw from average scores per apartment to give the average:

- Greenhouse emissions from energy use
- Energy peak demand
- Mains (drinking) water consumption.

Guide to Using STEPS

1.4 Setting targets

What score must a dwelling achieve?

For each element a target score has been specified based on improving current practice. The target scores are shown in the table.

The targets represent the percentage reduction over current practice that STEPS is seeking. The table explains the basis for the selection of the target.

Element	Target	Based on
Greenhouse Emissions from Energy	25	At the higher end of present Federal targets and low end of present State targets. (Victorian Climate Change Green Paper)
Energy Peak Demand	10	Modest target considered achievable with good design
Mains (Drinking) Water Consumption	25	Victorian 'aspirational' target for water reduction in government White Paper
Stormwater Quality Indicator	100	Melbourne Water, DSE and Association of Bayside Municipalities 'STORM' methodology.
Materials Sustainability Indicator	variable	RMIT research on readily achievable improvements.

For bicycle storage and waste recycling facilities STEPS specifies the number of spaces or bin area to be provided. Developments are assessed as to whether they make an adequate provision or not.

Guide to Using STEPS

Who developed STEPS?

The STEPS algorithms, assessment methodology and spreadsheet framework were developed for Moreland City Council by Jan Talako and Geoff Andrews of Ark Resources and Lester Townsend of IUM. Andrew Walker-Morison of the Centre for Design at RMIT provided the scores for the building materials impact. Media Equation has been responsible for the web-enabling and branding of the Moreland STEPS web site and supporting documentation.

Subsequent review and amendment of supporting algorithms and assessment methodology has been carried out by Moreland City Council's ESD Unit, in particular Nicki Taylor, Cate Collins, Ed Cotter and Shannon Best in association with Media Equation, GHD Pty Ltd and Organica Engineering.

Disclaimers

The Centre for Design at RMIT University makes no claim as to the accuracy or authenticity of the content of the materials element of STEPS, and does not accept liability to any person for the information or advice provided in it or incorporated into it by reference.

The Moreland City Council does not accept any liability for loss or damages incurred as a result of reliance placed upon STEPS. STEPS is provided on the basis that all persons using STEPS undertake responsibility for assessing the relevance and accuracy of its content.

Guide to Using STEPS

2 Understanding the elements

2.1 Greenhouse emissions from energy

What environmental aim is STEPS seeking?

STEPS is seeking:

- To reduce total operating greenhouse emissions (kilograms of CO₂) per 'resident'.
- To adopt economically viable energy efficiency design initiatives.

What does STEPS do?

STEPS predicts the emissions of CO₂ per resident. Because we cannot know exactly how many people will live in a dwelling STEPS makes an estimate based on the number of bedrooms – over the life of the dwelling this is assumed to even out at one person per bedroom.

How does STEPS relate to the 5 star standard?

In Victoria all new dwellings are required to obtain a five star rating under the NatHERS home energy rating system for the building envelope. The FirstRate, AccuRate and BERS Professional modelling programs are used to determine if a building meets the required standard. These programs rate the energy efficiency of the structure of the building in terms of the amount of heating or cooling energy needed to keep the building within predetermined temperatures per square metre of floor. This is the building envelope energy rating. This rating is converted by the programs into a star rating. A large energy efficient house that housed only two people might score the same as a small energy efficient house that housed four people because the amount of heating or cooling per square metre was the same. STEPS looks at the energy used per resident not per square metre because this is a more effective assessment of how efficient a dwelling is.

FirstRate, AccuRate and BERS Professional rate the building envelope only and do not assess the actual efficiency of the appliances used to heat or cool a dwelling (e.g. air-conditioners). The building itself might be energy efficient, only requiring a modest amount of heating or cooling, but if this is supplied by inefficient appliances (e.g. electric resistance heaters) then the good work done in making the building envelope energy efficient could be lost.

Guide to Using STEPS

What STEPS needs to know?

STEPS requires the following inputs from the FirstRate, AccuRate or BERS Professional certificate:

- Building Envelope Heating Score in MJ/m² (Area Corrected from the on-screen report)
- Building Envelope Cooling Score in MJ/m² (Area Corrected from the on-screen report)
- Building Envelope Conditioned Area in m²
- Building Envelope Energy Star Rating

For apartments and multi-unit developments the user must enter the average values across the building. Note that the building envelope energy rating must also be completed for renovations of over 50m².

