

# GROWING GREEN GUIDE

## GREEN ROOFS, WALLS & FACADES POLICY OPTIONS BACKGROUND PAPER

December 2013

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## BACKGROUND

Cities are increasingly trying to get back to nature and integrate the urban environment with the broader landscape. Around the world, and in Melbourne itself, more and more walls and roofs of buildings are being covered with living plants. From the creepers that quietly cover greater amounts of a wall as they expand from a garden, to the fanfare that accompanies the development of major 'artworks' of living walls in public spaces, to the home-made green roofs on backyard sheds, and the increasing number of inner city bars with rooftop gardens .... we are seeing a transformation in the city and a new appreciation of living plants as part of the built environment.

In 2011 there were an estimated 87 green roofs<sup>1</sup> in Victoria (Yourn unpub). There are untold numbers of green facades and an estimated 50 green wall installations in central Melbourne (van Zuilekom pers. comm.). Much greater numbers of green roofs, walls and facades are possible in Melbourne, and in other parts of Victoria. Urban environments with these features would be cooler and more pleasing to live among and they would provide new habitat for insects and birds. In addition, with good planning, vegetation grown on buildings could provide urban environments with greater resilience in heavy rainfall events. Building owners could also have significantly reduced power costs from heating and cooling, - as rooftop plants and the 'soil' they grow in act as a layer of insulation.



Green roof at the University of Melbourne's Burnley campus

Recent studies undertaken by the Victorian Centre for Climate Change Adaptation Research (VCCCAR) indicate that green roofs and walls are likely to be an effective measure to reduce the urban heat island effect within Melbourne. Thermal images and ground based thermography showed that green facades could reduce surface temperatures of building walls. The studies have suggested that green walls should be prioritised on streets where space for trees is limited; and that green roofs could reduce rooftop surface temperatures in Melbourne if they were well designed and irrigated (Coutts and Harris 2012).

A future with Melbourne's buildings (and those in other parts of Victoria) covered in vegetation relies on the development of high quality roofs, walls and facades, and commitment to their ongoing maintenance. Governments, particularly at the local level, have the ability to support builders, developers and homeowners to create and maintain green roofs, walls and facades in order to improve the liveability and resilience of our urban environments into the future.

Policies related to green roofs, walls and facades are being developed by governments in countries around the world to manage an increasingly variable climate, and to add to the "liveability" of a place via aesthetics and provision of open space. Policy that supports the incorporation of vegetation into urban structure and function (so called green infrastructure) is particularly important in Australia, where most of the population lives in cities, the density of many cities is growing and this is placing pressure on the natural systems that support city inhabitants (Reeve et al. 2011). Policy need not be restricted to green roofs, walls and facades. It could be about broader concepts of environmentally

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<sup>1</sup> Green roofs were defined as a significant cover or ratio of contained vegetation on a built structure.

sustainable development, and/or incorporate other concepts such as solar panels and white roofs (painted with materials and colours that keep buildings cooler by reflecting the sun). This document focuses specifically on green roofs, walls and facades but the authors acknowledge that the many agencies will find it more appropriate to develop higher level policies.

This document outlines policy options that could be used in Victoria to promote, enable and encourage rooftop and vertical greening. It was written with the support of a range of experts across Inner Melbourne Action Plan (IMAP) councils and the state government. The document was developed as part of the Growing Green Guide for Melbourne project, to improve knowledge on green roofs, walls and facades and create solutions for the current barriers to implementation.

## DEFINITIONS

**Green roofs** – a green roof is a vegetated landscape built up from series of layers that are installed in the roof surface as ‘loose laid’ sheets or modular blocks. Vegetation on green roofs is planted in a growing substrate that may range from 50mm to over a metre in depth, depending on the weight capacity of the building’s roof and the aims of the design.

**Green facades**– green facades are created by growing plants up and across the face of a building. Plants are either rooted in the ground or grown from containers installed at different levels on the face of the building. Climbing plants can attach directly to the surface of a building or be supported on a structure independent of the building.

**Green walls** – green walls are plants grown in vertical systems that can be freestanding but are generally attached to internal or external walls. Green walls differ from green facades in that the entire vertical structure is planted, as opposed to planting at the bottom of a structure and encouraging vertical growth. In green walls the plants, growing substrate, irrigation and drainage are incorporated into the one system.



Green roof

Green façade

Green wall

## EXECUTIVE SUMMARY

Like many other cities in the world, Melbourne is facing pressure from increasing urbanisation of the landscape, which has contributed to Urban Heat Island Effect, the loss of vegetation and habitat, more flash flooding, and negative effects on human health and well-being. Many of these issues are exacerbated with the increasingly variable climate. These combined pressures present enormous environmental challenges and require urgent efforts and combined measures from governments and communities.

One response to the challenges is the development of green infrastructure in cities: The incorporation of vegetation into urban structure and function. In Victoria policy to support green roofs, walls and facades is becoming important as the popularity for this green infrastructure is growing and there are few current policies providing direction.



If local councils or other levels of government create policy to support green roofs, walls and facades, there can be a flow on effect to the community at large. Public benefits of green roofs, walls and facades include:

- Cleaning the air
- Cooling a city – reducing urban heat island effect
- Creation of habitat and biodiversity
- Storm water management, to reduce flood risk and improve water quality
- Aesthetics, green space, urban agriculture opportunities

Other benefits can accrue from reduced energy used and costs for heating and cooling of individual buildings, along with noise reduction and potential higher sales or lease values.

This paper investigates how the development of green roofs, walls and facades can be best supported by government policy, in order to provide a range of benefits to Melbourne and other Victorian urban centres. It is written for Victorian local councils, interested groups in the building industry, the Victorian Government's Department of Transport, Planning and Local Infrastructure, and anyone else interested in how to support a significant increase in the number of green roofs, walls and facades being installed and maintained in Melbourne and Victoria.

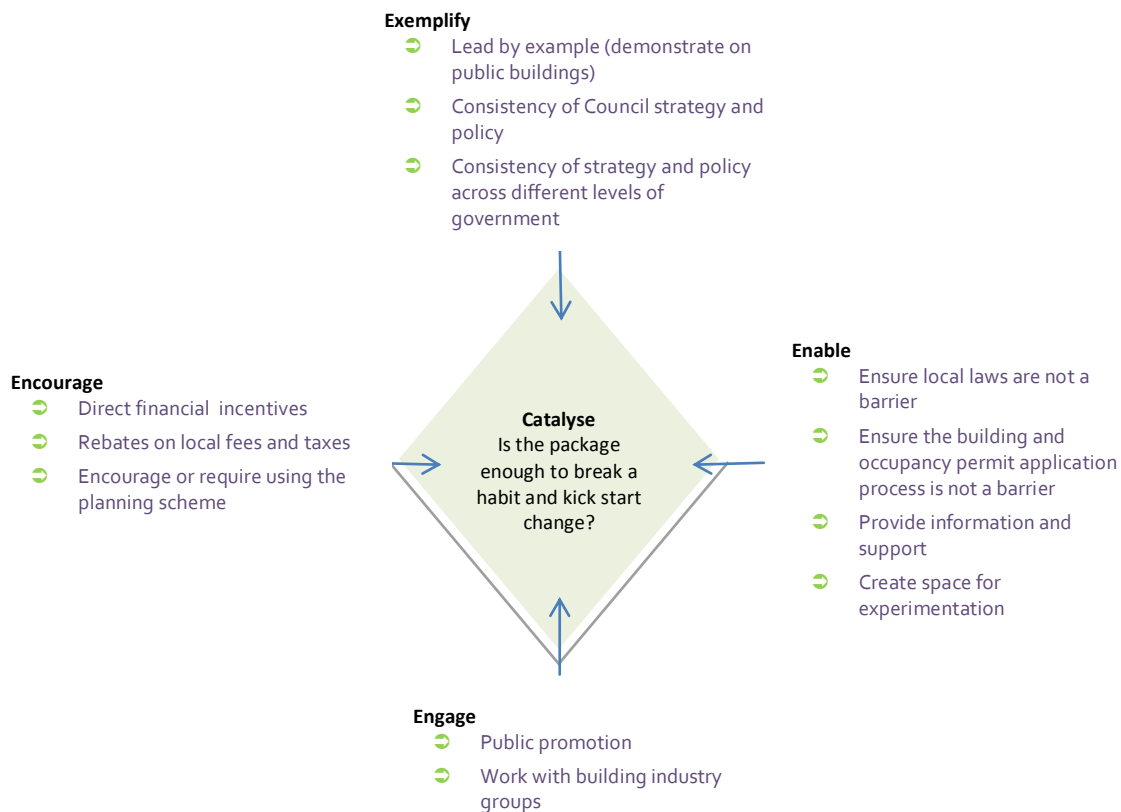
This paper was written as part of the Growing Green Guide for Melbourne project, with support from a Policy Reference Group, which included representatives from the Cities of Melbourne, Port Phillip, Yarra and Stonnington, as well as a planning representative from the Department of Transport, Planning and Local Infrastructure.

## POLICY AROUND THE WORLD

There are examples of green roofs policy, more so than green walls or facades, in a number of cities around the world. These can range from programs that allow developers to build higher density dwellings if a green roof is included, to subsidies for building green roofs, to by-laws that require green roofs on new buildings of a certain size, to tax incentives and reduction in fees for business owners with green roofs. Victoria can learn from other cities about their successes and challenges in implementing policies that support and encourage green roofs.

## POLICY OPTIONS

The policy options described in this background paper are grouped under four categories—exemplify, enable, encourage and engage. This way of considering policy options has been used by policy makers around the world and was first developed in the United Kingdom by the Centre of Expertise on Influencing Behaviours. Twelve options have been mapped out for this discussion paper, as shown in the following diagram. Some of these have further sub-options.



Organisations interested in supporting green roof, wall or façade development should consider a mix of measures from each of the categories as they influence people in a different way. For instance, it is likely that options from the engage and enable categories will only lead to change with people most willing and able to act. Other groups might act if exemplification measures are also proposed. For some people there is a role for financial incentives or standards (encouragement) before behaviour is influenced.

## EXEMPLIFY

The 'exemplify' part of the policy model is about demonstrating shared responsibility and leading by example. Leading by example could include governments committing to develop green roofs, walls and facades on public buildings. Governments could also consider supporting demonstration roofs on private buildings, with the intention that these would be for public access (for instance; shopping centres or university campuses, which already facilitate public access).

It is important for government agencies to show consistency in their policies and strategies to ensure a clear message. Ideally this consistency should be across different levels of government. At a minimum, councils need to ensure that all their own relevant policies are consistent and are either supporting, or at least not discouraging, green roofs, walls and facades. Options to exemplify consistency of Council strategy and policy are to:

- Ensure consistency amongst Council's strategies, action plans and local planning policies
- Develop joint policy across neighbouring councils. For instance, it may be appropriate for the four IMAP Councils to develop an agreed policy or strategy for encouraging green roofs, walls and facades across the region
- Identify opportunities to rewrite policies and guidelines as they come to scheduled review points

## ENABLE

Enabling councils will investigate if they can remove barriers and make it easy for communities to act. For instance:

- Ensure council processes are not a barrier to construction of green roofs, walls and facades, including the building permit and occupancy permit application process; and the processes and permits required to comply with local laws
- Provide free information. *Note: A free guide for people involved in planning, building or maintaining green roofs, walls or facades, is being developed as part of the Growing Green Guide for Melbourne project.*
- Create space for experimentation around green roofs, walls and facades - Councils could consider how to support innovators in the community to trial, and evaluate their ideas, before bringing in municipality-wide changes, e.g. temporary installations
- Develop a support service to help residents and businesses interested in green roof, wall and façade development. This could include a training component, a person in Council to call for advice (that person could also champion the cause within Council), or a way to link people who want to garden on a roof with building owners with suitable roofs.

## ENCOURAGE

The encourage part of the policy model focuses on providing incentives or regulations to influence people.

Financial incentives can be direct, such as a subsidy or grant, or indirect, such as the rebate of some or all of a fee. The latter is considered the best option to consider at present for IMAP councils. Fees that Councils could consider for indirect financial incentives include rates, which building owners pay annually, contributions which developers pay at the point of building, or other permit fees that people have to pay to Council.



Outside of Councils, water authorities represent another agency with an opportunity to provide a rebate, for instance on the annual drainage fees charged to property owners.

Planning schemes are an opportunity for Victorian government (state and local) to provide incentives, or to mandate for green roofs, walls and facades. These types of green infrastructure are not specifically addressed in the planning schemes of the Cities of Yarra, Port Phillip, Stonnington or Melbourne.

Reference to these types of green infrastructure in a planning scheme may encourage developers to build them. It would also provide guidance for planners assessing planning applications with such elements. Several options are available to provide more guidance and support, including:

- amending the state planning policy framework
- amending Municipal Strategic Statements
- amending local planning policy frameworks
- amending specific design and development overlays
- providing incentive using the Clause 62 exemption

## **ENGAGE**

Policy options that engage are focussed on getting more people involved in, and aware of, green roofs, walls and facades.

One option for councils is public promotion and encouragement of public discussion. Councils can raise awareness of green roofs, walls and facades through the media, special events, competitions and demonstration projects. Competitions and associated media coverage can ensure that green roofs are seen and appreciated. Special events that Council is involved in, from launch of new places and services, to conference attendance, are opportunities to promote green roofs, walls and facades. Special events can be created in addition to what a Council is usually involved in, for instance; development of an open garden event for local green roofs and walls.

Another policy option is to work with groups from the building industry. It may be worthwhile having multiple councils develop a joint position on how green roofs and walls could be incorporated into relevant building rating and assessment products, and beginning a conversation with the appropriate organisations on how to progress this. Some suggested guidelines, codes and standards, which do not yet have specific consideration of green roofs, walls or façades, are:

- Building Code of Australia
- Green Star
- STORM
- NABERS

Councils and state government could work with industry groups to explore ways to raise the profile of green roofs, walls and facades in these guides and codes.



## MOVING FORWARD

This paper canvasses the wide range of policy options available. Further work is needed to explore the policy options in detail. Agencies wishing to support green roofs, walls and facades should consider the following steps to take after reading this paper.

