



CLIMATE NEUTRAL WATER SAVING SCHEMES

DISCUSSION PAPER

CLIMATE NEUTRAL WATER SAVING SCHEMES



INTRODUCTION

The City of Melbourne has developed a new discussion paper entitled **Climate Neutral Water Saving Schemes**, which promotes the use of water saving schemes that do not result in increased greenhouse gas emissions.

This is a summary of the discussion paper. For additional detail please read the full discussion paper prepared jointly by the City of Melbourne and Ecological Engineering.

The discussion paper is designed to help project managers, planners, engineers, architects, landscape architects and other industry professionals plan the installation of climate neutral water saving schemes. We welcome all feedback on the discussion paper and have provided some questions as prompts for your response.

Please provide your response to:

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THE CITY OF MELBOURNE'S COMMITMENT TO CLIMATE NEUTRAL WATER SAVING SCHEMES

The City of Melbourne is committed to reducing water consumption by 40 per cent by 2020 and intends to achieve zero net greenhouse gas emissions by the same year.

WATER AND GREENHOUSE TOGETHER

Water conservation is a high priority in Australian cities such as Melbourne. We need to use our existing supplies wisely to avoid drawing further supplies from our waterways, or causing ecological damage with the construction of dams and other infrastructure.

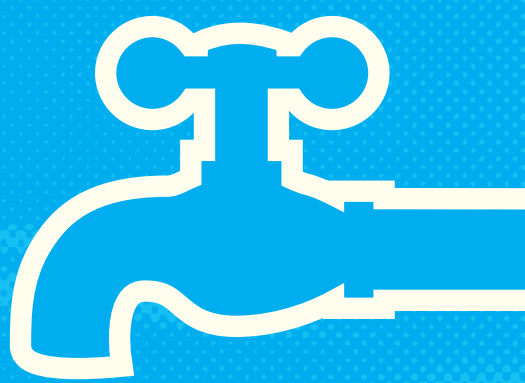
Reusing or harvesting water is a great way to reduce our reliance on potable water, but it can have environmental consequences in the form of extra greenhouse gas emissions. These emissions may be created from energy use associated with pumping, treating and other activities.

Because of this, the City of Melbourne recommends all water reuse or harvesting projects to be climate neutral. This means the Council requires water saving schemes not to contribute greenhouse gases through the use of traditional energy or the production of methane.

QUESTIONS

Should there be an order of priority for managing water and greenhouse? Or do we manage them hand-in-hand? Should a large water recycling project be abandoned on the grounds that it has too great a greenhouse impact? Or should there be an exception for projects that will significantly reduce water use?

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DELIVERING CLIMATE NEUTRAL WATER SAVING SCHEMES

The following points outline a simple process for considering greenhouse gas emissions arising from potential water saving projects:

FIRSTLY, when planning consider all opportunities for water conservation. Saving water will reduce greenhouse gas emissions.

SECONDLY, consider opportunities for alternative sources of water, namely rainwater harvesting, stormwater and wastewater recycling. If an alternative source is to be used, then;