STEPS also requires the designer to select options from drop down menus for:

- Heating System Type
- Cooling System Type
- Water Heater Type
- Lighting in Living Areas
- Clothes Drying Facility
- Renewable Electricity System Type and Size

How is the STEPS score calculated?

The heating and cooling figures from the building's building envelope energy simulation are entered on the energy page. These figures represent the amount of actual heating or cooling energy, which must be supplied because of heat transfer through the building envelope. Because the heating and cooling figures from FirstRate, AccuRate and BERS Professional are in MJ/m², the STEPS tool multiplies these by the conditioned floor area, to calculate the total heating and cooling energy consumed. The amount of gas and electricity required is calculated by dividing the heating and cooling energy requirements by the conversion efficiency of the heating and cooling equipment selected by the user. The user can also specify the amount of space normally heated or cooled by choosing from central heating, zoned heating or room heating.

The energy needs for hot water are based on the hot water requirements (data entered on the Water page) and the water heater efficiency, based on the water heater selected.

Guide to Using STEPS

Lighting energy is calculated based on the floor area, the type of lighting selected, and the assumed usage pattern.

The greenhouse gas emissions are calculated using the:

- electricity consumption and the greenhouse gas index for Victoria (kg CO₂ per kWh of electricity)
- gas consumption and the greenhouse gas index for Victoria (kg CO₂ per MJ of gas)

2.2 Peak energy use

What environmental aim is STEPS seeking?

STEPS is seeking:

- To reduce summer peak loading.

A key challenge in planning the energy supply infrastructure is to manage short-term or peak demands in electricity use caused by summer cooling loads. In Victoria in 1986 air conditioning was estimated to be only 0.2 per cent of domestic energy use yet contributed 9.4 per cent to peak electricity loads. Since then ownership of air conditioners has grown by around 30 per cent. Buildings with a high cooling demand in summer are likely to have cooling systems fitted whether or not they are part of the original design.

What does STEPS need to know?

All the data STEPS requires to calculate peak energy loading is determined from the data already entered in the 'Greenhouse emissions from operating energy' module.

How is the STEPS score calculated?

The peak energy score is calculated in the same way as the Greenhouse Emissions from the Energy score, but looking only at the electricity use for air-conditioning during summer electricity peak use. If a building has a poor summer energy score it is assumed that it will be air conditioned. There are numerous examples of air conditioners being fitted to recently constructed multi unit developments one or two summers after the buildings are completed.

Guide to Using STEPS

2.3 Mains (drinking) water use

What environmental aim is STEPS seeking?

STEPS is seeking:

- To reduce mains drinking water demand for indoor and landscape water use.

What does STEPS do?

STEPS estimates the total amount of mains water likely to be used. Water use can be reduced by more efficient tap and shower fittings and by use of rain water or recycled water (a 'third pipe' system) in place of mains water.

What STEPS needs to know?

Fixtures/Fittings

The amount of water used will depend on the efficiency of fittings, in particular:

- Shower Type
- Toilet
- Basin Taps
- Bath Volume

For apartments and multi-unit buildings these values will reflect the average apartment.

Rainwater collection and reuse

Collecting rainwater to substitute for mains water is a good idea. How much water saved depends on how much can be collected – and whether the tank will run dry in summer. STEPS calculates water saved from:

- Rainwater collection tank size
- Area of roof draining to rainwater tank

These calculations take into account local rainfall patterns. For multi-unit development the user will enter values for the whole of site. STEPS will then attribute the savings to the average apartment automatically.

Guide to Using STEPS

How much water is saved depends on how the water is used. Toilet flushing, clothes washing, hot water supply and garden irrigation have been assessed as potential uses for collected rainwater – toilet flushing, clothes washing and hot water supply have the advantage in that they use rainwater all through the year where gardens generally do not need watering in winter and spring.

How is the STEPS score calculated?

Total water use is calculated based on the water appliances selected, their water efficiency and a number of assumptions about patterns of water use.

Water supply from rainwater is calculated based on the roof area connected to the rainwater harvesting system, and rainfall data for the selected area. The rain collected is calculated for each month, and the amount drawn off calculated for toilets, clothes washing, hot water and gardens (depending on the water uses selected). The irrigation demand varies seasonally and the amount of water left in the tank governs how much water can be collected the following month.