1. Articulate what outcome(s) is sought by the agency implementing the policy. This could be about reducing flooding, improving biodiversity or provision of more green space. Clarity about the desired outcome will help identify whether a specific green roof/wall/façade policy will be best suited, or a broader ‘umbrella’ policy, such as a biodiversity policy.
2. Determine appropriate definitions for green roofs, walls and/or facades that your policy or associated programs will cater for. For instance, a program that sought to decrease flooding problems by development of green roofs, could specify a minimum depth of substrate that a green roof needs to be eligible (as a very shallow substrate would be unlikely to ameliorate flooding issues).
3. Create supporting information and guidelines for internal use – whether this is to inform planners, or building regulators or others who will be interacting with the public about the policy implications. Support is needed to build the capability of staff in the agency implementing the policy.
4. Identify possible and/or necessary partners – for instance, neighbouring jurisdictions, other authorities, industry bodies or research organisations.
5. Consider long term maintenance as part of the policy options – if your organisation is promoting the development of more green roofs, walls and facades, will it also support their long term maintenance, and if so, how? Through punitive or supportive measures?
6. Determine your package of policy options, considering all four categories– exemplify, enable, encourage and engage.



*Green façade on the City of Melbourne's Council House 2*

# DEVELOPING POLICY TO ENCOURAGE MORE GREEN ROOFS, WALLS AND FACADES

The Inner Melbourne Action Plan (IMAP) councils recognise the potential benefits that green roofs, walls and facades can bring to their municipalities and have developed this paper to outline the various policy options open to them.

The chapter explains:

- The benefits of green roofs, walls and facades
- Why government policy is needed
- A model of the policy instruments available to governments
- The journey of green roof, wall and facade policy development to date at the City of Melbourne

## Benefits of green roofs, walls and facades

Green roofs, walls and facades can provide a range of benefits to cities and individual building owners and tenants. These benefits should be outlined when developing policy, to justify why rooftop and vertical greening is important. It must be emphasised however that not all green roofs, walls and facades will provide all the benefits listed here, the likelihood of realising any one benefit depends on careful design, construction and maintenance of the wall, façade or green roof.

### Cleaning the air

Good air quality is important for the health of the community and the liveability of cities. The combination of cars, industrial pollutants and building emissions as well as elevated ambient temperatures in cities can result in poor air quality due to increased particulates and air contaminants (Tolderlund 2010). A study in Sydney showed that cleaner air is a key benefit that the community expects from green roofs (Heller et al. 2012).

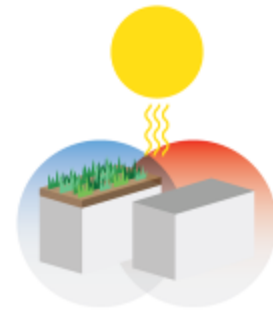


Plants on green roofs, walls and facades can be effective at removing pollutants from the air - depending on the type of plant, leaf surface and leaf tissue (Tolderlund 2010). Green walls planted with vines have a very dense leaf area per square metre and have been shown to be good in removing particulate matter (de Roo 2011). Green roofs and walls also help improve air quality by controlling heat gain and the associated generation of smog (DDC 2007). A recent study of the effectiveness of green infrastructure for improvement of air quality in urban street canyons has indicated the need for more green walls and facades, and even 'green billboards' on roofs, to decrease air pollution in city streets (Pugh et al. 2012).

### Cooling a city - Urban heat island effect

Cities are becoming warmer with the transformation of natural environments to engineered infrastructure, accompanied with increased heat generation from human activities and summer heat accumulation due to massive heat absorbing surfaces (Chen 2012). This results in high temperatures in urban areas in comparison with rural areas, a phenomenon known as the urban heat island (UHI) effect. In Melbourne, research has shown a UHI of a mean of around 1 to 4°C and as high as 7°C depending on the location, time of the year and day (Morris and Simmonds, 2000; Morris et al., 2001; Coutts et al. 2010).

Urban summer heat accumulation is likely to be further exacerbated with global warming. Climate change projections for Australia suggest an increase in the number of warm nights and heat waves which can pose significant threats to human health (Alexander and Arbalster, 2008). The heat wave event in Melbourne, in early 2009, may have resulted in 374 excess deaths over what would normally be expected for the period: a 62% increase in total all-cause mortality and an 8 fold increase in direct heat-related presentations in the emergency departments (DHS, 2009).



Green roofs and walls, implemented as a city-wide strategy, can mitigate the heat island effect (DDC 2007). By introducing vegetation onto roofs and walls temperatures can be reduced by means of evapotranspiration (evaporation of water from the soil and plants, and plants transpiring by taking water in through roots and releasing it through leaves) and simply through covering the roof with a less absorbing surface. Energy from incoming solar radiation that would otherwise heat the roof or wall surface and increase ambient air temperatures is instead used in the evapotranspiration process, resulting in latent heat loss that lowers surrounding air temperatures (Peck and Richie, 2009).

A study in Toronto, Canada, modelled the effect of green roofs on the urban heat island and concluded they would reduce local ambient temperature by 0.5C to 2C. It was calculated that this would result in \$12m in savings from reduced energy demand for cooling (Banting *et al.* 2005).

An 'Inquiry into Environmental Design and Public Health in Victoria' recommended that the Victorian Government urgently develop a response to the emerging health problems stemming from poor air quality and the urban heat island effect in Melbourne. The inquiry suggested that the design of residential communities should prioritise tree planting and green spaces to provide shade, improve respiratory health and to lower ambient temperatures in summer months (Legislative Council Environment and Planning References Committee 2012). In many built-up areas, the only options for green spaces may be rooftop and vertical greening.

#### How green roofs, walls and facades cool

Temperatures can be reduced by covering the roof or wall with a layer of vegetation that shades building materials that would otherwise absorb heat. Evapotranspiration provides cooling effects as water is evaporated from the soil and plants, and plants transpire by taking water in through roots and releasing it through leaves. Energy from the sun that would otherwise heat the roof or wall surface and increase ambient air temperatures is instead used in the evapotranspiration process, resulting in latent heat loss that lowers surrounding air temperatures. When green wall and facade plants are grown on a support system that leaves a gap between the wall and the planting, hot air moves by convection up through the space between the wall and the vegetation, providing passive cooling.

## Creation and Preservation of Habitat and Ecological Biodiversity

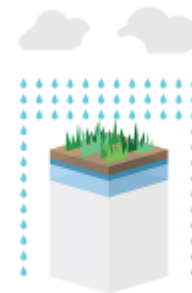
Biodiversity preservation and creation of habitat is important in meeting a range of local, state and federal environmental priorities and targets. Opportunities to create habitat can be limited in highly developed cities and towns, however there is a growing realisation of the potential of green roofs, walls and facades in landscapes otherwise dominated by man-made structures.



Green roofs have been shown to increase biodiversity if consideration is given to this at the design stage (Newton *et al.* 2007). Green roofs can provide connectivity between larger patches of vegetation, giving local species access to a greater amount of habitat (Dunnett and Kingsbury 2008). In particular, green roofs that are not designed for public access have the most potential for biodiversity because they offer an undisturbed habitat for insects and birds (Dunnett and Kingsbury 2008). The potential for biodiversity depends on plant species and height, food sources and building height (Tolderlund 2010). The proximity of the green roof to existing habitat areas is also important in determining whether the roof has high biodiversity potential (Williams unpub).

## Storm Water Management

Many local governments are interested in water sensitive urban design (WSUD) which embraces a range of measures that are designed to avoid, or minimise, the environmental impacts of urbanisation by reducing the demand for water and the potential pollution of natural waterways (City of Melbourne 2009). WSUD is based on the idea of treating stormwater before it enters a waterway or before it is re-used for another purpose.



The importance of integrated water cycle management in Victoria has been highlighted by the recent establishment of the Office of Living Victoria with a \$50m commitment from the state government to support innovative rainwater, stormwater and recycled water projects (OLV 2013).

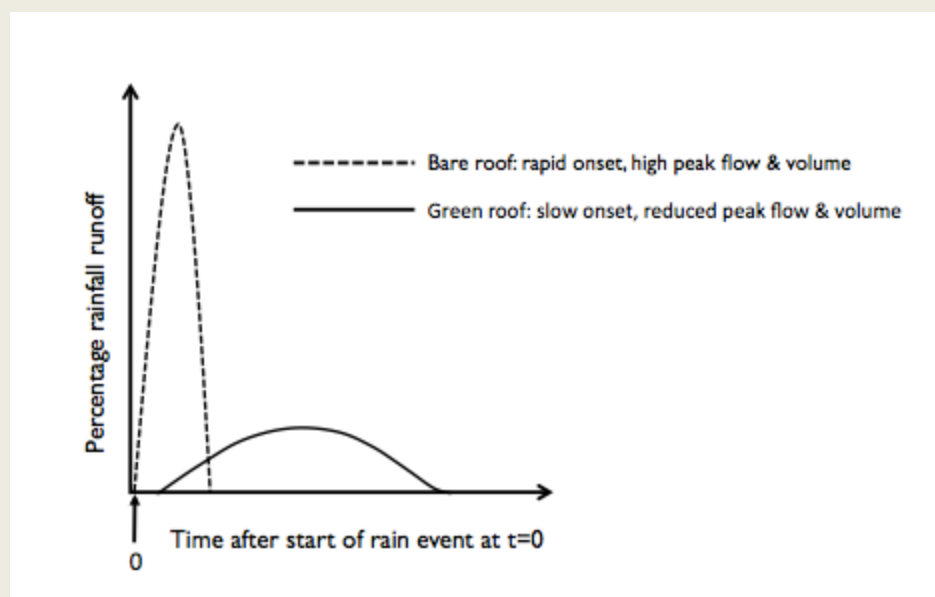
Green roofs absorb and retain water and are therefore one strategy for controlling stormwater runoff in urban environments (DDC 2007). Green roofs influence run-off by intercepting and retaining water from the early part of the storm, and limiting the maximum release rate of run-off in larger storms (Newton *et al.* 2007). Water is stored in the substrate, used by the plants, or retained in plant foliage and on the substrate and evaporates (Oberndorfer *et al.* 2007, Newton *et al.* 2007 and DDC 2007). Additional water storage capacity is available in green roof systems which have a drainage layer. In addition to helping slow and reduce storm water run-off, green roofs can also filter particulates and pollutants (Carter and Jackson 2007, Berndtson *et al.* 2008). This is important in urban areas where run off can be polluted from contaminants that are picked up on the way, such as motor oil, animal droppings and pesticides (Tolderlund 2010).

A number of elements influence the extent to which a green roof or vertical wall can control the volume of water running off from a site. The vertical depth of the growing medium and drainage layer, consistency and porosity of the growing medium, structure of the drainage layer, and slope of the site are all important elements of a rooftop's ability to slow water (Getter *et al.* 2007, Mentens *et al.* 2006, Oberndorfer *et al.* 2007). The type of plant species

and type of drainage system are important factors to consider when designing a green roof system for water treatment (Tolderlund 2010). The runoff diversion for green roofs is also influenced by the weather conditions of the region. The length, intensity and frequency of rain events influence a green roof's ability to retain water (City of Sydney 2012, Netwon *et al.* 2007).

### How green roofs affect storm water run off

Green roofs absorb and retain water and can be an effective strategy for reducing stormwater runoff in urban environments. When rain falls on a bare roof, runoff water flows into drains very rapidly. The rate of runoff depends on the slope of the roof as well as the volume of the rain event. When the rain stops, runoff continues until the roof is drained. Any water remaining on the surface will evaporate. On a green roof, plants and growing substrate intercept rainfall. Some water will evaporate directly off plant foliage. Rain that falls directly onto the substrate, or drips off the foliage, percolates downwards. Some water is absorbed by substrate particles, and some drains down into underlying layers where it can be stored if these have the capacity to hold it (typically the drainage and protection/water retention layers). Excess water drains onto the roof and out into the stormwater system. So, on a green roof, both the time to onset and the time to peak flow of stormwater entry are delayed, and the overall time taken to drain the roof is increased, as shown in this notional graph. Retention by the substrate and other layers of the green roof build up means that the overall volume of stormwater is reduced.



## Aesthetics, open space and urban agriculture

The 'liveability' of cities, especially those undergoing rapid population growth and building development, is dependent on availability of open space. Green roofs help increase amenity and open space, can encourage community gardens and food production, and can extend commercial and recreational space (Tolderlund 2010).



The majority of building owners in Melbourne ignore the potential of the leasable spaces on roof tops, which can be almost as large in area as the floors below them.

It has been suggested that including greenery in the cityscape reduces stress and patient recovery time, increases property values and has been linked to a reduction in crime in inner city areas (Kuo & Sullivan 2001, Ulrich et al 1991, Dwyer et al 1992).

Urban agriculture is commonly discussed as a way to ensure food security, enhance community participation in the food system and improve health. Food producing gardens located on rooftops can be places for education and local distribution, as well as a showcase for commercial endeavours (Tolderlund 2010).

The importance of green roofs, walls and facades in providing green space in dense urban areas should not be underestimated. Especially in inner Melbourne, it can be difficult to create new areas of parks and gardens, where most space has been taken up with built infrastructure. Access to green space is extremely important to health. The importance of considering public health in design of cities was recognised recently, with the establishment of an 'Inquiry into Environmental Design and Public Health in Victoria'. The results, published in May 2012, showed *"that one of the most important aspects of the built environment that impacts positively on health is provision of parks and other public spaces. Extensive research links multiple positive physical, mental and social health benefits to living near green and open public areas. Conversely, health outcomes are generally poorer in communities that lack such spaces"* (Legislative Council Environment and Planning References Committee, 2012). Green roofs and walls may be one of the few options to provide more green space in built up urban environments.

## Benefits for building owners

There are many private benefits associated with green roofs, walls and facades which can be promoted to building owners. The same roofs can also provide broader social, environmental and economic gains. Examples of why private owners would be interested in green roofs, walls and facades are outlined below.



## Green Star and NABERS

Green roofs are increasingly being considered to help achieve points toward the Green Star program and National Australian Built Environment Rating Scheme (NABERS). Green Star is a national, voluntary environmental rating system that evaluates the environmental design and construction of buildings and communities. Green roofs can help achieve points in the ecological value category. Points are achieved where the ecological value of the land at the time of site purchase is either maintained, or increased (GBCA 2010). NABERS is a national rating system that measures the environmental performance of Australian buildings, tenancies and homes. NABERS measures the energy efficiency, water usage, waste

management and indoor environment quality of a building or tenancy and its impact on the environment (NABERS 2013).

### **Return on Investment, property value**

Internationally and in Melbourne, it has been suggested that if a building is more aesthetically and environmentally desirable, there are economic benefits in terms of lease and property values and employee recruitment. Research in Canada estimated that buildings with a recreational green roof achieve an 11% increase in property value, and buildings with views onto green roofs have a 4.5% increase in property value (Tomalty and Komorowski 2010).

### **Prolonged building longevity**

Green roofs provide additional roof protection by covering the waterproofing membrane with a layer of organic and inorganic insulation. This reduces the stress placed on the membrane by preventing severe fluctuations in temperature (Tolderlund 2010). The protection afforded to roofs is especially important in Australia where exposure to ultraviolet radiation can be extreme.

