

Toronto's Green Roof Policy

A Review of the Process and Product

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ABSTRACT This paper explores the City of Toronto's green roof bylaw and its development within the context of other municipalities' green roof policies. It examines the process through which the policy was developed and adopted and considers the final bylaw in relation to the City's initial objectives.

INTRODUCTION

Policy development is an integral part of the overall planning process. Policies are used to provide clear guidance to municipal officials, the general public and developers on how a city's vision for its future is to be implemented (Hodge, 2003). Toronto was one of the first municipalities in Canada to develop a bylaw requiring green roofs to be built on new developments (City of Toronto, 2010.). This paper explores how the City of Toronto developed its Green Roof Bylaw. It will consider the process of writing green roof policies and look closely at the City of Toronto as an example for evaluation.

The 2006 publication *Green Roofs: A Resource Manual for Municipal Policy Makers* the Canadian Mortgage and Housing Corporation (CMHC) lays out six Phases for developing a green roof policy. These are:

1. **Introductory and awareness:** The municipality starts to consider the local benefits of green roofs. They begin to look at existing green roof policies, send delegates to green roof conferences and consider what the local environmental benefits might be.
2. **Community engagement:** The municipality, starts to raise the local profile of green roofs by meeting with community stakeholders. Possible opportunities and constraints are considered including issues such as climate and existing built infrastructure (CMHC, 2006).
3. **Action plan development and implementation:** An advisory or working committee is set up with local stakeholders. Demonstration projects might be used to gather local data. Often a database or inventory of existing green roofs within the municipality is also developed.

4. **Technical research:** A high profile test site is invariably set up to develop local data that can be used to support any policy recommendations. Researchers will identify, and attempt to quantify, the benefits green roofs can have locally.
5. **Program and policy development:** This stage looks at transforming local green roof research and knowledge into policy. Financial incentives, tax credits and density bonuses are considered.
6. **Continuous improvement:** Once a municipality has fully implemented its green roof policy and sufficient time has past for the policy to mature, it is evaluated and assessed for its effectiveness at achieving its stated goals and objectives.

ROOFTOPS OF TORONTO

Since the mid 1990's Toronto has had a number of high profile green roofs, including:

- The 9,500 square foot intensive and extensive green roof on the roof of 401 Richmond Street
- The 10,000 square foot indigenous meadow grass and flower extensive green roof over MEC's downtown store
- The Fairmont Royal York's rooftop garden, which includes about 4,000 square feet of raised planting beds that grow fresh herbs and vegetables for the hotel kitchens.
- The Robertson Building's 4,000 square foot semi-extensive green roof, which was completed on top of the mixed-use building.

(Greenroofs.com, 2011)

The City was able to leverage the publicity surrounding these projects and other successful local green roofs to develop support for a wider green roof policy in Toronto, thus entering Phase 2 of the CMHC's Green Roof policy development process.

TORONTO'S POLICY DEVELOPMENT PROCESS

As it went through the process of developing a green roof policy, the City of Toronto closely mirrored the steps outlined by the CMHC. The timeline shown



Figure 1. The Robertson Building, 215 Spadina Street, Toronto (Source: greenroofs.com)



Figure 2. Fairmont Royal York Hotel Green Roof Kitchen Garden (Source: greenroofs.com)



Figure 3. MEC Store Green Roof (Source: greenroofs.com)

in Figure 4 illustrates some of the key dates and milestones.

Initially the City put together a team of experts involving Earth and Environmental Technologies and a research group from Ryerson University (City of Toronto, 2005). They studied municipal level costs and benefits of implementing green roof technology in Toronto and conducted an extensive literature review to identify and quantify the benefits of green roofs (Doshi, et. al., 2005). This research was contained within the *2005 Report on The Environmental Benefits and Costs of Green Roof Technology for the City of Toronto* released by Ryerson University.