A monthly calculation is less accurate than using daily rainfall data and water consumption calculations, but was chosen to reduce the computer resources required to run the STEPS tool, and provides a reasonable estimate.

Alternative water sources such as greywater, third pipe connection or on-site wastewater treatment and reuse are also included in STEPS. Toilet flushing and garden irrigation have been assessed as potential uses for alternative water sources. Where these systems are connected to toilets and/or gardens, it is assumed that all water use associated with toilets and/or gardens is supplied by the alternative water source.

The total water reused is the sum of the rainwater and alternative water source supply. The net mains water consumption is then calculated by subtracting the water reused from the total water consumption.

Guide to Using STEPS

2.4 Stormwater quality impacts

What environmental aim is STEPS seeking?

STEPS is seeking:

- To reduce peak and total storm water run-off
- To improve the quality of storm water run-off

Improving the quality of storm water runoff is part of a wider program of councils and Melbourne Water to improve stormwater. The Urban Stormwater Best Practice Environmental Management Guidelines, Water Sensitive Urban Design Engineering Procedures Manual, Model for Stormwater Improvement Conceptualisation (MUSIC) tool and Stormwater Treatment Objective – Relative Measure (STORM) tool further support this work.

Development creates impervious surfaces causing stormwater to run off more quickly – this causes problems with local flooding and drainage infrastructure capacity problems. It also reduces water quality in our creeks and the bay – during dry weather pollution builds up on driveways and roofs and this is washed into waterways with the first rain (this is called the ‘first flush effect’). By providing for stormwater retention and treatment we can slow down the rate that run-off enters the stormwater system, reducing local flooding problems and giving natural processes a chance to break down some of the pollutants.

What does STEPS do?

STEPS refers to Melbourne Water’s STORM tool for stormwater assessment. As noted in the Guide to STORM “*Melbourne Water has developed the STORM (Stormwater Treatment Objective – Relative Measure) Calculator to simplify the analysis of stormwater treatment methods. The Calculator is designed for the general public to be able to assess simple Water Sensitive Urban Design (WSUD) measures on their property and has been developed specifically for small developments.*”

STORM is a user friendly, web-based, free to use tool that provides a score for stormwater treatment that is then entered into STEPS. STORM can be found at www.wsud.melbournewater.com.au and www.storm.melbournewater.com.au.

What does STORM need to know?

STORM requires the location and size of the site as well as the type (e.g. residential - dwelling).

Designers need to specify for the hard surfaces areas over the whole site:

- The description of the impervious surface eg. roof, driveway etc.
- The total area of the impervious surface

Guide to Using STEPS

- The area of the impervious surface to be collected from for treatment eg. You may only have half of your 100m² roof plumbed for collection of rainwater; hence this figure would be 50m².
- The stormwater treatment method.

Note that all hard surfaces must be included. Even those that will have no treatment applied.

There is a range of storm water retention or treatment systems that could be incorporated into a development. STORM assesses the following methods:

- Rainwater Tank
- Raingardens
- Infiltration into sand or sandy loam soil
- Pond
- Wetland – a specially constructed wetland
- Buffer strips
- Bio Swales

Melbourne Water have a guide to STORM titled “Using the STORM Calculator to achieve best practice stormwater treatment” on their website with more information. ClearWater are a training organisation who run STORM training sessions as part of the “Introduction to WSUD”. Go to www.clearwater.asn.au for more information.

2.5 Building materials impacts

What environmental aim is STEPS seeking?

STEPS is seeking:

- To minimise environmental impacts of materials used
- To encourage use of ‘environmentally benign/friendly materials’

How are materials assessed?

Rather than looking at individual materials STEPS considers the different ways in which various parts of a dwelling can be constructed and gives a score based on the full range of impacts. For example a concrete slab incorporates steel and plastic, a timber frame typically incorporates different types of timber. The way in which these elements are constructed and how many materials are incorporated, influences the environmental impacts of the materials.

Guide to Using STEPS

When STEPS identifies a component – for example ‘brick wall cladding’ – this component includes the typical components used in Melbourne construction including brick ties, damp proof course, mortar and so forth.

The target materials scores are based on improvements in floors, claddings and windows. Bonus points are awarded for improvements in other areas.

The STEPS Greenlist

STEPS asks designers what type of materials they are proposing to use, because different materials have a range of impacts – sometimes depending on the manufacturer – it is therefore, necessary to specify a ‘greenlist’ of environmentally suitable materials.