### **Cooling individual buildings**

The insulation provided by green roofs reduces heat transfer through the roof and ambient temperature on the roof surface, and results in better performing Heating Ventilation and Air Conditioning (HVAC) systems (City of Sydney 2012, Tolderlund 2010).

There are mixed research results about how much difference in temperature, and effect on energy savings, can be detected between buildings with green roofs and conventional roofs. The variety in results is because the amount of energy saved depends on a range of factors including:

- the percentage of rooftop covered by a green roof
- the thickness of other insulation
- the height of the building (the floor directly under the green roof receives most benefit)
- the type of vegetation used and depth of the soil substrate
- roof to wall ratio
- climatic conditions and microclimate of the building
- HVAC efficiency (City of Sydney 2012, Tolderlund 2010, DDC 2007).

### **Noise Reduction**

Studies have shown that green roofs, walls and facades can reduce the noise level within a building by 40-60 decibels. The thickness, plant type, growing medium and plant coverage can influence the effectiveness of the green roof, wall or facade to reduce noise levels (Tolderlund 2010).

A study on making courtyards on the non – street side of buildings quieter, found that green roofs were very effective. Green façades have been found to be most efficient when applied to narrow city canyons with otherwise acoustically hard façade materials (Van Renterghema *et al.* 2013).

### **Solar Panel Efficiency**

For building owners interested in using photovoltaics, they can benefit from combining these with a green roof. Keeping a constant temperature on the roof ensures a better efficiency of solar panel energy production (Tolderlund 2010).



## Government policy is needed

Many of the benefits from green roofs, walls and facades are shared with the public, such as reduced stormwater runoff, biodiversity preservation and mitigation of urban heat island effect. Public benefits are, by definition, not fully realized by the party bearing the cost of the installation and therefore justify public intervention through the development of government policies, regulations, incentives and legislation (Ngan 2004, Carter and Fowler 2008).

The building of green roofs, walls and facades in Australia has always been a voluntary undertaking. Under the volunteer system, only direct private benefits, such as extra amenity space and aesthetics induce owners and developers to build green roofs (Ngan 2004). In many countries around the world, policies, legislation, regulations and incentives have been used to help to develop more green roofs with benefits on a broader scale. In Germany, a world leader in green roof development, a dramatic increase in green roof construction has been attributed to legislation that is linked to collective benefits (Ngan 2004). The experience in Germany has shown that it is not sufficient to rely solely on the goodwill of the building owners, but rather that it is necessary for the governing authorities to introduce green roof policy (Landskron 1998 cited in Ngan 2004).

Policy is needed in Australia to support green roofs, walls and facades because the collective benefits these initiatives can deliver cannot be encouraged through sporadic private interests. Relatively large continuous areas of green rooftops and other green infrastructure are needed in order to provide an effect (Ngan 2004). When local councils or other levels of government create policy to support collective benefits, there can be a flow on effect to the community at large, from the economy to the environment.

Although many city councils in Melbourne have recognised the importance of green infrastructure, and have begun to develop policy and actions which supports it, there is little policy specific to green roofs, walls and facades. Broad policy on green infrastructure sets the scene for encouraging vegetated walls and rooftops. To date, the existing strategies amongst inner Melbourne councils that explicitly mentions green roofs, walls and facades are the *Urban Forest Strategy* (City of Melbourne), *Greening Port Phillip: An Urban Forest Approach* (City of Port Phillip) and the *Council Plan* for the City of Stonnington.

## The process of policy development

It has been suggested that there are six phases to green roof policy development (Lawlor et al. 2006):

1. Introductory and awareness
2. Community engagement
3. Action plan development and implementation
4. Technical research
5. Program and policy development
6. Continuous improvement

The City of Melbourne is one of the most progressive in Victoria for investigating green roof policy development. The phases suggested by Lawlor et al. appear to match the journey that the City of Melbourne has progressed through in relation to policy development for green roofs, walls and facades.

In the first stage – introductory and awareness - the benefits of green roofs and vertical gardens were explored through support of the ‘Growing Up’ green roof competition, an initiative of the Committee for Melbourne’s Future Focus Group, and by involving staff in green roof and wall conferences and forums.

In the second phase meetings were held with environmental groups, industry professionals, researchers and potential funding agencies, to raise the profile of green roofs and gain support for municipality involvement.

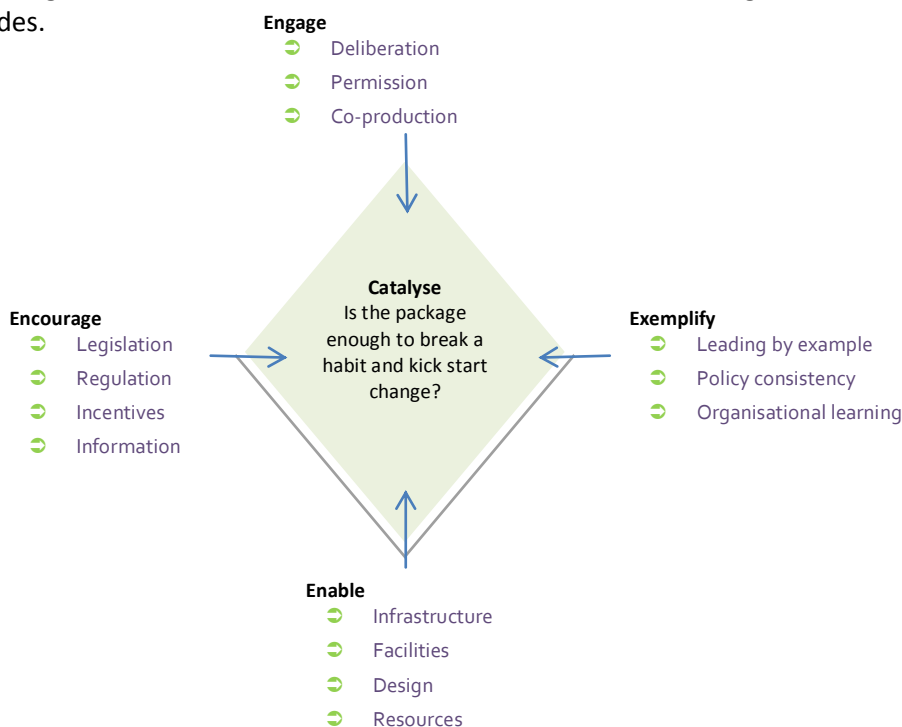
In the third phase, action was taken by initiating a City of Melbourne quarterly forum on green roofs –Canopy: Melbourne Green Roof Forum. The third phase also included developing green roofs and roof top gardens, one on a public child care facility and another on one of the main council administration buildings.

This led directly into phase 4, technical research, as both roofs included a research and demonstration component, partnering with the University of Melbourne. The action phase (phase 3) also included developing an Inner Melbourne Action Plan (IMAP) project and gaining a state government grant to begin the Growing Green Guide for Melbourne project. This project will lead the Council into phase 5, - indeed this document has required research be carried out (phase 4) and is providing recommendations for steps in phase 5.

Other Inner Melbourne Action Plan councils have progressed at different rates through the policy development phases for green roofs, however the involvement of the four inner Melbourne councils in the Growing Green Guide for Melbourne project enhances the likelihood that they too will progress into phase 5 at the completion of the project.

## Policy instruments

In 2008 the UK's Centre of Expertise on Influencing Behaviours developed a model of different types of policy tools that governments can use to seek to influence behaviour. See below. This model is useful for Victorian governments in considering how they can encourage behaviour change to support the development of more green roofs, walls and facades.



This review of policy options for supporting green roofs, walls and facades in Melbourne and Victoria explores each category, as shown below.

### Encourage

- Encourage green roofs, walls and facades using the planning scheme
- Provide rebates on local fees and taxes for buildings with green roofs, walls and facades
- Direct financial incentives or subsidies for green roofs, walls and facades

### Exemplify

- Leading by example – demonstration sites and roofs, walls and facades on public buildings
- Consistency of Council strategy and policy
- Consistency of strategy and policy across different levels of government

### Engage

- Public promotion (encourage public discussion about green roofs, walls and facades)
- Work with building industry groups to integrate green roofs, walls and facades into guidelines, codes and standards

### Enable

- Ensure local laws aren't a barrier
- Ensure the building and occupancy permit application process is not a barrier
- Provide information and support to residents and businesses
- Create space for experimentation

# GREEN ROOF POLICY AROUND THE WORLD

A range of policy tools have been employed around the world to encourage inclusion of green roofs, and to a lesser extent, walls and facades, in new building designs and in retrofitting of existing buildings. Table 1 provides a brief synopsis of some of the policies being implemented around the world. More detailed information is first provided on three case studies: Toronto, Canada; Portland, USA; and a broad overview of the German experience. These cases were selected because of the information available on implementation of and impact of the policy.

## **Toronto Green Roof By-law**

Toronto was the first North American city to pass a by-law requiring green roofs on new building developments. This followed a long running consultation and a trial of a policy requiring new city-owned buildings to green a significant proportion of their own roofs.

Toronto City Council adopted a Green Roof By-law in May 2009, this required, from 31st January 2010, new residential, commercial and institutional buildings with a minimum Gross Floor Area of 2,000m<sup>2</sup> to install a green roof, or pay a penalty for not doing so. The area of coverage required ranges from 20-60% depending on the gross floor area of the building (City of Toronto 2013). Starting from 30<sup>th</sup> April 2012 industrial developments were required to comply with the by-law having lower coverage requirements being the lesser of 2,000m<sup>2</sup> or 10% of the gross floor area. Schools were given an exemption from the by-law and can provide an alternative type of roof (Moulton 2012).

Toronto also requires every green roof under the by-law to be maintained in accordance with the maintenance plan required in the Toronto Green Roof Construction Standard (City of Toronto 2013a).

Toronto has financial incentives for installing green roofs on buildings not mandated by the by-law (i.e. smaller roof size) or for the retrofit of an existing building (City of Toronto 2013b). Eligible green roof projects will receive CAN\$50 per square metre up to a maximum of CAN\$100,000. Some of the funds used for the incentive program come from the fee that developers must pay if they do not include a green roof under the by-law (a fee of CAN\$200 per square metre) (Moulton 2012).

Toronto's interests in increasing the number of green roof surfaces in the city are:

- to address reduction in storm water runoff
- reduction in the urban heat island effect
- reduced energy consumption
- beautification of the city
- creation of green spaces and
- potential opportunities for local food production

Since the introduction of the by-law, 140 new buildings and 160,000 square metres of rooftop have been planned for vegetation, with another 25,000 square metres voluntarily provided (Moulton 2012).

## Portland incentives

Portland has an extensive incentives program to promote green roofs and the more storm water focussed eco-roofs. New developers can receive a “density bonus” for installing an eco-roof, or a grant for an eco-roof. The ultimate density of development in Portland is regulated by a system that stipulates base densities and then allows the developer to apply for additional density in some cases – through the Floor Area Ratio Bonus Program (City of Portland 2007). The bonus program that applies in Portland comprises 18 different bonus options adopted between 1988 and 2003. Eco-roofs were added in 2001. Roof-top garden bonuses are also available. An eco-roof is defined as a rooftop stormwater facility that has been certified by the City’s Bureau of Environmental Services. A proposal may earn bonus floor area for both the eco-roof option and the rooftop gardens option.

The density bonus works on the amount of roof surface covered by the eco-roof and can provide a developer with an extra 3m<sup>2</sup> per 1m<sup>2</sup> of eco-roof coverage (City of Portland 2007). The roof top garden bonus only provides 1 for 1.

An evaluation of the bonuses in 2007 indicated that the Rooftop Garden bonus had been used only twice. It was considered to compete on some level with the Eco- Roof Bonus, which had been used 6 times. The study noted that for developers considering making modifications to the roof, the eco-roof option is cheaper and provides a 3-for-1 bonus, compared to the 1- for-1 bonus of the rooftop garden option. The Rooftop Garden was considered to have the strong advantage that it provides a marketable amenity to building tenant in return for the cost. In addition, eco-roofs were considered still a relatively new technology, while roof gardens involve more straight forward landscape maintenance (City of Portland 2007).

The City of Portland has offered a financial incentive to property owners and developers to add more eco-roofs since 2008. The incentive program is to increase sustainable stormwater management practices. The incentive funds up to US\$50 per square metre of installation of an eco-roof project. Note: funding of this program has been discontinued for the 2013/14 financial year (City of Portland 2013b).

Since 2005 there has also been a requirement for all *city owned* buildings to have 70% green roof coverage – to be installed on new buildings or when re-roofing. In Portland there are also storm water fees – the cost of which is influenced by the amount of impervious surfaces (City of Portland 2013c) on site, therefore green roofs can be used as a measure to lower storm water fees.

All these initiatives have been coupled with a strong push on education – people can access information about events, guides and other resources through the City of Portland

### Portland’s floor area ratio bonus program, rules of rooftop gardens and eco roofs.

To qualify for the floor area ratio bonus program, **rooftop gardens** must cover at least 50 per cent of the roof area of the building and at least 30 per cent of the garden area must contain plants. In addition, the property owner must execute a covenant with the City ensuring continuation and maintenance of the rooftop garden by the property owner.

Proposals that include **eco-roofs** receive bonus floor area as follows:

- (1) Where the total area of eco-roof is at least 10 per cent but less than 30 per cent of the building’s footprint, each square foot of eco-roof earns one square foot of additional floor area.
- (2) Where the total area of eco-roof is at least 30 per cent but less than 60 per cent of the building’s footprint, each square foot of eco-roof earns two square feet of additional floor area.
- (3) Where the total area of eco-roof is at least 60 per cent of the building’s footprint, each square foot of eco-roof earns three square feet of additional floor area.

Before an application for a land use review will be approved, the applicant must submit a letter from Bureau of Environmental Services certifying that they approve the eco-roof. The property owner must execute a covenant with the City ensuring installation, preservation, maintenance, and replacement, if necessary, of the eco-roof (City of Portland 2013a).

website. One resource is a list of professionals who can assist in developing an eco-roof, from structural engineers to architects (City of Portland 2012). There is also a monitoring program in place in Portland, to measure and track the ability of eco-roof systems to manage stormwater runoff in urban settings (Hall 2012).

As of July 2012 Portland had 355 eco-roofs that covered 7 hectares. This is still well-short of the target to reach 17.5 hectares of green roofs by 2013 (Hall 2012).