The team began by collecting information on different types of buildings in Toronto that could accommodate green roofs. This information was modeled and applied to an inventory of existing flat roofs over 350 square metres in the City (Doshi, et. al., 2005). The database of existing flat roofs Toronto was used to determine the potential benefits green roofs could generate city-wide, if 100% of the roofs were converted. The researchers assumed that at least 75% of each roof would be greened with an extensive green roof system and would achieve a stormwater coefficient of less than 40% (City of Toronto, 2005). Based on these assumptions, there would be over 5,000 hectares of green roofs in the city.

The researchers then attempted to monetarily quantify the values and benefits of a transformation of this scale, focusing on the potential impacts on combined sewer overflow, improved air quality and reductions in energy use and urban heat island effect (See Figure 8) (City of Toronto, 2005). Although the scenario was an idealized one, it provided enough evidence to support the promotion of green roofs in the City and to conduct further research into and development of a green roof policy for Toronto. The City thus began work on a staff report encouraging green roofs in Toronto. The report, entitled *Making Green Roofs Happen*, was released in 2005 and summarized arguments and research that would be present to the City's Roundtable on the Environment in early 2006 in support of the development of a green roof policy. The report also considered some of the other major green roof policies in place at the time and was used to inform all stakeholder meetings.

Figure 4. Key events in the development of Toronto's green roof policy and bylaw.



Figure 5. Average Monthly Precipitation in Toronto (Adapted from: The Weather Channel, n.d.)

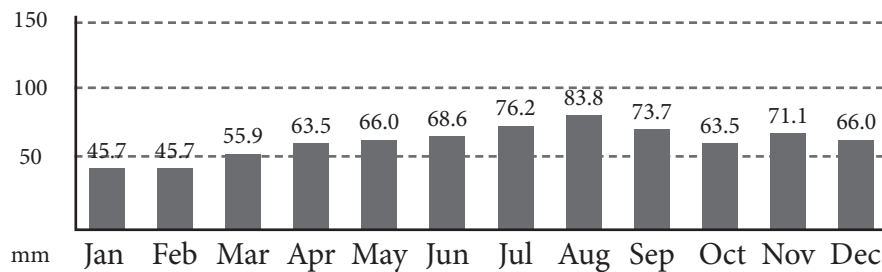


Figure 6. Buildings in Toronto with roofs over 350 square metres as of 2005 (Source: Doshi, et. al., 2005)

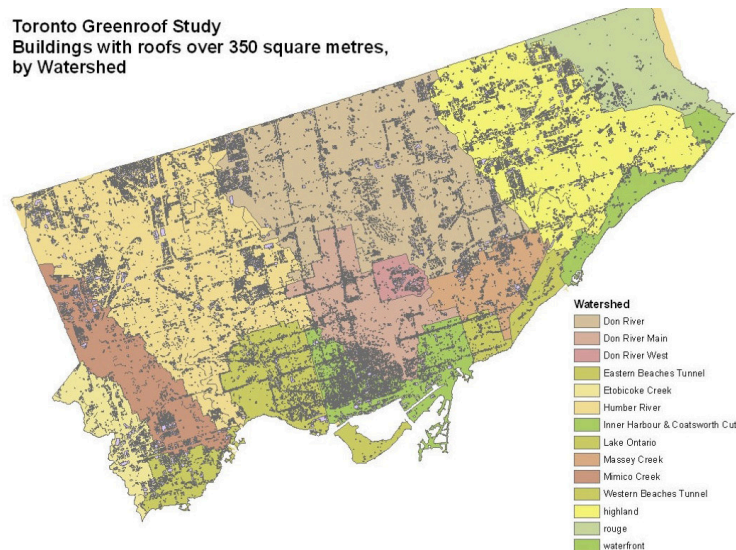
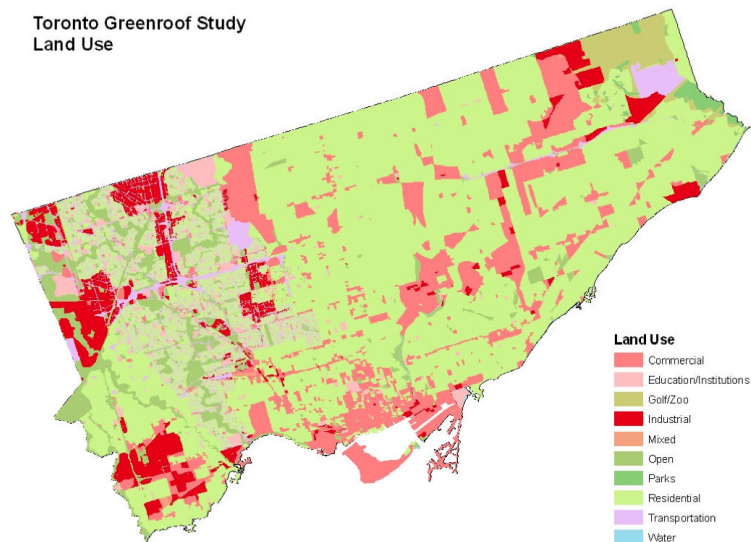