STEPS uses the *STEPS Greenlist*, which has been adapted, with permission from VicUrban, from the progressive work done with the Centre for Design at RMIT in creating the Materials Eco Selector. VicUrban is the owner of the Intellectual Property of the Materials Eco Selector that was a DRAFT at the time the STEPS Greenlist was created and will change and evolve over time.

The Greenlist is available on the STEPS website.

What does STEPS need to know?

STEPS calculates the impact of building materials on the environment based on the details of the material used for different components of the dwelling and the area of these components. Designers need to select from a drop down list how the following components will be constructed:

- Floor – Ground Level
- Floor – Upper Levels
- Wall framing
- Interior Wall Framing
- Wall Cladding
- Windows
- Roof Framing
- Roof Cladding
- Outdoor Structures

Guide to Using STEPS

How are materials assessed?

A composite score for the sustainability of each material has been calculated based on the following factors:

- **Fate of material** – A critical indicator of sustainability is the end of life options for the material. How recyclable can a product be if the only option for it at the end of its life is landfill? This is termed the 'fate' of the material. STEPS rewards products and construction practices that are highly reusable or, at least, recyclable.
- **Embodied Energy** – The criteria scores the embodied energy of the material (and its necessary fixing materials).
- **Biodiversity** – Often the major impacts on biodiversity from construction occur off-site, arising from the extraction and production of building materials. The criteria scores materials from best – those that contain a high percentage of recycled content, or are sourced from existing agricultural systems – to worst – materials that are sourced from virgin natural environments where species are being made extinct (tropical rainforests for example).
- **Human Health** – A number of building materials are associated with high level, short-term emissions during and shortly after construction. The criteria considers whether the product has few emissions or is likely to emit carcinogens or persistent organic pollutants.
- **Environmental Toxicity** – The aim of this criteria is to reduce or eliminate the use of materials that at some stage in their life-cycles emit known problematic environmental toxins and persistent organic pollutants. Some products have substantially less environmental impacts than others, and the same product from different manufacturers can have widely different impacts.

Guide to Using STEPS

2.6 Waste Management

What environmental aim is STEPS seeking?

STEPS is seeking:

- To ensure adequate storage space is provided to enable an effective recycling service to be provided.

Recycling and waste bin provision

A total volume of general waste and recycling is estimated and STEPS calculates the number of bins required to handle this material based on the proposed volume of the bins to be supplied. It then calculates the area required to house the bins based on the area each bin takes up.

2.7 Transport

What environmental aim is STEPS seeking?

STEPS is seeking:

- To ensure bicycle parking facilities are provided at a level that recognises the potential for bicycle use.

Bicycles have the potential to play a significant role in meeting the sustainable transport objectives of councils. The STEPS assessment tool calculates the recommended bicycle provisions necessary for each development.

Guide to Using STEPS

3 Documentation

For planning submissions to councils, upon completion of a STEPS rating, print out each page of the assessment and ensure that all other supporting documentation represents the commitments made in STEPS. A fully annotated statement to submit with your planning application, called a Sustainable Design Statement can also be generated within STEPS. Ensure that a STORM assessment is also submitted with the STEPS reports.

Things that need to be marked on the plans include:

- Specifications to get to 5 stars eg aluminium improved window framing
- Air-conditioning system / heating system as specified
- Fixed clothes drying racks
- Hot water systems including solar panels on roof
- Specified lighting type
- Specified shower/toilet/basin types
- Rainwater tank, sized and showing plumbing from the roof and to the toilets/garden.
- The location, size and type of treatment systems
- The proposed drainage to the treatment system
- Section details, planting schedules and maintenance requirements and responsibilities of treatment other than rainwater tanks are to be provided.
- Car park design details on plans e.g. gradients of car parks to direct flow to treatment systems.
- Material types, which should also correspond with those selected in your FirstRate assessment.
- Waste and bicycle parking space allocation.

Guide to Using STEPS

4 Become a STEPS designer

STEPS will provide a useful tool for designers wanting to create environmentally sustainable dwellings.

Feedback on the use of STEPS is sought so that the tool can be refined – eventually it is envisaged that a local policy in the Victorian Planning Scheme will set out the environmental scores to be achieved under each element.

For information regarding STEPS or if you would like to provide feedback please contact:

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Or refer to the 'Contact Us' page on the STEPS website at www.sustainablesteps.com.au