## **Germany**

Germany has a long history of policies to support green roof development. Modern green roofs began in the 1960s when researchers began to investigate some of the rooftop vegetation which had begun to naturally occur around Berlin (Carter and Fowler 2008). This research and subsequent public and private interest led to the formation of the FLL (the research society for landscape development and design within Germany) in 1975 which helped consolidate green roof interests in the country and paved the way for innovation both in the construction of green roofs and in the policies used to promote them (Carter and Fowler 2008). In 1982 the FLL created the first version of guidelines for the planning, construction and maintenance of green roofs. This has been updated seven times, the latest in 2010.

In Munich green roof provisions have been included in building ordinance since 1984. Berlin enacted a green roof subsidy program from 1983– 1997 which reimbursed residents approximately 50% of green roof construction costs and resulted in approximately 63,500m<sup>2</sup> of green roofs built in the city (Kohler and Keeley 2005). Green roofs grants remain available in certain areas and the local government lead by example with over half of new government buildings incorporating green roofs (Kohler and Keeley 2005). By 2002 one hundred and three German cities were identified as having policy incentives for green roofs (Ngan 2004). Of these 51 cities had direct incentives, 29 had indirect incentives, 35 used green roofs as a mitigation measure for nature conservation, and 28 had green roofs requirements in local development plans (Ngan 2004).

German subsidies occur at the state and municipal levels of government and they typically range from 10–50% of initial construction costs (Carter and Fowler 2008). Approximately 50% of German cities offer some form of direct subsidy to building owners for installing green roof systems (Kohler and Keeley 2005).

**Table 1 Policy examples from around the world.**

**Europe:**

Location	Method	Summary
<b>Austria:</b>		
Linz	Mandatory requirement + incentives	Building requirements include obligation for green roofs on new buildings, with reimbursement of up to 5% (reduced from 30% in 2005) of the cost of green roof installs as an incentive.
<b>Denmark:</b>		
Copenhagen	Policy on sustainability, incentives + sustainability targets	As a part of the city's ambition to be more sustainable and achieve a carbon neutral system, landscaping is now a mandatory obligation on roofs with a pitch less than 300. There are incentives available for refurbishments of older roofs and exemptions due to structural integrity of buildings.
<b>Germany:</b>		
Berlin	Mandatory targets	Mandatory targets to increase permeability and "green" surfaces, through planning regulations.
Munich	Mandatory requirement + incentives	Employ a wide range of techniques, including reductions in storm water fees, incentives and regulations in urban land use. They also require all suitable flat roofs over 100m <sup>2</sup> to be installed with a green roof. As a result in Munich green roofs have become a recognised construction standard.
Cologne	Incentives storm water	There are a range of financial incentives to reduce and control storm water runoff, green roofs are encouraged as a means to manage storm water.
Munster	Incentive storm water fee reduction	Storm water management plan and storm water fees are calculated on pervious and impervious surfaces on the property, extensive green roofs on buildings are used as a means to reduce storm water fees.
Stuttgart	Mandatory requirement	Requirement for new developments with flat roofs to be greened to specific standards, has led to a large amount of green roofs in the city.
<b>Switzerland:</b>		
Basel	Mandatory requirement	Amendment in the city of Basel's building and construction law requires all new and renovated flat roofs be greened, with incentives and regulatory tools in place.



Location	Method	Summary
<b>England:</b>		
London	Policy on living roofs  Guidelines	The London Plan policy expects that provision of either intensive, extensive or recreational roof space (or a combination of these) should be provided on all new development. Recommended standards are provided including suggestions for area of roof space covered, depth of substrate, etc. Outside of government, the green roof industry along with academics have developed the Gro Code – best practice green roof installation.

### North America

Location	Method	Summary
<b>Canada:</b>		
City of Richmond	Building by-law storm water	By-law requiring new buildings with over 2000 square metres of floor area to meet storm water management objectives. Called, <i>Green Roofs and Other Options Involving Industrial &amp; Office Buildings Outside the City Centre</i> , the by-law does not mandate green roofs. The by law was introduced in 2008 but as of 2011 only 2 or 3 projects had been completed, none of which installed green roofs.
City of Port Coquitlam	Green roof specific by-law	Green roof requirement on new construction over 5000m <sup>2</sup> within the city's general zoning by-law
Toronto	Green roof specific by-law + financial incentives	First North American city to pass a by-law requiring a green roof on new commercial, institutional and residential developments on buildings with a gross floor area of 2,000m <sup>2</sup> or above. Requirements range from 20% of assessed available roof space for 2,000m <sup>2</sup> , to 60% on 20,000m <sup>2</sup> or larger buildings. Applies to industrial building plans submitted after April 30 2012, with lesser requirements. Have also used financial incentives as a driver to encourage green roofs.
Vancouver	LEED certification requirement	Leadership in Energy & Environmental Design (LEED) is a program that provides third-party verification of green buildings. Policy and by-laws have adopted requirements for LEED gold certification, which does not require, but encourages, green roofs and green walls, and has led to several large-scale green roof installs.
<b>United States:</b>		
Austin	Incentives density bonus	Various incentive programs, including a proposed density bonus system, including bonuses to square footage of floor space relating to planning permits, with bonuses for % roof covered, as well as access and public access on site.

Location	Method	Summary
Boston	LEED certification requirement + demonstration site	New large-scale projects must be LEED certified, there are points awarded for storm water retention onsite. City Hall has a demonstration green roof. See Vancouver for more information on LEED.
Chicago	Financial and planning permit incentives	Financial assistance for buildings meeting specific green roof and efficiency criteria, green permit program for fast tracking planning permits.
Los Angeles	LEED certification	Large buildings are required to be LEED certified. See Vancouver for more information on LEED.
Milwaukee	Incentives -rebates green roofs	Offer rebates for green roofs at a rate per square foot.
Minneapolis	Indirect financial incentives -reduced storm water fees	Reduced storm water utility fee for effective storm water management practices.
New York	Incentive: Tax Credit	To offset 25% of the cost of a green roof, from January 2009 until March 2013, owners could receive a one year tax credit of approx US\$48/ m <sup>2</sup> or up to \$100,000 for green roofs covering over 50% of a building's surface area.
Philadelphia	Incentives Tax credits	Business privilege tax credit of 25% of the building cost of a green roof install (capped at US\$100 000), provided it covers 50% of roof surface.
Portland	Incentives density bonus, grants for retrofits, public building rules	Eco-roof floor area ratio (FAR) bonus allowing developers an extra 3 square foot per foot of green roof without additional permits, also offer grants for reducing storm water runoff with a green roof. All city owned buildings are required to have 70% roof coverage with an eco roof.
San Francisco	LEED / Greenpoint rated certification requirements	Green building requirements for all new buildings, to meet LEED or GreenPoint Rated standards. Incentives are also available for sustainable building practices. See Vancouver for more information on LEED.
Seattle	Green Factor Landscape requirement + incentives	One of the few policies identified in this literature review that specifically encourages vertical greening as well as green roofs. The Green Factor; in selected zones new developments must meet the green factor by using the green factor score sheet in order to gain a planning permit. The scoring is based around a landscape requirement for developments and designed to encourage innovative designs such as green roofs and green walls by awarding higher points for use of these. A range of bonuses and incentives are provided to developers for including a green roof.
Washington	Incentives rebates	Green roof specific rebate program offering incentives for developers including a green roof.

Organisation	Method	Summary
EPA (United States of America)	Incentives under Clean Water Act	Under section 319 of the <i>Clean Water Act</i> twelve projects from across the US had received funding for green roofs as of 2006. The Act can also drive application of green roof systems as best management practices for stormwater and are a requirement of National Pollutant Discharge Elimination System permits.

**Asia:**

Location	Method	Summary
<b>Singapore</b>		
Singapore	Planning system incentives	Rooftop greenery is promoted by not including certain portions of the areas used for greenery in the calculation of a building's gross floor area
<b>Japan</b>		
Tokyo	Policy mandate	A 25% coverage for new buildings was mandated in 2001, this lead to an increase from approx. 52,500 m <sup>2</sup> of roof coverage to approx. 102,500 m <sup>2</sup>

# POLICY OPTIONS FOR VICTORIA

Using the Policy Tools model described earlier, twelve policy options, some with several sub-options, are explored under the categories encourage, exemplify, engage and enable.

## Encourage

The 'encourage' part of the policy model incorporates policy options that provide signals via incentives and disincentives, to ensure that the target audience responds. The model takes a broad approach to the term 'encourage' and includes coercion via regulation under this category.

The following policy options are explored under the category of encourage:

- Encourage green roofs, walls and facades using the planning scheme
- Provide rebates on local fees and taxes for buildings with green roofs, walls and facades
- Direct financial incentives or subsidies for green roofs, walls and facades
- Encourage via fast turnaround times for permit applications

### Encouraging green roofs, walls and facades via the planning scheme

Green roofs, walls and facades are not specifically addressed in the planning schemes of the Cities of Yarra, Port Phillip, Stonnington or Melbourne. This reflects that green roofs, walls and facades are not yet widely used in Victoria. Without reference in a planning scheme, there is little encouragement to developers to incorporate this sort of green infrastructure, nor is there guidance for planners where planning applications include these elements. In the cases where applicants have included this infrastructure, the application can cause confusion because green roofs, walls and facades are not well defined and do not fit neatly into planning schemes.

A planning permit is not required for general gardening, such as planting and pruning, but a planning permit is required to construct and carry out buildings and works, including for structures such as pergolas, handrails or the supporting structures for planting/irrigation that are used for green walls and some green facades. The construction of a green roof, wall or façade may therefore require planning permission, particularly if the building is affected by an overlay which has a general buildings and work requirement such as a Heritage, Neighbourhood Character or Design and Development overlay. Using a roof top as accessible open space as part of a development proposal may also raise some planning issues, such as overlooking, and, in certain circumstances, may be prohibited due to mandatory height controls.

As green roofs, walls and facades become more popular it is important to address these issues in planning schemes so that confusion, lack of knowledge and inconsistent decision-making do not act as a disincentive to their development.

Components of planning schemes that could be amended to encourage rooftop and vertical greening, and clarify positions on such greening, include:

- State Planning Policy Framework
- Local Planning Policy Framework
- Zones
- Overlays

- Particular Provisions

In addition the planning application process could be altered, to provide incentives to encourage and develop green roofs, walls and facades. This could include preferential treatment for developments that incorporate rooftop and vertical greening. For instance:

- Fast tracking planning applications
- Waiving planning fees
- Providing concessions in the planning scheme
- Providing exemptions on some planning requirements

A detailed investigation into options associated with planning schemes is provided later in this document.

## Rebates on local fees and taxes for buildings with green roofs, walls and facades

The rebate of some or all of a fee (an indirect financial incentive) could be applied to encourage the development of green roofs, walls and facades. Fees that Councils could consider for indirect financial incentives include rates, which building owners pay annually, contributions which developers pay at the point of building, or other fees that people have to pay to Council. Water authorities charge annual drainage fees to property owners, and these could also be considered as an indirect financial incentive, although Councils will have limited ability to encourage water authorities to do so.

Rates are the sole tax local government has under its control in Victoria. Other licenses, charges, fees and fines tend to be governed by other legislation (e.g. Planning Fees are governed by the *Planning and Environment Act*). Rate rebates to support rooftop and vertical greening could be justified on the basis of supporting the provision of public good; as long as the greening contributed to public open space, or some other collective benefit such as reducing urban heat island or reducing stormwater runoff (in these cases more than one building in a particular location would need to be greened). As rates are a major source of revenue for Councils, rebates can be viewed unfavourably as a reduction in revenue for other programs and services. As such, this option would only be realistic where a Council and the ratepayers have a strong interest in encouraging green roofs, walls and facades.

Local councils can require developers to pay contributions for Open Space or Community

### Opportunities and limitations of indirect financial incentives (based on a green roof policy review by Ngan 2004).

#### Opportunities

- Incentives may work better than regulations or other mandatory means, since property owners act voluntarily when there are clear economic gains.
- The policy could run indefinitely, unlike direct financial incentives which depend on municipal budgets.
- They can be easy to communicate to the community because they can introduce fairness and transparency.
- Can work well in both new development areas and in already built areas.
- Ongoing, annual fees are a more permanent incentive, compared to subsidies which are usually a one-time financial advantage, and therefore long-term maintenance may be more enforceable.

#### Limitations

- For small municipalities, or water authorities, the cost of administering indirect financial incentives may be too high.
- A system for inspection and maintenance may be required to ensure the intended outcome is being realised.

Infrastructure. It may be appropriate for green roofs to be defined as open space or community infrastructure, if they were to meet particular criteria (for instance, that all members of the community can use the space, as opposed to simply building tenants). Councils may then be able to reduce or waive the developer contribution fee as an incentive to design a green roof into a building.

Other smaller incentives that Councils have at their disposal include permit fees. For instance, those associated with local laws, such as a permit to have a crane on a street.

Water authorities are also in a position to provide indirect financial incentives. A drainage fee incentive model can recognise the stormwater retention and filtration potential that green roofs and walls offer a city. Water retailers on behalf of Melbourne Water bill property owners quarterly for the Waterways and Drainage Charge. The charge is set up to fund programs to manage drainage, improve flood protection and warning systems, and improve the quality of waterways throughout the Port Phillip and Westernport region (Melbourne Water 2013a). Exemptions from the Charge could be used as an incentive to reward building owners with green roofs, wall or facades that provide drainage, flood and water quality benefits. The money saved by a property owner could be used instead for maintenance costs so maintenance could be seen as less onerous and the quality of the water and/or flood risk reduction could be assured over time.

Alternatively, as suggested in Canada in the 'Making Green Roofs Happen' report (City of Toronto 2005) a new Stormwater Management Charge could be introduced and then reduced according to the stormwater management measures on site, including rooftop and vertical greening.

**Ngan (2004) summarised the advantages and disadvantages of direct financial incentives for green roofs as follows (these arguments also apply to vertical greening):**

#### **Opportunities**

- As an incentive, property owners are not forced to include green roofs; they act voluntarily when there are clear economic gains.
- Direct financial incentives can be designed to suit any number of purposes that the jurisdiction has.
- Incentive programs are useful to encourage green roofs in specific target areas, such as existing built-up areas and densely developed areas, where regulation is difficult to impose.
- Direct financial incentives are effective for retrofit roofs.
- The incentive per square metre is proportional to the overall environmental benefit.

#### **Limitations**

- Municipalities can run out of the funds needed to pay for financial incentives, effectively terminating such programs.
- Some jurisdictions have extremely limited budgets and more pressing priorities to begin with.

## **Direct financial support for construction or maintenance of green roofs, walls and facades**

Direct financial support refers to subsidies, grants and low interest loans that are provided to applicants who meet certain criteria. These could be applied to the design, construction and/or maintenance of green roofs, walls and facades. The *Growing Up* report on Melbourne's policy options for green roofs (Crawford 2010) suggested that financial incentive schemes will be important in Australia where comparatively, green roof costs are higher than for overseas counterparts. Over time and with the assistance of financial subsidies, these costs will fall as green roofs become more popular and the industry becomes more competitive.