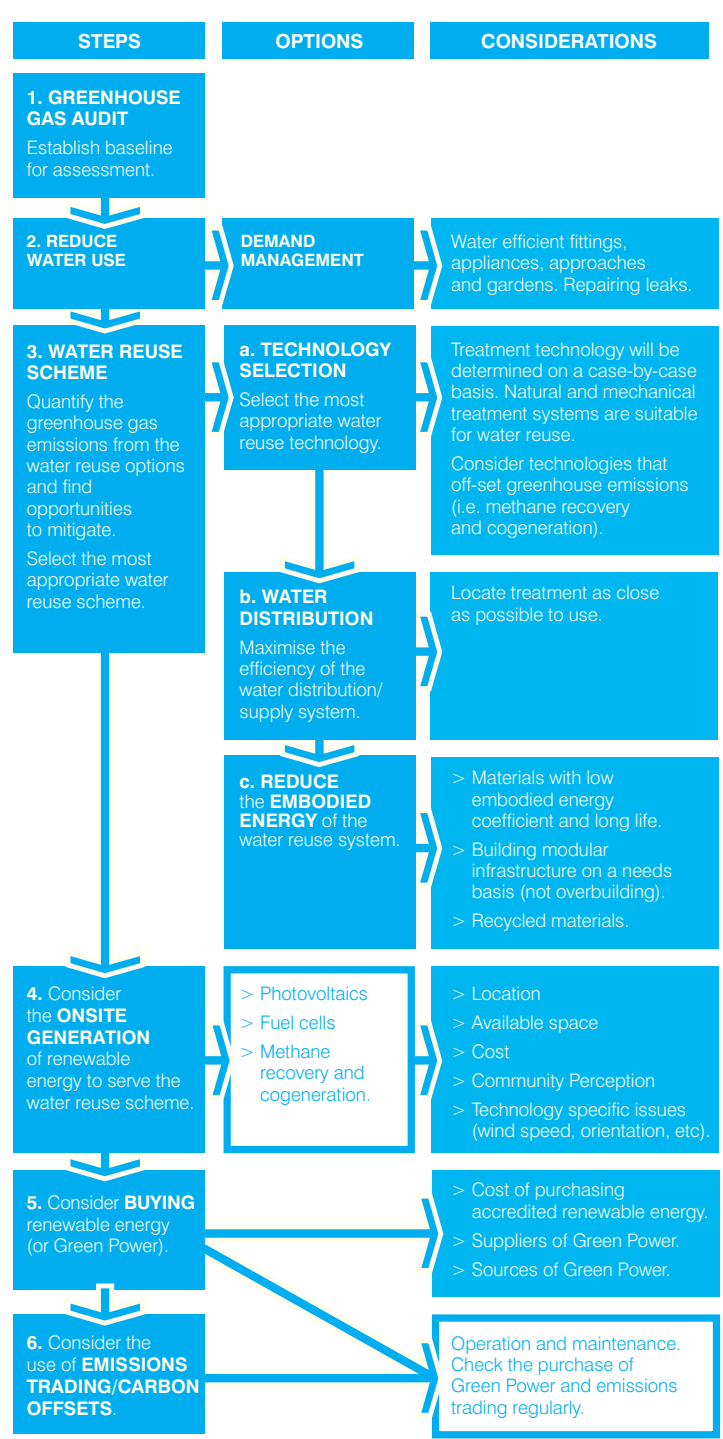
THIRDLY, undertake assessment of greenhouse gases emitted from the proposed alternative source.

The City of Melbourne has developed the following process to help deliver climate neutral water saving schemes (rainwater, stormwater, greywater and blackwater). Each step is further discussed in Figure 1 (right).

QUESTIONS

As a project manager, does this decision making process fit with your approach?
 How can the City of Melbourne make the decision making process around the selection of water saving techniques any easier?

Figure 1: Process for implementing climate neutral water recycling



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STEP 1: AUDIT GREENHOUSE GAS EMISSIONS OF CURRENT PRACTICES

Determining the amount of greenhouse gas emissions arising from current practices creates a baseline figure to compare our efforts against.

Before the greenhouse gas audit, a water balance will have been prepared for the project that identifies and quantifies the total water use and wastewater generation of the site. The baseline water consumption enables the embodied energy to be calculated.

ACTION: Undertake a water balance for the site. Calculate baseline greenhouse gas emissions.

QUESTION

As a project designer, are water balances a standard project management practice?

A formula is provided in the discussion paper to help you calculate the baseline assessment, incorporating:

💧 **The embodied energy of the water consumed and wastewater generated.** Embodied energy is the energy consumed by all the processes associated with the creation of a product, from the acquisition of natural resources to product delivery. The embodied energy accounts for the energy required in water transportation, treatment and disposal.

💧 **Greenhouse gas emissions from the biological degradation of wastewater.** Greenhouse gas emissions are produced by the biological treatment of wastewater. The organic loading is predominantly derived from faecal matter. Other organic matter is derived from kitchen wastes and laundry wastes.

ACTION: Calculate baseline greenhouse gas emissions.

STEP 2 – REDUCE WATER USE AND ORGANIC LOADING (DEMAND MANAGEMENT)

Greenhouse gas emissions associated with water treatment can be minimised by:

- 💧 reducing water consumption and wastewater generation;
- 💧 using alternative water supplies;
- 💧 reducing organic material in wastewater (this can be achieved by educating commerce and industry about waste minimisation and cleaner production); and
- 💧 diverting organic waste from uncontrolled anaerobic conditions.