Figure 7. Land use map of Toronto as of 2005 (Source: Doshi, et. al., 2005)



GREEN ROOF POLICIES ACROSS THE GLOBE

The cities included as precedents in *Making Green Roofs Happen* (City of Toronto, 2005) included:

Portland, Oregon, U.S.A.: The focus of Portland’s efforts has been stormwater management. The City levies a fee per 1000 square feet of impervious surface on each property per month. It promotes green roofs as one way of achieving a reduction in stormwater runoff. The municipality is leading by example by requiring all new city-owned buildings to have a green roof coverage of at least 70%. In addition, they fund demonstration projects, outreach and educational programs and provide technical assistance.

Chicago, Illinois, U.S.A.: Chicago’s 2001 Energy Conservation Code stipulates minimum solar reflection standards for all new and retrofit roofs and suggests that green roofs are an appropriate way to achieve this. Although the City does not directly require the construction of green roofs on all projects, they can require them on projects that receive public assistance through their Building Green/Green Roof policy. Buildings that are granted density bonuses through this policy are also required to green the greater of 50% of the roof or 2,000 square feet (185.8 metres squared).

Basel-City, Switzerland: Focusing on habitat provision, the City has required all new and renovated flat roofs to be greened since 2002. The City also promotes research on biodiversity on green roofs through grant programs to support technological improvements and design specifications.

Stuttgart, Germany: The main motivation for developing green roofs in Stuttgart was air quality. The city is located in a valley where pollution settles, a problem that has only been made worse by urbanization. In addition to requiring green roofs to be installed on public buildings, the City provides financial incentives for green roof development on private roofs. They also require all new flat and slightly sloped roofs to be extensively greened.

STAKEHOLDER WORKSHOPS

In order to facilitate the development of a strategy for implementing green roofs in Toronto, workshops

were held with local stakeholders to obtain input on possible green roof policies. The workshops involved city staff, green roof suppliers and designers, building owners and managers, as well as developers and builders, and they covered questions such as: What is a green roof? What are the barriers to the development and construction of green roofs in Toronto? What are the solutions to the barriers? (City of Toronto, 2005)

The City presented a number of potential policies to the workshop participants. These are summarized in Figure 10. Based on the feedback received from the participants, the policy recommendations on the right side of the table were made to the Roundtable on the Environment. The City had originally been contemplating requiring 75% coverage of the roof footprint as a minimum standard. However, the workshop participants suggested that this was too high and might discourage development, especially with retrofit projects. At the same time, they did not want staff to become burdened by applications for projects with minimal coverage and wanted to ensure tangible benefits would be achieved with each of the projects. Based on the recommendations of the workshop participants, it was therefore decided to recommend a policy that required 50% as the minimum coverage, which was consistent with the requirements of LEED (City of Toronto, 2005).