A grant program could take a number of different forms. It could be a specified dollar amount per square metre to help with installation costs, it could be a grant to cover the costs of a feasibility assessment, or green roofs, walls and facades could be worked into an existing program that provides low interest green loans (City of Toronto 2005).

Direct financial incentives help overcome the barrier of adopting new technology. In places where the green roof industry is not robust, such as North America and Australia, reducing the market friction of high green roof installation costs is important to encourage the uptake of green roof, wall and façade technology (Kohler and Keeley 2005).

It is important that any subsidies have quality standards associated with them, so that the council, wider community and the environment benefit, and greenwash is avoided. Ansel (2009) suggests that to ensure that subsidy programs are not abused, there must be defined ecological quality standards for roof greening within funding programmes, and compliance with these standards following completion of the project.

## **Encourage via fast turnaround times in the approvals of building and planning permit applications**

A major incentive to property developers is money saved. This can be achieved not only by financial incentives, but through time saving, - if developers have land sitting idle for months, before projects can begin, they are losing money. If a green roof, wall or façade could be seen as an element that might help the permissions period become shorter, the extra cost in building it compared to a conventional roof or wall may be considered inconsequential. A major concern that councils have towards fast tracking as a policy option, is that if there are substantial issues with an application apart from the roof or wall, the fast track could not be guaranteed. Further concerns about fast tracking are detailed in the chapter on planning, later in this document.

An alternative to an immediate fast track is to provide some kind of account manager within Council who helps a developer to navigate through the building and planning permit application processes. The City of Chicago in the USA offers a Green Permit Program which offers expedited permit processing for green building projects. Projects accepted into the Program can receive permits in as few as 15 business days depending on the complexity of the project. Some projects may also qualify for waiver of plan review fees.

Further investigation with the Property Council and other building industry bodies might reveal other incentives for builders and developers.



## Exemplify

The 'exemplify' part of the policy model is about demonstrating shared responsibility and leading by example. Consistency in policies is part of exemplifying, as is demonstrating that others are acting.

The following policy options are explored under the category of exemplify:

- Leading by example – demonstration sites and roofs, walls and facades on public buildings
- Consistency of Council strategy and policy
- Consistency of strategy and policy across different levels of government

### Leading by example – demonstration sites and roofs, walls and facades on public buildings

Leading by example could include local and/or state government committing to develop green roofs, walls and facades on public buildings. Melbourne has a small community group already advocating for this – Do It On The Roof.

Councils could also consider supporting demonstration roofs on private buildings, with the intention that these would be for public access (for instance; shopping centres, university campuses, which already facilitate public access). In the *Growing Up* report (Crawford 2010) it was suggested that further consideration should be given to how to utilise properties that are particularly well suited to the retrofitted installation of green roofs. For example, commercial car parks have higher weight loading capacities than most standard buildings. Crawford suggested that with assistance, the commercial benefits to the building owner or leaseholder of converting the top floors of a car park to a green roof with public access may outweigh its current returns, especially considering that top-levels of car-parks are the least popular given their exposed conditions.

The Growing Green Guide for Melbourne project has identified some potential demonstration sites for green roofs, walls and facades, and feasibility studies for 9 sites in the four Inner Melbourne councils has been undertaken. Funding opportunities are being investigated to realise the best of these projects.

#### Developing a demonstration site

When developing a demonstration site, some of the issues to be considered include:

- Public access or public viewing – is the site well positioned to be a demonstration?
- Cost – can a grant be obtained via a funding agency, or could the site be on a building of a partner which would be willing to share costs, such as a shopping centre or educational institution? Sites that are low in elevation are usually cheaper than high rise sites, not just for construction, but for avoiding needing to train staff in safety regarding 'working at heights.'
- Heritage – will the site be subject to heritage planning controls, and can these controls be overcome?
- Access around the site – will the site be subject to planning or building controls that limit protrusion of vegetation, and can these controls be overcome?
- Maintenance – who will fund ongoing maintenance and who will be responsible for the asset once it is installed?

Besides councils, there are many other agencies that can show leadership by example in this area. In Melbourne the EPA has a publically viewable green wall and Melbourne Water has an internal green façade.



## Consistency of Council strategy and policy

It is important for government agencies to show consistency in their policies and strategies to ensure a clear message. Councils need to ensure that all their relevant policies are encouraging, or at least not discouraging, of green roofs, walls and facades. Table 2 provides examples of IMAP sustainability policies and strategies concerned with:

- how energy and water will be managed
- how climate change will be addressed
- how the natural environment will be conserved and improved
- how Councils intend for development to progress in an environmentally sensitive manner

Green roofs, walls and facades could be incorporated into revisions of these existing policies and strategies, and should be included in relevant new policies and strategies that Councils are considering.

**Table 2: Cities of Port Phillip, Melbourne, Yarra and Stonnington’s sustainability policies and strategies that could be amended to refer to, and thereby encourage, green roofs, walls and facades**

*Note: many of the IMAP councils also have planning schemes and Council Plans with a strong sustainability emphasis*

	City of Port Phillip	City of Melbourne	City of Yarra	City of Stonnington
<b>General sustainability</b>	Toward Zero	Environment Management Plan		
<b>Energy</b>	Greenhouse Plan	Zero Net Emissions by 2020 – Strategy Update (2008)		
<b>Water</b>	Water Plan – Toward a Water Sensitive City  Water Sensitive Urban Design (WSUD) Guidelines  Open Space Water Management Plan	Total Watermark – City as a Catchment  Water Sensitive Urban Design (WSUD) Guidelines	Water Sensitive Urban Design (WSUD) Guidelines	Sustainable Water Management Strategy  Water Sensitive Urban Design (WSUD) Guidelines
<b>Climate Change Adaptation</b>	Climate Adaptation Plan	Climate Change Adaptation Strategy		
<b>Natural Environment</b>	Greening Port Phillip (already includes rooftop and vertical greening)  Greening Port Phillip Street Planting Guide  Open Space Strategy	Urban Forest Strategy (already includes rooftop and vertical greening)  Open Space Strategy	Yarra Environment Strategy  Open Space Strategy	Public Realm Strategy
<b>Urban Design</b>	Sustainable Design Strategy and Policy		Sustainable Design Guidelines  Urban Design Strategy	Council Plan, - open space and green roofs

Because strategies and policies guide Council decision making and inform people how the Council will apply rules, they can be crucial in building support for, and understanding of, vegetated rooftops and vertical greening in a municipality.

It is also important to consider Council's own business practices and their strategies for how their own buildings are developed and renovated. In a number of North American cities, there are explicit policies and commitments that new Council buildings, or major upgrades, will include green roof development.

Consistency is also needed across the tools that are referred to in Council policies. For instance, City of Port Phillip's Sustainable Design Policy (2011) is relevant to planning permit applications for new buildings and extensions to existing buildings over 50m<sup>2</sup> in floor area. It requires compliance with Sustainable Design Assessment in the Planning Process (SDAPP) requirements, submission of either a Sustainable Design Assessment (SDA) or a Sustainable Management Plan (SMP) and use of an applicable Ecologically Sustainable Development (ESD) assessment tool. In this case, inclusion of green roofs, walls and facades in not just the policy but the accompanying information sheets and relevant tools would support consistency of the messaging around green roofs, walls and facades.

Options to exemplify consistency of Council strategy and policy are to:

- Ensure consistency amongst an individual Council's strategies and action plans, by rewriting and re-releasing documents as they come to scheduled review points.
- Ensure consistency amongst an individual Council's strategies, plans and planning system, especially local planning policy framework and Municipal Strategic Statement
- Develop joint policy across neighbouring councils.

#### **Opportunities for consistent messaging around green roofs, walls and facades: STEPS and SDS**

The Sustainable Tools for Environmental Performance Strategy (STEPS) and the Sustainable Design Scorecard (SDS) tools were developed for assessment of developments at the planning permit stage in Victoria. They do not assess building design and attributes as other rating tools can do this, they are specific for planning applications.

STEPS is a web-based tool that provides an assessment of the environmental performance of a given planning application. STEPS awards scores for greenhouse emissions from operating energy, peak energy use, mains (drinking) water use, storm-water quality impacts, and building materials impacts (Moreland City Council 2005). STEPS does not explicitly reference green roofs, walls and facades. An upgrade to the STEPS and SDS tools is currently underway (2012-2013). This will include introducing an online interface for the SDS tool, and development of an improved STEPS tool for multi-residential development. This upgrade may provide an opportunity for promotion of green roofs, walls and facades, most likely in the section around Urban Ecology (although there are links with stormwater and energy sections of the tools).

Sustainable Design Scorecard (SDS) was established to assess and quantify the environmental performance of non-residential developments in Victoria, with its sister tool, STEPS, complementing it through the assessment of residential developments. Currently green roofs are mentioned in the SDS under the category of "ESD excellence."

## Consistency of strategy and policy across different levels of government

Consistency of policy and messaging around green roofs, walls and facades across different levels of government is important to reinforce to the public the benefits of these and the support government has for them. Local governments can influence the messaging around greening roofs and walls at a state level by advocacy and lobbying.

Two examples in 2013, where local government could try and influence state government strategies to be supportive of green roofs, walls and facades, are the Metropolitan Planning Strategy and the government's response to the Inquiry into Environmental Design and Public Health in Victoria.

The Metropolitan Planning Strategy is being developed as a plan for Melbourne for the next 40 years. Environmental resilience is considered a key principle that should inform development of the Metropolitan Planning Strategy. Discussion papers preceding the strategy's development have outlined the urban heat island effect, energy efficient urban design and capturing, recycling and reusing water as 'key issues and possible opportunities', all of which green roofs, walls and facades could contribute solutions to. Green roofs were only mentioned in the discussion paper in relation to water. There is potential for local governments to promote the value of rooftop and vertical greening, and the benefits these can provide in responding to wider environmental issues, in submissions to the state government about the Metropolitan Planning Strategy.

An Inquiry into Environmental Design and Public Health in Victoria has been completed, and recommended a number of amendments to state legislation, to promote public health and urban greening. There may be opportunities for Councils to advocate for the recommendations to be addressed, where these would be the same ideals that Council would want to pursue for green roofs, walls and facades. For instance the suggested amendments to the planning system about focussing on environments for health and wellbeing:

- Amendment of section 4(1) of the *Planning and Environment Act 1987* to include 'the promotion of environments that protect and encourage public health and wellbeing' (or similar wording) as an objective of planning in Victoria.
- Amendment of the State Planning Policy Framework to include a policy on planning for health and wellbeing.
- Amendment of the Precinct Structure Planning Guidelines to establish minimum requirements for open space (Legislative Council Environment and Planning References Committee, 2012).

The Inquiry also recommends that the Victorian government:

- establishes targets for the provision of green and open public spaces
- provides guidance to local government on appropriate rating tools for assessing the quality of public open space
- supports the ongoing maintenance of existing open space and the establishment of green and other public spaces in new residential developments, particularly in high density areas (Legislative Council Environment and Planning References Committee, 2012).

Councils with an interest in promoting greening in general, and green roofs, walls and facades in particular, should monitor the Victorian Government's response to the inquiry, once it is released and determine if further advocacy of the Inquiry's recommendations is required.

## Engage

The 'engage' part of the policy model is about policy options that work to get other people involved.

The following policy options are explored under the category of engage:

- Public promotion (encourage public discussion about green roofs, walls and facades)
- Work with building industry groups to integrate green roofs, walls and facades into guidelines, codes and standards

### **Public promotion, encourage public discussion about green roofs, walls and facades**

Councils can raise awareness of rooftop and vertical greening through media, special events and competitions and demonstration projects. The *Growing Up* competition was run in Melbourne in 2009, resulting in several designs from a range of firms, video footage of development and creation of one roof as a demonstration.

It has been suggested that because competitions are voluntary initiatives, they are received more positively by building owners than regulations, which many see as a burden (Ngan 2004). Competitions and associated media coverage can ensure that green roofs are seen and appreciated, which is important as roofs are often not physically visible or accessible to the public (Ngan 2004).

Special events that Council is involved in, from launch of new places and products, to conference attendance, are opportunities to promote green roofs, walls and facades. Special events can be created in addition to what a Council is usually involved in, for instance; development of an open garden event for local green roofs and walls.

Organisations that could be partners with Councils on promotional programs include:

- Victorian Planning and Environmental Law Association
- Council Alliance for a Sustainable Built Environment
- Municipal Association of Victoria
- Victorian Local Government Association
- Planning Institute of Australia
- Australian Institute of Landscape Architects
- Property Council
- Urban Development Institute of Australia
- Office of the Victorian Government Architect
- Do It On The Roof – community advocacy group
- Green Roof 4 Youth – social enterprise
- Green Roofs Australasia – industry body
- Victorian Building Authority
- Property Council
- Master Builders
- Building Designers Association of Victoria
- Green Building Council

## Work with building industry groups

To engage more people in discussions about the benefits of green roofs, walls and facades, it may be worthwhile developing a position on how green roofs and walls could be incorporated into relevant building codes, rating and assessment products, and beginning a conversation with the appropriate organisations on how to progress this.

Examples of particular activities that could be pursued with building industry groups include developing:

- practice notes with the Victorian Building Authority, there are a set of practice notes that provide guidance and a green roofs one could be added - many building surveyors treat them not just as guidance but as instructions which must be followed.
- modelling protocols for NABERS or First Rate to show how to model energy savings associated with green roofs, walls and facades
- expert reports that can be submitted to building surveyors to demonstrate that the green roof, wall or facade is a suitable alternative for particular performance specifications in the Building Code
- Model clauses and technical specifications that could be included in building project specifications, these could be incorporated into NatSpec – a computerised resource for anyone who wants specifications for a building project

Technical guidelines will support industry awareness on design and construction issues.

Some relevant guidelines, codes and standards, which do not yet have specific consideration of green roofs, walls or façades, and could be considered for partnerships are outlined below.

### **Building Code of Australia**

The Building Code of Australia provides a nationally accepted and uniform set of technical requirements for all areas of building, from design to construction (SAI Global, 2013). The BCA contains technical provisions for the design and construction of buildings and other structures, covering such matters as structure, fire resistance, access and egress, services and equipment, and energy efficiency as well as certain aspects of health and amenity (ABCB 2011). There are no specific requirements for green roofs or walls in the Building Code, and therefore the compliance of these kind of structures is left to be somewhat subjective to building surveyors and fire authorities. It may be appropriate to specifically address these structures in the Code, or to create advice and guidance for the people who have to assess green roofs, walls or façades against the Code's requirements. It is important to note that changing the Code would be a time consuming process.