Biological decomposition of organic matter such as human waste, but also kitchen waste including food scraps, oils and vegetable peelings, contributes to the overall wastewater load requiring treatment. Avoiding the disposal of kitchen waste down the sink is therefore important.

ACTION: Reduce water demand and organic loading of wastewater.

Question

As a developer, project manager, architect, or owner, do you consider there are ample opportunities to influence the reduction of water demand for future users of your site?

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STEP 3 – SELECT AN ALTERNATIVE WATER SCHEME AND ASSESS ITS GREENHOUSE GAS EMISSIONS

STEP 3A – Reduce greenhouse emissions associated with the treatment process

The greenhouse gases in water treatment emissions are generated by:

- energy consumption;**
For all mechanical systems the greenhouse gas emissions can be calculated from the energy consumption. The energy consumption is the sum of all energy requirements of the system including pumping, disinfection and treatment components.
- biological degradation of organic matter to produce greenhouse gas emissions; and**
The type of treatment technology will determine the occurrence of biological degradation. Biological degradation under anaerobic conditions (no oxygen present) generates methane and other greenhouse gases such as nitrous oxide. Where biological degradation occurs under aerobic conditions (oxygen present) energy is often required to mix and aerate.
- additional water supplied and wastewater generated.**
The proposed water saving scheme may only supply a proportion of demand. Any additional water supplied by the mains system also needs to have its greenhouse gases calculated.

You can quantify the greenhouse gas emissions of each water treatment option, and incorporate this information into the water treatment selection process. See the full discussion paper for the formula derived from the AGO (2005) Factors and Method Workbook.

ACTION: Choose your preferred scheme using knowledge of the greenhouse gas emissions of each water saving scheme, alongside the full range of considerations including space availability and consumer reaction.

STEP 3B – Maximise the efficiency of the distribution/supply system

Minimising energy requirements through the distribution and supply system can be achieved by:

- locating the treatment as close as possible to the end user, and relying on gravity if appropriate, minimises resource consumption (piping) and energy requirements (less need for pumping);
- using header tanks for water supply. These can be fed by low-flow trickle pumps; and
- selecting energy efficient pumps and motors.

The greenhouse gas audit must also include the greenhouse energy requirements derived from the additional reticulation networks.

ACTION: Minimise the greenhouse impacts arising from the supply and distribution system.

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STEP 3C – Reduce the embodied energy of the water reuse system

Materials selection – embodied energy

In general, the embodied energy of a water saving scheme can be reduced by:

- the selection of appropriate materials with a low embodied energy coefficient and longer life expectancy;
- building modular infrastructure on a needs basis (not overbuilding); and
- considering the use of recycled material. The embodied energy in recycled materials is generally less than new materials.

ACTION: Select materials with low embodied energy.

QUESTIONS

Do you agree that embodied energy is an important environmental consideration?
Is additional information needed to help work out embodied energy?

STEP 3D – Calculate the overall greenhouse emissions

The greenhouse gas emissions are the sum of Steps 3a, 3b and 3c.

ACTION: Calculate total greenhouse emissions (in Steps 3a, 3b and 3c) for the proposed water reuse scheme.

STEP 4 – CONSIDER ON-SITE GENERATION OF RENEWABLE ENERGY TO SERVICE THE WATER SAVING SCHEME

After minimising energy use, some greenhouse gases may still be produced. These emissions can be negated or offset by onsite generation of renewable energy including:

PHOTOVOLTAICS: Photovoltaic cells convert light energy from the sun directly into direct current electricity (d.c.). An inverter then converts this into alternating current (a.c.) electricity for use.

WIND: A wind turbine generator consists of a foundation, tower, nacelle and a rotor (blades on a central hub). The rotor turns a generator, converting some of the wind's energy to electricity.

FUEL CELLS: Fuel cells convert energy from chemical reactions directly into electrical energy. They are cleaner and more efficient than any carbon fuelled engine.