Policy Option Proposed to Workshop	Policy Recommendation Based on Feedback
75% continuous green roof coverage	50% continuous coverage (consistent with LEED)
Green roofs should be installed on "flat roofs" (>2% slope) as a priority	Green roofs should be installed on roofs with a slope of up to 10% as a priority
Maximum runoff coefficient of 40%	Maximum runoff coefficient of 50%
Green roofs should have a depth of at least 150mm	Green roofs with a depth of at least 150mm are preferred however a depth 80mm acceptable
Green roofs should be installed over air conditioned spaces that are heated and cooled	Green roofs should be installed over spaces that are heated
Green roof systems should be designed and installed according to manufacturers' recommendations	Green roof systems should be designed, installed and maintained according to manufacturers' recommendations and designers' requirements

Figure 10. Comparison of policy recommendations proposed to workshop attendees and final recommendations (Summarized and adapted from: City of Toronto, 2005)

Concerned with the feasibility of building green roofs on sloped surfaces, the City considered prioritizing greening flat roofs. However, based on the feedback from workshop participants and examination of the sloped green roof on York University's Computer Science Building, a policy that prioritized all roofs with a slope of up to 10% was eventually recommended (City of Toronto, 2005).

The initial suggestion made in the Report on the Environmental Benefits and Costs of Green Roof Technology for the City of Toronto by the Ryerson University team of researchers - that green roof systems should have a maximum runoff coefficient of 40% - was reconsidered due to recent monitoring data, which suggested that green roofs in Toronto are only likely to retain 50-55% of runoff, not 60%. The final recommendation relating to this topic also focused on the green roof system as a 'holistic whole' able to achieve runoff reductions rather than just the green roof itself.

Although initially considered, the idea of only requiring green roofs over spaces that were heated and cooled was quickly dismissed. Almost all inhabited buildings in Toronto are heated, however a significant number do not have cooling systems and, as such, many would have been excluded from the bylaw.

Finally as its initial research had suggested that there were some obstacles to insuring green roofs, the City proposed recommending that green roofs be developed only according to manufacturers recommendations. However, the workshop participants suggested that this recommendation be reconsidered to include other professionals involved in the green roof design process, such as engineers, architects, landscape architects and horticulturalists. Based on their work, the City's research team used the *Making Green Roofs Happen* (2005) report to put the following recommendations forward to the Roundtable on the Environment.

FINAL GREEN ROOF POLICY, TORONTO 2010

In the end, the City's green roof policy was implemented as a by-law requiring green roofs on all new developments with over 2,000 square metres of gross floor area (City of Toronto, n.d.). The bylaw took effect on January 31, 2010 and applies to commercial, institutional and residential buildings; however, any development required to build a green roof can apply for an exception "provided that a cash-in-lieu payment of \$200/m² is made for the reduced green roof area" (City of Toronto, n.d. para. 8).

The coverage requirements were developed based on a graduated scale ranging from 20% to 60% of the available roof area (City of Toronto, n.d.). The specific coverage required for each gross floor area is shown in Figure 12 and illustrated in Figure 13. However, there are a number of exceptions included within the bylaw, including residential buildings that are less than 6 storeys and the roofs of towers with floor plates smaller than 750 metres squared. Figures 12 and 13 on the following page illustrates the sliding coverage scale of the policy in greater detail.

CONCLUSION

Toronto's green roof policy is a big first step towards promoting green roof technology as part of sustainable development practice. It was developed with the best of intentions and the merits of green roofs and a green roof policy in Toronto were thoroughly researched; however, the final policy fails to reflect the rigorous background research that supported its development. The bylaw's use of a sliding coverage scale makes no appearance in any of the background research or policy recommendations put forward to the Roundtable on the Environment. There is no clear reasoning laid out for what appear to be arbitrary percentages allocated to arbitrary building sizes. In addition, it appears as if the bylaw was designed in such a way that if a developer was set against building a green roof it would be relatively easy not to build one, through cash-in-lieu payments.

While the bylaw was a good first step, the City of Toronto ultimately needs to move towards CMHC's sixth phase of green roof policy development and evaluate the effectiveness of the policy and improve upon it (CMHC, 2006).