### **Green Star**

Green Star is a national, voluntary rating tool that evaluates the environmental design and construction of buildings. There are currently nine Green Star rating tools which address a range of building types. The Green Star rating system is designed to take an holistic approach within each class and building sector, addressing nine categories in total: Management, Indoor Environment Quality, Energy, Water, Materials, Land Use and Ecology, Emissions, Innovation and Transport.

Green Star generally does not explicitly address green roofs. Crawford (2010) has noted that green roofs can contribute to a number of points across Green Star. For example, 'thermal comfort' points in the Environment Category; 'Greenhouse Gas Emissions' in the Energy



Category and 'Landscape Irrigation' in the Water Category. Yet other environmental measures have stand-alone treatment, such as waste management plans, levels of office lighting, or water storage – so they are awarded specific points within the GBCA. Stand-alone treatment within the GBCA would make it easier for building owners to understand the value of green roofs and encourage their adoption by the industry (Crawford 2010).

Green Star Community is a new rating tool for sustainable development projects on a community scale, examining issues of economic, social and environmental importance. The pilot rating tool was launched in 2012, and includes 7 criteria to assess 'site planning and layout' during the design review process. One of the criteria is "Landscape and Green Infrastructure" (Green Building Council of Australia 2013) which potentially a green roof or wall could be recognised under, but without specific examples of green roofs, walls and facades, such design features may be overlooked.

The Green Star rating tools traditionally focused on building attributes for new and retrofitted buildings. The GBCA is now looking beyond this to develop the Green Star – Performance rating tool, to assess the operational performance of all existing buildings. This may provide another option for consideration of roofs, walls and facades.

Green Star's rating tool for Public Buildings, released in 2013 will provide points for green roofs.

### **NABERS**

NABERS (National Australian Built Environment Rating System) is a national rating system that measures the environmental performance of Australian buildings. NABERS measures the energy efficiency, water usage, waste management and indoor environment quality of a building or tenancy and its impact on the environment (NABERS 2013). Green roofs, walls and facades are not explicitly addressed in this rating system.

### **STORM**

The STORM calculator, provided by Melbourne Water, can be used to assess whether best practice water quality objectives have been achieved for a given site. Results of STORM assessments can be submitted to statutory authorities along with development applications to demonstrate compliance with objectives. Planning applications submitted to City of Stonnington include STORM ratings. Achievement of a 100% STORM rating is equivalent to achieving a 45% reduction in the typical annual load of total nitrogen and achieving best practice objectives (Melbourne Water 2013b). Green roofs, walls and facades all have potential to improve STORM ratings because they provide a treatment for impervious surfaces, however they are not yet considered in the calculator. Stormwater run-off research results would need to be available to model the impact of these treatments – in order to inform the STORM calculator.

### **FirstRate5**

FirstRate5 is a residential thermal performance assessment software. It is used to rate the energy efficiency compliance of residential dwellings to the 6-star standard under the National Construction Code of Australia. The standard applies to all new homes and major renovations and extensions (Sustainability Victoria 2013). When more research results are available on the thermal insulation properties of green roofs, walls and facades, it may be appropriate to try and get these addressed in thermal performance rating schemes such as FirstRate5.



## **NatHERS**

NatHERS refers to the Nationwide House Energy Rating Scheme, and is a scheme that enables the design of a home to be assessed using modelling programmes to generate a star rating. This star rating is used to assess the home's design and fabric performance, and is used to demonstrate compliance for building approvals. There is potential for green roofs and facades to impact on, and potentially improve, the performance of the fabric of a home.

## **Enable**

The 'enable' part of the policy model includes options that influence existing systems and the capacity of individuals to act. This part of the model includes removing barriers to ensure ability to act; building understanding; providing facilities or viable alternatives; and educating and training.

The following policy options are explored under the category of enable:

- Ensure local laws aren't a barrier
- Ensure the building permit application process is not a barrier
- Provide information and support to residents and businesses
- Create space for experimentation

### **Ensure Local Laws are not a barrier**

There are a number of local laws in councils which may present as obstacles for people developing and maintaining green roofs, walls or facades. Local laws are developed by councils to deal with community safety, and peace and order issues (MAV 2012). Local laws relevant to green roof, wall and façades tend to include where waste products (e.g. pruned foliage) are held and how they are disposed of, any vegetation issues that are considered to be a weed or fire risk, overgrown vegetation on a public frontage, any poor quality drainage and any need for lifts or cranes that need to be based on public land during construction or maintenance.

A review of how local laws impact owners of green roofs, walls and facades would help to identify if there are aspects of local law administration that could be changed to better enable people to install or maintain their roofs, walls or facades. For instance a permit is usually needed for using street space for lifts and cranes, which could be a disincentive for regular maintenance. If this was found to be a concern, then Council could help enable green roof, wall and façade development by making the process to obtain the permit simpler and/or cheaper. Processes could also be created to ensure developments will comply with local laws, at the time they are approved by council.

**Examples of local laws in the City of Melbourne** that may influence how construction and maintenance of roofs, walls and facades is carried out (Melbourne City Council 2009a, Melbourne City Council 2009b):

- All necessary steps must be taken to ensure that all recyclable material and green waste is separated from other waste material
- The stormwater drainage connection from the premises must be maintained in good order and repair and free from blockages
- The owner or occupier of any land situated at an intersection must not erect any fence on the land so as to obstruct the clear view of [pedestrians, vehicles and traffic control items].
- An owner or occupier of premises must ensure that all necessary steps are taken to prevent fires and minimise the possibility of the spread of fire by regularly minimising the build-up of grass, weeds, scrub, undergrowth and any other material or substance on or in the premises and ensuring that there is no storage of such material likely to assist in the spread of fire.
- A person must not allow any vegetation, building or thing to protrude from premises so as to obstruct or interfere with the passage of pedestrians or vehicular traffic in or on a public place.

Examples of local laws in the City of Stonnington (Stonnington City Council 2008):

- The owner and occupier of land must ensure:
  - that the land is adequately drained to the satisfaction of an Authorised Officer; or
  - that the land does not discharge water that is a nuisance to an owner or occupier of adjoining land; or
  - water does not discharge from an air conditioner or other equipment onto a footpath.
- A person must not, without a Permit, place, leave standing or use a crane, travel tower, boom, hydraulic arm, lift, tackle or any other machine on or over Council Land.
- A person must not, without a Permit, erect any hoarding, scaffolding, protective barrier or like structure on a Road, Public Place or Council Land.
- The owner and occupier of land must ensure that the land and nature strip adjacent to that land do not contain blackberries or a weed which is a noxious weed, within the meaning of the Catchment and Land Protection Act 1994.
- The owner and occupier of land must not allow:
  - any tree, hedge, plant or vegetation of any kind growing on that land to overhang any road at a height less than two and half metres;
  - any tree, hedge, plant or vegetation of any kind to grow in such a manner so that it obstructs the view of a Motor Vehicle, sign or signal on a Road by any person using that Road; or
  - any tree, hedge, plant or vegetation of any kind to obstruct a footpath.
- A person carrying out any Building Activity, landscaping or gardening works on land must ensure that any rubbish, Waste, water, slime or other debris does not escape from the land.

## Ensure the building permit application process isn't a barrier

Building permits are issued under the Victoria Building Regulations and generally relate only to the construction aspects of a building or other development. A building permit is required in most cases involving development. This means that new buildings incorporating a green roof, wall or façade would go through the building permit application process, whereas existing roofs that are retrofitted might not need to, especially if they are not trafficable (accessible). If however, a retrofit included adding building elements, then a building permit would be required for a retrofit.

As is the case for local laws, it may be worthwhile reviewing how the process of obtaining building permits impacts people trying to build green roofs, walls or facades. This will allow local governments to determine whether the process is a barrier to action and if any response is required at Council level to make the process more straightforward. One consideration is whether exemption getting a building permit required is appropriate for certain types of works.

When building plans are submitted they are reviewed in light of the Building Code of Australia, which provides technical provisions for the design and construction of buildings and other structures. The code covers matters such as structure (load bearing capacity), fire resistance, access and egress, services and equipment, and energy efficiency as well as certain aspects of health and amenity (ABCB 2011). There are no specific requirements for green roofs or walls in the Building Code, but elements of the code will be relevant.

Some of the issues that a building surveyor would consider prior to issuing a building permit would be:

- Siting considerations – i.e. is a planning permit required, or must siting be assessed against the building regulations? Is vegetation protruding onto public space?
- A report from a structural engineer if additional loads are proposed, i.e. people, planted areas, retained water, additional structures, etc
- Applicable fire ratings for new structures (including provision of fire reels and hoses)
- Applicable energy efficiency provisions for new structures (Buildings will need to be constructed to comply with the regulations for energy efficiency. If there is an alternative method of design, i.e. putting in a green wall or façade, the design and material will still need to meet the performance requirements. It would be the applicant's responsibility to provide the building surveyor with evidence that the proposed alternative building design meets the relevant performance requirements)
- Access and (emergency) egress for people occupying the area (e.g. number of exits, distance to exits, DDA compliant access)
- Waterproofing and drainage of the existing structure and new green roof area to ensure health and amenity of occupants below the roof is not compromised
- Safe movement for users in and around the area, including ramps, stairs and balustrades.
- Any necessary alterations to "essential safety measures" within the building, e.g. additional emergency and exit lighting, etc.

Road encroachment is another issue that may come up for people developing green walls or facades. This can be dealt with under planning regulations, building regulations or local laws. Councils tend to have guidelines about these issues, such as the City of Melbourne's Road Encroachment Guidelines (2003). They do not specifically mention vegetated walls, but the issues and principles in these guides are relevant to people considering vertical greening, for instance; ensuring access at street level for people with a disability (not encroaching too

much into footpath space); ensuring no negative impact on street lighting or traffic signs; and ensuring the structure won't collapse prematurely in the event of an earthquake or fire and in doing so impede access by emergency services or the safe egress of occupants.

From the perspective of pedestrian access, a footpath should, as far as possible, allow for a continuous accessible path of travel so that people with a range of disabilities are able to use it without encountering barriers. In order to achieve this, green walls and facades should not encroach beyond the title boundary of an allotment, below a height of 2 metres.

## **Provide information and support about green roofs, walls and facades**

Provision of free information is an activity which Council can undertake to support policy or regulatory changes. This can be via printed materials, online advice or phone or face to face discussions. Advice to building owners and developers which helps them to consider realistic green roof, wall or façade projects can help raise more awareness of what is possible and the benefits of building such infrastructure. Raising community awareness can help build market demand (e.g. tenants desiring such features in apartment buildings).

The creation of a guide for builders, owners, landscape architects, horticultural contractors and others involved in planning, building or maintaining green roofs, walls or facades, is underway. This project is being undertaken by the four inner Melbourne councils, along with the University of Melbourne and the State Government. *Growing Green Guide: Victoria's Guide to Green Roofs, Walls and Facades* will be available by early 2014 and will be free to download.

Aside from new information guides, existing publications can be reviewed to assess suitability for inclusion of new information. This will be particularly important for information sources that Council already refers building owners to. For example the City of Melbourne has *Greening Your Building – A Toolkit for Improving Asset Performance*, and many Councils use *Sustainable Tools for Environmental Performance Strategy (STEPS)*, to assess planning applications. Including information on rooftop and vertical greening in a tool such as STEPS is further discussed in the following chapter of this report, about ensuring consistency of strategy and policy. Consistency is also needed amongst existing guidelines and information booklets that Councils provide for their residents and developers, in order to build a strong interest and awareness of green roofs, walls and facades.

Councils could potentially develop a support service to help residents and businesses interested in green roof, wall and façade development. This could include an education or training component – such as information nights to teach people about green roofs, walls and facades, and introduce them to the Victorian Guide. As well as a person in Council that people could call for advice. If there were a key person in each Council, then that person could also champion the cause within Council.

Services to the public could include making information on existing building structures simple to obtain so that building owners could more easily get that information to a structural engineer to appraise the feasibility of the structure for rooftop or vertical greening. Council could even provide a service whereby engineers could be easily engaged, making it simpler for people interested in exploring the potential of their building. Or in conjunction with an industry body, develop a list of approved consultants and engineers with a track record of developing quality green roofs, walls and facades. A support service might also provide advice to help people navigate through the Council's permit system from

planning permits to building permits to permits for exemptions from local laws. Councils could develop information on how to construct green roofs, walls and facades on heritage buildings to maximise the chances of having planning applications approved.

Councils interested in enabling people to build green roofs, walls and facades could encourage local nurseries to supply appropriate plants and substrates for these projects. Compost systems, whereby residents could access free compost made from local food waste, would be another way that Councils could enable budding rooftop gardeners.

If demand warranted it, a support service could also be used as a way to match people who want to garden on a roof (most likely people interested in urban agriculture enterprises) to building owners with suitable roofs and an interest in leasing their roof space. The legal system can already accommodate such a leasing arrangement. The 'Sharing Backyards' program could be used as a model, it is a program used in Canada, the USA and New Zealand that encourages urban gardening by connecting those who have the space to garden with those who would like to garden but don't have the yard space.

### **Factsheets**

Information about green roofs, walls and facades could be collated into factsheets and reports that owners or developers could provide to the builders and building surveyors, or other industry professionals who might need convincing about the concept. For instance, creating a factsheet outlining methods of construction that are clearly compatible with Building Code specifications and requirements, would provide advice to make it easier and more familiar for builders and building surveyors. Under the Building Code of Australia there are certain performance requirements that can be met by either conventional means or through 'alternative solutions.' In Victoria there are performance requirements for buildings around thermal performance and water use performance. Green roofs represent a possible alternative solution to meeting these performance standards. Building surveyors need to be able to cite 'documentary evidence' as one step towards approving an alternative solution. If Councils could develop such evidence it would enable the surveyors to make their decisions about approvals. Existing factsheet series by the Building Commission (now Building Authority) and industry associations such as Architects Institute of Australia could also be used for spreading information about green roofs, walls and facades. Practice Notes such as those released by the Building Commissions are issues as guidance, they are not regulatory, but building surveyors often treat them as something to be strictly adhered to (Robert Enker pers. Comm).

## **Create space for experimentation**

There is potential for Councils to facilitate spaces for experimentation for people in the community who are interested in green roofs, walls and/or facades. Sometimes the best way to introduce new policy is to have trialled an approach in one place, before making a municipal-wide policy.

Often there are community members who want to experiment and try new things, and who find the existing rules obstruct them. For instance, if a community group wanted to put a greenhouse on a rooftop, or if a group wanted to create facades or roofs on local community infrastructure, such as a sports pavilion or even public transport shelters, this can often be almost impossible to explore. Councils could consider how they could support the innovators to trial, and evaluate the benefits of, their ideas, before bringing in municipality-wide changes.