METHANE RECOVERY AND COGENERATION:

Greenhouse gases (predominately methane) can be generated from the water treatment process when biological systems are used. In these situations biogas (predominately methane) can be collected and used to operate co-generation plants that provide energy.

ACTION: Investigate the onsite generation of renewable energy and quantify the greenhouse gas emissions that this can negate or offset.

QUESTION

As a project manager, have you had experience with installing renewable energy technology?
Are there any further considerations?

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STEP 5 – CONSIDER BUYING GREEN POWER™

(accredited renewable energy)

If greenhouse gas emissions from the water saving process still exist after steps 3 and 4 have been addressed, the purchase of Green Power™ from an accredited electricity supplier must be considered.

It should be noted that a project cannot be deemed climate neutral unless 100% renewable energy is servicing the project.

ACTION: Buy Green Power™ to offset greenhouse gas emissions.

QUESTION

As a developer, do you support buying Green Energy to offset additional greenhouse gas emissions for alternative water schemes? Will this help to market the green credentials of your development?

STEP 6 – CONSIDER OFFSETTING EMISSIONS BY PURCHASING CARBON CREDITS

Offsetting the greenhouse impact of a project means buying 'credits' from greenhouse abatement projects undertaken by other organisations. These abatement projects encompass energy efficiency, renewable energy generation, or sequestering of carbon from the atmosphere through the establishment of carbon sinks (forests).

ACTION: Buy carbon credits to offset greenhouse gas emissions.

QUESTION

Would it be valuable to you if local government pursued carbon offset programs to provide an opportunity for buying carbon credits?

CASE STUDY OF A CLIMATE NEUTRAL WATER SAVING SCHEME

CH₂ BUILDING – WATER MINING

The City of Melbourne's latest building, Council House 2 (CH₂), incorporates environmental design that achieves the Australian Green Building Council's six-star rating.

WATER CONSERVATION

Water conservation consists of efficient fittings and appliances, pressure reduction valves and the absence of a cooling tower for air conditioning.

The total water demand is 10.6 megalitres per year which equates to 11.8 tonnes of CO₂ equivalent in greenhouse gases.

ALTERNATIVE WATER SCHEMES

A blackwater reuse system is installed in the basement of the CH₂ building. Stormwater is harvested from the roof and collected for reuse within the building.

The reused water is used for toilet flushing, irrigation, cooling towers, and external irrigation such as tankers and street sweepers. This system uses energy for pumping from sump and sewer, ultra-filtration, reverse osmosis and the hot water system for cleaning and disinfection.

As the system is a physical separation system, no degradation of organic waste occurs onsite. The organic material is directed to the sewer systems and treated at centralised facilities. Biological decomposition occurs at centralised facilities – in this case at the Western Treatment Plant at Werribee.

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The distribution system consists of a header tank situated on the roof, dual supply reticulation and a pumping system. Reused water is pumped from the basement to a header tank. The water is pressurised by a second pump before delivery to the building. The embodied energy requirements are due to additional materials for the header and holding tanks, dual supply reticulation and associated equipment.

In conclusion, a net increase of greenhouse gas emissions from the water mining treatment system is shown. The majority of the emissions are derived from the treatment and distribution energy requirements.

RENEWABLE ENERGY

CH₂ will use approximately 549,257 kWh of electricity per year for all its operational needs. If this were sourced only by conventional energy it would generate 764 tonnes of greenhouse gases.

However the CH₂ building has onsite renewable energy systems including electricity from co-generation and solar photovoltaic cells that generate 32 per cent of CH₂'s electricity needs. In addition the following technologies provide efficiencies at CH₂ – heat from co-generation, heat recovery, solar hot water heat recovery, and wind turbines.

The remaining 68 per cent of energy needed for the building is powered by Green Power™.

Because the management of CH₂ has agreed to supply Green Power™ for all the building's mains electricity requirements, there is no remaining energy that needs to be offset by exploring carbon trading programs.

CH₂ CASE STUDY: CLIMATE NEUTRAL WATER SAVING SCHEMES

Please see the full discussion paper for a step-by-step outline of the CH₂ climate neutral water scheme's approach.

This is a summary document – please refer to full discussion paper for further details on how to set up climate neutral water saving schemes.