Gross floor area (size of building)	Coverage of available roof space (size of green roof)
2,000 – 4,999 m ²	20%
5,000 – 9,999 m ²	30%
10,000 – 14,999 m ²	40%
15,000 – 19,999 m ²	50%
20,000 m ² or greater	60%

Figure 12. Green roof coverage requirements for Toronto's green roof bylaw (Source: City of Toronto, 2010)

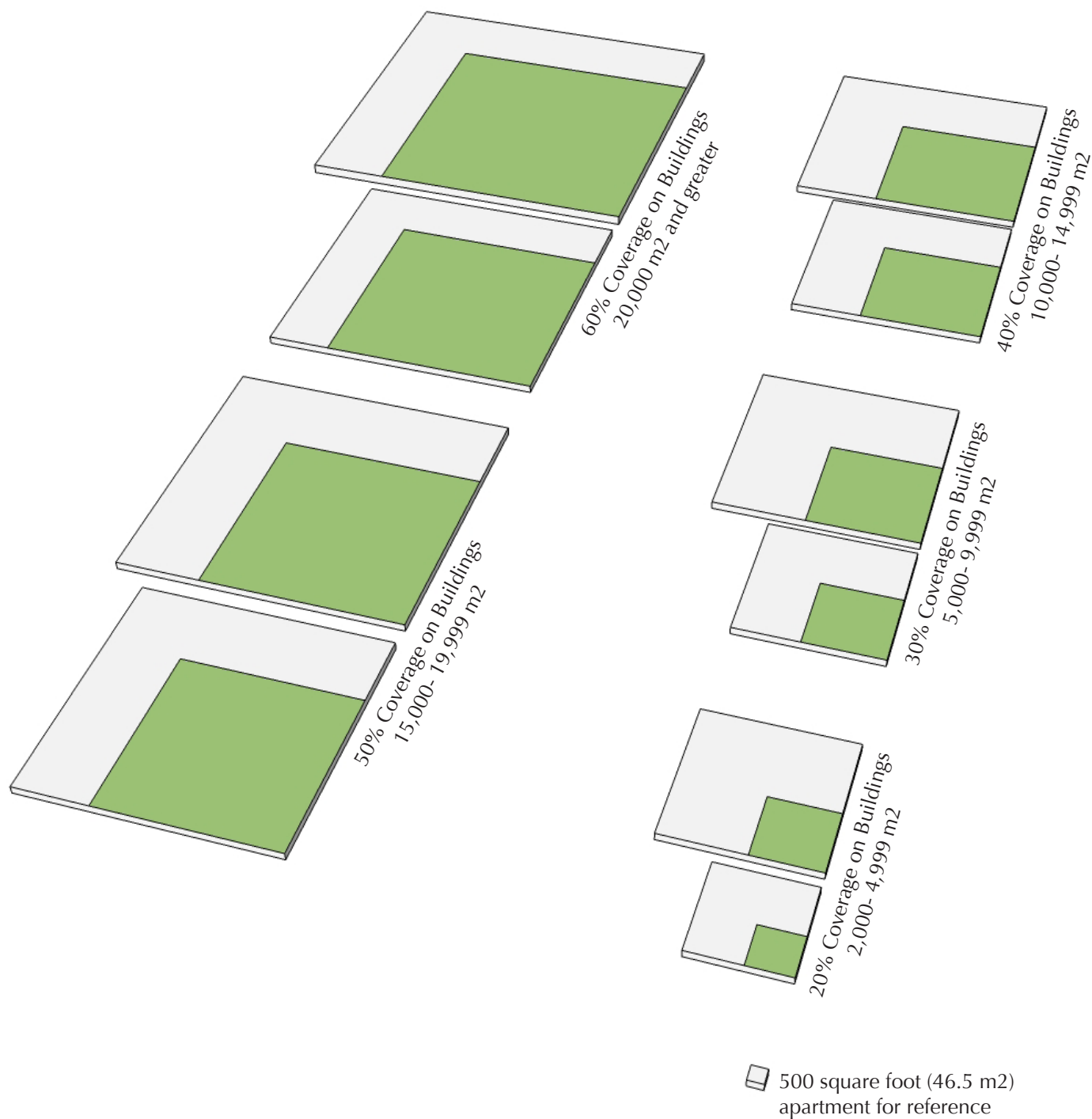


Figure 13. Illustration of Toronto's Green Roof Policy sliding coverage scale. (Adapted from: City of Toronto, 2010)

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