Two examples of experimenting with the transformation of public space can be seen in Newcastle and Sydney, NSW. *Renew Newcastle* has reinvigorated the city and is based on a model to constantly provide new spaces for experimentation and incubation. Artists were given temporary space in empty shop space, and this system incubated 60 new creative projects and enterprises. It was always expected that some of projects would succeed and some would fail, the point was to promote experimentation. The people behind the project say that to be able to create fertile ground for experiments it is important to lower the barriers to entry - so more people can try more things. They aim to make the place malleable and responsive to the initiative and experimentation of individuals or small groups who have imagination but have no capital (Westbury 2013). In Sydney, residents of Chippendale have experimented with street composting and a street orchard. Their innovations have allowed the City to see where community interest is and what elements work – the compost bins were eventually closed because of insect infestation. Allowing the residents to experiment was a low risk strategy for the City, because they were able to watch how the experiment turned out in one location, before deciding on an official course of action.

Temporary installations such as those described above, have also been a feature of many innovative street redesign projects around the world. The advantage of a temporary installation is that it lets the broader public experience something new, and allows the community and council to work together to improve and refine the design, and ultimately choose whether to retain or remove it.

Feenstra (2002) highlighted the following lessons from watching sustainable food systems initiatives develop over several years in California, USA. The insights are relevant to Councils wanting to facilitate communities to explore rooftop and vertical greening.

- Social space is important, this can be an actual physical place, but more often is about the opportunities these projects created for diverse people in communities to come together to talk, listen to each other's concerns and views, plan together, problem-solve, question, compromise, etc.
- Political spaces are needed to help pilot projects become part of broader policies and become more formal, or institutionalised, in their community
- Intellectual space is important, although difficult, and requires bringing multiple disciplines and community perspectives together
- Economic space is important and seed funding can be helpful but projects should be proactive in seeking additional economic resources
- Funders and local authorities must be patient, Feenstra suggests *"think of accomplishments or outcomes in different ways and support the invisible dimensions to the extent that you can."*

By the very nature of allowing community experimentation, temporary installations and development of ideas, there is no recipe that a council can follow to create these spaces, they will need to evolve in local areas.

Experimentation can also be encouraged within Council itself. For instance, urban designers could be encouraged to experiment with green facades as a method for reducing graffiti, or in order to get greenery into a confined space, like a laneway.

# PLANNING OPTIONS

## Overview of planning schemes in Victoria

A planning scheme sets out policies and requirements for the use, development and protection of land. A planning scheme applies to each municipality in Victoria and is implemented through strategic and statutory planning processes.

A planning scheme contains three main parts, consisting of maps, written text and incorporated documents. The written structure of a planning scheme is constructed with reference to the Victorian Planning Provisions and must contain the following parts:

- A State Planning Policy Framework
- A Local Planning Policy Framework
- Zone and Overlay provisions
- Particular Provisions
- General Provisions
- Definitions
- Incorporated Documents
- List of Amendments

The first 4 components of a planning scheme, shown above are considered in this chapter, for their potential to be amended in order to encourage the construction of green roofs, walls and facades. The *State Planning Policy Framework* provides direction in relation to strategic issues of State importance. Every planning scheme in Victoria contains this policy framework. The *Local Planning Policy Framework* contains a Municipal Strategic Statement and local planning policies. The framework identifies long term directions about land use and development in each particular municipality; presents a vision for its community and other stakeholders; contains locally applicable policies, and provides a rationale for the application of zone and overlay requirements and particular provisions in the scheme. *Zones* prescribe the type of land use allowed in an area. *Overlays* outline the development and built form requirements in an area, and additional requirements for subdivision, buildings and works. *Particular provisions* show requirements for any specific uses and development.

## State Planning Policy Framework

State Planning Policies apply to all planning schemes and therefore all land in Victoria. These policies must be taken into account when developing local policy and making planning decisions. The State Planning Policies help provide builders and developers, other industry stakeholders, and the public, with clarity on the broad principles that the Victorian government considers should guide development across the state.

The State Planning Policy Framework is structured around nine themes - settlement, environmental and landscape values, environmental risks, natural resource management, built environment and heritage, housing, economic development, transport and infrastructure.

Each policy includes:

- An objective that sets out the aim of the policy
- Strategies that outline how the policy is to be achieved
- Policy guidelines that provide guidance about specific strategies, legislation and other matters to be considered in planning decisions

Information about green roofs, walls and facades would be relevant under the policy themes at *Clause 13 - Environmental Risk* and *Clause 15 - Built Environment and Heritage*.

*Clause 13.01 – Climate change impacts* exists under *Clause 13 - Environmental Risks*. This clause has only one sub-section under it dealing with 'Coastal inundation and erosion'. A new section about excess heat gain and retention in built-up urban environments could be included under this clause. The strategies section could highlight the importance of urban greening in the form of green roofs, walls and facades, especially if implemented on a broad scale.

*Clause 15.02 - Sustainable development* can be found under *Clause 15 - Built Environment and Heritage*. This clause has a sub-section dealing with 'Energy and resource efficiency'. A new sub-section could be inserted about alternative approaches to greening, as an important element of sustainable development.

If the State Planning Policy Framework were amended by the Victorian State Government to include specific reference to urban heat island effect and alternative approaches to greening (as suggested above), this would provide a clearer planning policy context to support green roofs, walls and façade technology. Some of the benefits of this approach include:

- Identify the role / contribution of alternate greening in urban development
- Provide clarity and strength to planning decisions around green roofs, walls and facades and help encourage their development
- Provide a consistent policy approach to green roofs, walls and facades for all municipalities
- Provide a solid policy basis for decision making in planning and making any amendments to a Local Planning Policy Framework regarding green roofs, walls and facades

The challenge of amending state policy (as with amending any part of a planning scheme) is that adoption of changes must be made at the State Government level and particular must be approved by the Minister for Planning. As such there can be a significant lag time between suggesting changes to the State Planning Policy Framework and seeing them enacted in practice.

## **Municipal Strategic Statements**

The Municipal Strategic Statement (MSS) is a statement of the key strategic planning, land use and development objectives for a municipality and includes strategies and actions for achieving the objectives. A MSS provides the strategic basis for the application of local policies as well as zones and overlays.

MSSs are reviewed every four years. Local governments are able to include objectives and strategies which could focus on green infrastructure in general; reducing urban heat island effect; or explicitly around green roofs, walls and facades. The City of Melbourne has a proposed updated MSS that includes reference to vegetated rooftops as a method for increasing biodiversity in cities. In early 2013 the City of Stonnington proposed changes to the MSS that included information on encouraging green and white rooftops as a means of incorporating more sustainable design techniques in developments. However the review panel recommended that the ESD strategies be removed and considered as part of a



separate amendment. It was subsequently proposed to include this specific strategy in the MSS as part of Amendment C177 to introduce an ESD local policy.

At first glance, the advantage of amending a MSS, compared to other parts of a planning scheme, is that it may not raise too many concerns at a State Government level, and therefore be easier and quicker to change. However the Stonnington experience may be highlighting that the state government is not supportive of these kind of changes. The benefit of highlighting green roofs, walls and facades in a MSS rather than in the state planning policy framework, is that a Council could be more specific, not having to write in general enough terms to be relevant to the whole of Victoria.

## **Local Planning Policy Framework**

The Local Planning Policy Framework includes policies to implement the objectives and strategies of the Municipal Strategic Statement. A Local Planning Policy (LPP) is a policy statement of intent or expectation. It states what the responsible authority will do in specified circumstances or the authority's expectation of what should happen. A LPP gives the responsible authority an opportunity to state its view on a planning issue or its intentions for a local area. A LPP provides guidance for planning permit applicants, and guidance for assessing an application and decision making. The Local Planning Policy Framework provides clarity and consistency of local planning conditions.

Explicit support for green roofs, walls and facades in a LPP will provide planners with the capacity to require, encourage or support development which includes these types of green infrastructure and provide clarity around which types of green infrastructure are appropriate and inappropriate. The inclusion of requirements and support for green roofs, walls and facades in a LPP will provide clarity and consistency in relation to local planning context.

The advantage of promoting green roofs, walls and facades in LPP is that building designs can be influenced at a very early stage, when permission is being sought for a new building or a renovation. This is preferable to trying to encourage green roofs, walls and facades via other means, which only apply to an applicant after planning permission has been granted and a building already designed.

There are two options for encouraging green roofs, walls and facades in a LPP – an amendment to an existing policy or the inclusion of a new policy.

A new policy would allow a clean slate to create specific objectives, strategies, application requirements, development requirements, decision guidelines for green roofs, walls and facades. It may be questionable whether a policy purely focused on green roofs, walls and facades could be adequately justified if other alternatives to state the same information exist (i.e. by amending existing policies) or an alternative may be to create a policy on a related broader topic about greening, or urban heat island effect or stormwater management. The creation of a new local policy is a lengthy and difficult process (and therefore resource intensive for Councils).

An alternative option to a new policy is to identify an existing policy that could be amended to be explicitly supportive of green roofs, walls and facades. Opportunities are likely to be within the urban design and built form policies that exist in most Councils' LPP's. An example is City of Melbourne's 'Urban Design Outside the Capital City Zone' (Clause 22.17). This policy addresses the built form character of an area and there would be an opportunity to amend the following areas of the policy:

- Objectives (include a new one)
- Building tops
- Visible facades and blank walls facades

The process of amending existing LPPs can be lengthy, due to the need to obtain Ministerial authorisation and approval for each planning scheme amendment. The State Government is currently considering a proposed LPP on Environmentally Sustainable Development and Water Sensitive Urban Design for some Municipalities. It has recently approved a LPP for City of Melbourne on energy, water and waste efficiency: Planning Scheme Amendment C187 which proposes specific industry-recognised standards for energy, water and waste efficiency depending on use and size of the proposed building. It may be appropriate to wait until the State's position is clear on these local policy proposals, prior to determining where best to adapt or introduce local policy partly or wholly addressing green roofs, walls and facades.

The Victoria's Guide to Green Roofs, Walls and Facades, under development by the IMAP Councils to explain the design, construction and maintenance of green roofs, walls and facades, could be listed as a 'Reference Document' in Local Planning Policy Frameworks to support any strategy or policy dealing with such greening types.

## Particular Provisions

Particular provisions are part of a planning scheme that can require planning permits or alternatively outline specific prerequisites under which a planning application may need to be assessed. Relevant provisions include:

- *Clause 54 and 55 (ResCode)* A residential design code that governs all Victorian residential developments up to three-storeys. It includes regulations regarding street setbacks, building heights, provision of private open space, etc (Property Subdivision 2013)
- Higher Density Residential Design Guidelines (HDRDG) - Guidelines which apply to buildings of four storeys and above and cover aspects including height, neighbourhood character, street setback, open space, overlooking and overshadowing (DPCD 2013). The HDRDG are policy guidelines listed under *Clause 15.01-2 - Urban design principles*.
- Clause 52.35 (Urban Context Report & Design Response for Residential Development of Four or More Storeys). This clause requires an urban context report to provide a written statement that describes any relevant housing, neighbourhood character, urban design and landscape plan, strategy or policy set out in this scheme, and a design response that explains how the proposed design responds to these matters.

*Clauses 54 and 55 (ResCode)* of the Victorian Planning Provisions could be amended to be supportive of green roofs, walls and facades. Standards for the encouragement of green roofs, walls and facades would probably include permeability (*Clause 54.03-4 and 55.03-4*) private open space (*Clause 54.05-4 and 55.05-4*), site coverage (*54.03-3 and 55.03-3*) and *landscaping objectives* (Clause 55.04-8).

Amenity impacts (Clause 54.04) which address overshadowing and overlooking objectives should also be reviewed to ensure that non trafficable green roofs are not treated the same as green roofs which are designed for regular access and traffic. It will be important for planners to stay abreast of VCAT decisions about overshadowing of solar panels, as in future

there might also be opposition to new high rise development that is going to overshadow existing rooftop greening.

*Clause 55.03 - Site Layout and Building Massing* provides opportunities to promote the value of green roofs, walls and/or facades in various objectives, including:

- To facilitate on-site stormwater infiltration (also note Clause 54.03-4 – *Permeability impacts*)
- To integrate the layout of development with any public and communal open space provided in or adjacent to the development.
- In locations of habitat importance, maintain existing habitat and provide for new habitat for plants and animals
- To achieve and protect energy efficient dwellings and residential buildings

Adjustments could be made to the objectives and standards in these clauses, or an additional objective specific to encouraging green roofs, walls and facades could be added to the clause.

In the HDRDG, amendments could be made in Section 2.11.2 'Roof forms' that provides guidance on designing the roof to be used.

A disadvantage of HDRDG is that it is a Reference Document which is performance based and not as 'prescriptive' as ResCode. This means that any additions to HDRDG may not have a significant impact on green roof, wall and façade development. The disadvantage of ResCode is that it doesn't apply to the bulk of larger residential buildings that are more than three storeys.

ResCode and HDRDG only apply to residential buildings and any changes to these requirements will not affect applications for buildings for any other use. Changes to these provisions will therefore be limited in their effectiveness to residential buildings only.

## Zones and Overlays

Zones and overlays specify when a planning permit is required and provide direction to an assessment of an application. Zones and overlays have the opportunity to address local objectives and strategies through the use of an associated schedule, although there is more flexibility with this approach through the overlays. Reformed residential zones (introduced 1st July 2013; to be applied by local councils over the next 12 months) have detailed schedules e.g. Mixed Use Zone can contain objectives; and other residential zones include variations to Cl. 54 & 55 (ResCode) that could potentially support landscaping objectives.

Zones primarily relate to the control of land use and generally are not the most appropriate planning mechanism for incorporating information about greening, however the exception is the Activity Centre Zone (ACZ) and Capital City Zone. The ACZ is used specifically for developments in Central Activities Areas, Principal Activities Areas, Major Activities Areas and Specialised Activities Areas (DPCD 2012). The ACZ implements the strategic directions for an activity centre and dispenses with applying multiple zones and overlays at a centre (DPCD 2009). The ACZ is not used in the Inner Melbourne councils. The Capital City Zone is used in the City of Melbourne and City of Port Phillip.

The advantage to incorporating principles to achieve vertical and rooftop greening for Activity Centre or Capital City Zones is that these principles would also be incorporated into

structure plans and conditions for development. However the disadvantage of this option is that incorporating changes into these zones would be time consuming and difficult and this may not be warranted compared to other planning system changes which would provide consistency across a municipality rather than applying just to one area.

Exempting rooftop and vertical greening works from requiring a permit in the Capital City Zone or Activity Centre Zone may be an option.

Amendments could be made to overlays to include green roofs, walls and facades. The schedules to the overlays may be the best place to include greening objectives and requirements. The changes could be to an existing schedule or a new schedule that encourages green along a corridor or within a specific area.

Relevant overlays include:

- Design and Development Overlay – generally precinct specific
- Incorporated Plan Overlay – site specific
- Development Plan Overlay – site specific

Information could be included in existing overlays on design objectives such as urban ecology, landscape, and design requirements – for instance a minimum size expected to be covered in vegetation.

The *Growing Up* report commissioned through the Committee for Melbourne initiative (Crawford 2010) suggested that an important contribution that planning schemes might make is to encourage green roofs and target their proliferation along corridors or in clusters. Crawford suggested for instance that provisions be made to specifically encourage green roofs around areas that will help to reduce demand on the storm-water system during severe storm events. This could be achieved through overlays. If this option was pursued it might be developed in such a way that a number of water sensitive urban design treatments are encouraged, not just green roofs.

In relation to developing a new overlay solely addressing greening, it should be noted that it would be difficult to influence State Government to create a new overlay. Even making changes to an existing overlay could require a lot more effort from a Council than changing a local policy, and a municipality may get a greater impact from a local policy that supports green roofs, walls and facades, more so than an overlay (as the effect of a change in the overlay would only be applicable to the parts of the municipality covered by that overlay). It can be argued however that an amendment to an overlay is more useful than amending residential design guidelines, because overlays ensure that all buildings are captured. The City of Melbourne has recently created a Design and Development Overlay that affects the Southbank area which includes a reference to green roofs and walls and states specifically in the decision guidelines: *'Whether the development will provide a microclimate where street trees, green roofs, and green walls can flourish.'*

Existing Design and Development Overlays (DDO's) can also include either discretionary or mandatory height controls.

**Mandatory height controls:** Buildings in these overlays that are at or above these height limits cannot add further building storeys which can result in underutilised and unattractive rooftops. An opportunity exists to create an exemption for green roofs (and associated features) where mandatory controls apply in these overlays. Often architectural features and building services are exempt from these height controls, or are often exempt to a certain height above the maximum building height (eg: 4 metres) and to a certain area (eg:

10% of the roof area). This would allow the building owner to utilise their roof without creating development that might conflict with the design objectives of the DDO. Clear definitions of what architectural features are considered part of a green roof would be needed.

**Discretionary height controls:** Where DDO's have discretionary height limits an application can be approved above the height limit if it meets the design objectives and outcomes of the schedule. There is an opportunity here to require a green roof where development is proposed above the discretionary height. This requirement could be located in the outcomes section of the DDO.

## Planning Scheme Incentives

The process of considering planning permit applications provides opportunities for giving incentives to those applicants intending to incorporate green roofs, walls and/or facades into a development. This can be through waiving planning application fees, providing concessions in the planning scheme, fast tracking planning applications, or providing exemptions to planning permit requirements.

**Waiving planning fees** for planning applications proposing green roofs, walls or facades could be used as an incentive. However it would only be appropriate for applications that include only a green roof, wall or facade and no other works. It would also have resource implications for councils. If this option was pursued, Councils could potentially argue the case to waiving the fee under the Planning and Environment (Fees) Interim Regulations 2011, under the suggestion that: *"in the opinion of the responsible authority the payment of the prescribed fee is not warranted because the application or determination imposes on the authority no appreciable burden or a lesser burden than usual."*

**Concessions** in the planning scheme would mean allowing a developer a variation on one aspect of the planning scheme (for instance minor variations in height or an increase in the footprint of buildings) in exchange for greening, especially if the greening was of a certain standard and size to ensure other benefits, such as stormwater management and meeting permeability objectives. Another possible concession would be to reduce the private open space requirements for multiple dwellings if an accessible green roof is incorporated. A concession could also be considered by excluding particular features of building from the building envelope, for instance a greenhouse on a roof might not count against floor area, or set back limits. Currently there is scope to allow some variation on height controls (as long as the control is not mandatory) in built form controls and potentially something similar could be developed to provide a specific variation for green roofs.

An example of a local built form control follows:

*Buildings and works. Height.*

*Buildings and works are considered to meet the design objectives for height if:*

*\* They do not exceed the preferred maximum height specified in the table to this schedule.*

*\* Architectural features such as domes, towers, masts and building services do not exceed the maximum height by more than 4 metres and do not exceed 10% of the gross floor area of the top building level, except for DDO1-5*

Providing a guidance that allows for structures associated with green roofs, walls and facades (similar to the way the above example refers to architectural features) may enable

the uptake of these instead of having to provide these elements within the Design and Development Overlay (DDO) envelope (whether it is mandatory or discretionary). The downside is that each DDO schedule would need to be modified. Some DDOs will refer to design objectives encouraging landscaping within setback areas and it would be worth exploring whether specific DDO schedules could be modified to include a design objective encouraging green roofs, walls or facades.

Councils tend to be wary of providing concessions, with concerns that these are often abused by applicants or that they can set a precedent, which whilst applicable to one site, may not be appropriate for others.

**Fast tracking** planning applications is potentially another incentive for development of green roofs, walls and facades. All IMAP Councils have fast track planners and the City of Port Phillip, for instance, has a list of items to be fast tracked, including solar panels, water tanks and wind turbines. Potentially green roofs, walls and facades could be added to a fast track list. Fast tracking basically provides approval without requiring advertising. However Council would need to be satisfied that there is no impact - which can be difficult to prove, with our current understanding of green roofs, walls and facades, especially as these types of infrastructure all vary from site to site. It would be difficult to create one simple rule for which roofs, walls and facades designs would be eligible for fast tracking. In addition, another major issue is that many green roofs, walls and facades will be submitted for planning approval as part of a larger project, and whole projects could not be fast tracked, only the greening component, which would probably mean there wouldn't be any real incentive resulting. If the works were a simple greening addition they may not trigger a permit anyway. However as fast tracking is a matter which can be achieved outside an amendment to the planning scheme, and can be instigated by Councils directly, it is quicker to implement than many other options. An advantage to councils in using fast tracking, as opposed to other incentives such as exemptions, is that because the decision whether to fast track an application is made on a case by case basis, they can be treated as normal applications if a problem arises.

Exempting permit requirements or advertising will require an amendment to the zone/overlay content which could be a Ministerial Amendment if it's the zone or overlay, or Council driven if it's in a Schedule to those clauses.

For both fast tracking or concessions a major drawback is that it would be difficult to ensure that the applicant followed through to a satisfactory level on what they said they would do. If a permit is required, then conditions can be used to ensure proper installation and the ongoing maintenance; although these conditions are sometimes onerous on Councils in terms of enforcement and resources. In addition, there are no mechanisms for ensuring longevity of the greening even if its existence could be checked at completion of the build. This leaves the approaches open for abuse as applicants could represent to Councils that they would provide positive greening outcomes in order to warrant the fast tracking or concessions, and ultimately not deliver these in the longer term.

**Exempting certain works** associated with green roof, wall and facade constructions from requiring a planning permit, within certain limits, is an alternative way to create an incentive via the planning system. *Clause 62.02-1* and *62.02-2* set out exemptions from permit requirements in every planning scheme in Victoria relating to the construction of a building or the construction or carrying out of works.

*Clause 62.02-1* outlines 'Buildings and works not requiring a permit' and includes gardening. *Clause 62.02-2* outlines 'Buildings and works not requiring a permit unless specifically

required by the planning scheme' and include domestic services normal to a dwelling, a rain water tank with a capacity of not more than 4500 litres and repairs and routine maintenance to an existing building or works, for example.

Inclusion of an exemption for small green roof, wall and facade infrastructure in Clause 62.02-2 could override any requirement in the planning scheme unless there is a specific planning permit trigger that requires these buildings and works to require a permit. This option could be combined with additional triggers in the Heritage Overlay and Neighbourhood Characteristic Overlay to ensure that green roofs, walls or facades don't adversely impact in sensitive areas.

If a total or part exemption for green walls, roofs and facades from requiring a planning permit is not considered appropriate, the removal of further steps, such as notice and review (advertising of the application) could occur. As such, if the construction of a green roof, wall or façade is the only permit trigger then exemption from notice and review requirements would reduce the planning process timeframe, advertising costs and third party appeal rights.

Amendments to *Clause 62* would require definitions of green roofs, walls and facades to be included in the planning scheme, including the scale of them (for instance, very large installations might be excluded). *Clause 72* lists general terms which may be used in a planning scheme and provides a definition for each. Including a definition of green infrastructure such as green roofs, walls and facades will give clarity for decision makers and applicants when determining whether or not a planning permit is required.

Amending *Clause 62* would encourage green roofs, walls and facades by cutting red tape and removing obstacles that may dissuade their construction. However it would be difficult to develop an amendment unless clear definitions are developed of which types and sizes would be eligible for exemption. Such clarity is needed to avoid confusion and conflict with members of the community who do not get notified but feel they are affected by the works.

## Mandating Green Roofs, Walls or Facades

The planning system can be used as an instrument to require rooftop or vertical greening in particular circumstances, this is an option that has been deployed overseas, but not yet in Australia. The box below outlines lessons from this approach from the German experience.

### **Opportunities and limitations of mandating greening through planning regulations** (based on a review by Ngan 2004)

#### **Opportunities**

- Integrating green roofs into development regulations is useful when financial green roof incentives are not possible because of budget constraints.
- Regulations are especially effective in new development areas where all buildings are subject to a development approval process.
- Some German cities require that all flat roofs on public buildings be greened as an example to encourage the private sector.

#### **Limitations**

- Some property owners and developers are likely to protest against the extra costs. Although life cycle costs may favour green roofs, developers with short-term investment goals may be unable to recoup their investment. However, they may benefit in ways not initially calculated. Experience gained from Stuttgart has shown that some of those who complained vehemently later proudly presented their new environmental image on company brochures.
- Regulations are difficult to implement in existing areas and for retrofit projects. Often a combination of regulations in new developments and incentives for existing areas are used to promote green roofs in all areas.
- There are some areas where green roofs are not appropriate. For example, green roofs may not be appropriate in areas where visual design consistency is promoted.



## NEXT STEPS

When determining the appropriate policy options for any particular agency or jurisdiction, the following needs to be considered:

- The larger context of the agency's priorities and goals, and leading on from that, the most appropriate definitions of green roofs, walls and/or facades to suit the intended outcome of the policy or program being implemented
- Capability to implement and support the policy
- Appropriate partners and funding sources and a long term outlook green roofs, walls and facades

### Context

When determining the appropriate package of green roof, wall and façade policies (considering all four categories– exemplify, enable, encourage and engage), it is crucial to be clear on what the jurisdiction is trying to achieve and what context the organisation is working within. This is important at many levels.

Firstly, it needs to be considered whether green roofs, walls and/or facades are the only way to achieve the outcome the agency is after, and if not, it is important to ensure any supportive policy is not at the expense of other methods to achieve the same outcome. For instance, stormwater management: Green roofs can help reduce run-off but reducing the proportion of built up land in a municipality is more effective at reducing run-off, so it would be an overall negative impact to have an incentive on green roofs that encourage developers to build over a greater amount of land than they would have originally (e.g. removing ground level garden space and replacing with roof garden space).

Secondly, it is important to be clear on what a green roofs, walls and/or façade policy is trying to achieve, so that the policy is appropriately targeted. If the purpose is to raise public awareness, a whole municipality would likely be the target, if the purpose was about using green roofs and walls to manage stormwater then hydrological models of the area might inform where the projects are most needed, and therefore which parts of the municipality should be targeted.

Thirdly, a clear understanding of the aim of the agency will also inform how the policy should be evaluated and how green roofs, walls and facades will be defined for the policy or program under considerations. Generally, measures of performance, rather than counts of square metre coverage, will be needed to prove the success, or otherwise, of the policy. This means focussing on outcomes, such as change in stormwater run-off or summer temperatures of a local area, not simply counting installations. However, counting basic items such as numbers of green walls, or area of green roofs, could be a useful measure if the walls or roofs are known to meet a performance standard. For instance, if a program only supported green roof projects that met certain specifications, such as a minimum depth of growing media, minimum maintenance agreements, and minimum vegetation coverage, and these standards were known to ensure the roof was beneficial for particular outcomes, then each roof doesn't need to be evaluated on performance, in order to evaluate the success of the overall policy. However, in Australia there is not enough scientific research yet to be able to specify criteria that lead to particular outcomes. (This contrasts with Germany, where, with decades of research, they have comprehensive green roof standards and they are more likely to be sure that a roof meeting certain technical specifications will result in particular performance standards).

It has been suggested, in the USA, that at the very least, standards for green roofs should address minimum continuous coverage of the growing media, minimum depth of growing media, key features of qualifying buildings (e.g., roof slope, building class, zoning class), and maintenance agreements (Carter and Fowler 2008). Developing such minimum standards in Victoria will help policy makers, planners and others in government, be able to apply consistent and confident decision making to green roof, wall and façade policies and programs.

### **Capability**

It is important to ensure that staff are able to implement the policy and that the policy will not set up a conflict with another area of the agency. For instance, councils could develop internal guidelines on how to address planning applications that include green roofs, walls or facades, that ensures these projects are encouraged but do not adversely affect other outcomes the municipality is trying to achieve in relation to preservation of heritage and disability action plan compliance.

### **Partners, funding and long term outlook**

It is also important to identify possible and/or necessary partners – for instance, neighbouring jurisdictions, other authorities or industry bodies.

Consideration must also be given to long term maintenance– of both demonstration projects, but also privately owned projects that are developed in the municipality. If an agency is supporting development of more green roofs, walls and facades, will it also support their long term maintenance, and if so, how? - Through punitive or supportive measures?

A long term outlook should include consideration of how research into green roofs, walls and facades could be supported. As noted above, there is limited research on Australian roofs, walls and facades, and more is needed in order to develop performance specifications (and therefore stronger definitions to use in policy and program development) and to be able to get building rating schemes to formally rate roof, wall and façade installations and recognise their contribution to ecologically sustainable design objectives. Partnerships with research bodies should be pursued where appropriate.

## **CONCLUSION**

This report provides a comprehensive review of policy options that Victorian local governments and other agencies could use to encourage greater development of green roofs, walls and facades. By adopting policies outlined in this report it is likely that behaviour can be influenced in order to encourage greater development of green roofs, walls and facades. In most cases more than one policy option should be implemented at once, and policies should be supportive and reinforcing of each other. It is important that government agencies and partner organisations work together and share their experiences as they explore and trial different policy options.

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