



Green Roof Policy Review &
Benefits of Implementation

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A Review of Green Roof Policy Development in Toronto and Chicago and the Co-benefits of Green Roof Implementation

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This literature review will analyze the different approaches to green roof development policies through a jurisdictional scan of Toronto and Chicago. For the purposes of promoting policy action, this review will emphasize the various co-benefits of green roofs that have been identified by academics and policy experts.

Green Roof Policy

In most cases, a municipality can take three different approaches to green roof initiatives. The first option is to develop direct incentives, such as financial assistance (Shiah, 2011), which could increase incentives across a broader population. The second option is to develop indirect incentives, such as the reduction of utility fees or tax breaks (Shiah, 2011). Unlike direct incentives, this option could encourage those who might have already been considering green roof developments to take the next steps towards implementation. The third and final option would be to create regulatory requirements, such as landscaping requirements or mandating a compulsory green roof for public buildings (Shiah, 2011). Rather than creating an incentive, this option would enforce people to make efforts to meet green roof requirements. Policies intended to increase green roof development can use minimum requirements for storm water management or solar reflectivity, as seen in Toronto and Chicago respectively (Malina, 2011).

Toronto and Chicago are leading north American cities in the field of green roof policies. While the mitigation benefits of green roofs are known, this has not been a significant policy driver for many cities (Pearce & Semaan, 2016). The implementation of green roofs in Toronto and Chicago were influenced by four key themes: leadership

policy tools, incentives, and publicity and education (Loder, 11). Each city has had a different approach to developing their policies surrounding green roofs; however, the underlying motives and the ultimate benefits of their green roof developments have been quite similar.

Toronto

The City of Toronto's green roof policy development was largely affected by political forces before a more conservative mayor was in power (Loder, 11). The policies were developed through the use of cost-benefit studies and stakeholder workshops, which helped illustrate public support for green roof legislation (Loder, 11). This was soon followed by a commissioned report on the benefits of green roof adoption by Ryerson University that allowed the City to create an internal report (Loder, 11).

The intense lobbying by Green Roofs for Healthy Cities (GRHC), a green roof industry association based in Toronto, played significant role in initiating conversations about green roofs in Toronto (Loder, 11). These conversations were able to gain the support of a champion, Deputy Mayor Pantalone, who has helped keep green roofs on the environmental agenda with a policy focus on the economics benefits and opportunities to mitigate climate change (Loder, 11). The foundation of Toronto's green roof policy development was through the support of three main policy and planning documents: The Environmental Plan, The Official Plan, and the Wet Weather Flow Master Plan (Loder, 11).

In 2009, the city of Toronto put bylaws in place to require the construction of green roofs in new commercial, residential and industrial developments (Pearce & Semaan, 2016). Under the new City of Toronto Act, "the City has power to use municipal planning tools to encourage or enforce sustainable building practices" (Loder, 11). It is now required for all new City buildings and roof replacements to consider green roofs where feasible (Loder, 11). This was supported by a pilot incentive program to increase feasibility and further encourage green roof initiatives (Loder, 11).

The 2016 Annual Green Roof Industry Survey recognized Toronto for having the most square footage of green roofing installed (DCN News Services, 2017). While the outcomes of policy development have been quite positive, there has been an ongoing issue of maintenance given the costs associated with upkeep (Loder, 11). To add, a change in leadership has influenced more conservative climate policies.

Chicago

Similar to Toronto, Chicago's city hall installed a green roof in 2000, along with twelve other City buildings (City of Chicago, 2006b). By 2004, green roofs were being considered as a sustainable option to address the challenges of managing storm water runoff in Chicago (Pearce & Semaan, 2016). This was further encouraged through legislation that passed in 2007 which required large commercial and industrial properties to take measures to manage their storm water runoff (City of Chicago: Department of Water Management, 2007). The City of Chicago now requires that private developers request public assistance to meet minimum green building requirements, of which green roofs are an option (Loder, 11). The City developed the Green Roof Improvement Fund, a grant program, to share up to 50% of the development and installation costs for green roofs (City of Chicago 2006a).

In contrast to Toronto's approach, the City of Chicago's environmental initiatives were largely influenced by a top-down approach (Loder, 11). Similarly, however, political forces by the mayor in power played an instrumental role in the development of green roof policies in Chicago (Loder, 11). Strong leadership and the promotion of green roof benefits influenced the development of green roof policy development (Loder, 11). Mayor Daley's leadership approach created incentives to prioritize green initiatives, allowing green roofs to be incorporated in the Chicago Climate Action Plan which had a citywide goal of 6,000 green roofs by 2020 (City of Chicago, 2006b). At present, the City of Chicago's main challenge is to reduce the vulnerability of changes to policy under new leadership (Loder, 11).

Benefits of Green Roofs

Economic benefits

Green roofs have been identified as a means to reduce costs in a number of ways. For instance, the regulating properties of the vegetation and substrate layers can help green roofs gardeners avoid additional costs (Nurmi et al., 2016). Furthermore, using roof tops for production purposes reduces the need for land use conversion, making it an attractive mitigation measure (Malina, 2011).

Roof top gardens can provide a sustainable and reliable source of food for the community. To add, the community could participate in stakeholder engagement sessions to identify specific needs. This could provide a source of nutritious, local-grown food, which would be particularly beneficial given the rise of food insecurity in the Guelph-Wellington area (Guelph & Wellington Task Force for Poverty Elimination, 2016).

While the upfront costs of green roof development are higher than those of conventional roofs, there is an added value to properties that have green roofs (Malina, 2011). Green roofs can positively affect property spaces in surrounding areas based on the view and closeness to the green space, thus their benefits outweigh the costs (Nurmi et al., 2016).

Environmental

Not surprisingly, green roofs can provide many environmental benefits. They can affect the temperatures outside and inside buildings. Buildings with green roofs rely less on heating, ventilation and HVAC systems which can prolong the life of their services (GRHC, 2017). Research has showed cooler temperatures on green roofs when compared to conventional roofs (Pearce & Semaan, 2016). Rooftop vegetation covers black rooftops and absorbs the light from the sun, helping reduce the Urban Heat Island Effect (GRHC, 2017). Buildings with green roofs also experience thermal benefits

allowing them to moderate temperatures inside buildings (Pearce & Semaan, 2016). In urban environments across New York, green roofs have helped moderate heat gain (Pearce & Semaan, 2016). In addition to the energy savings, green roofs can also provide noise insulation, reducing the need for wasteful materials and costs associated with conventional insulation methods (Nurmi, Votsis, Perrels, & Lehvävirta, 2016).

Green roofs can play an important role in fighting against the effects of climate change. Studies have quantified the potential of green roofs to reduce greenhouse gases (Nurmi et al., 2016). Furthermore, green roofs can be considered a best management practice for future infrastructure development as a means to mitigate climate change. Green roofs can reduce storm water runoff and reduce the stress on sewer systems during periods of heavy rainfall, retaining up to 90% and 40% of precipitation in summer and winter respectively (GRHC, 2017). Due to the sustainability of green roofs, they can contribute to landfill diversion, reducing a city's waste, while also capturing airborne pollutants to improve urban air quality (GRHC, 2017). Animals can also benefit from green roofs as a result of enhanced biodiversity (Malina, 2011). Chicago's green roofs have proved to provide a source of habitat for many animals (Pearce & Semaan, 2016). Additionally, rooftop gardens could have the potential to promote pollination and improve pollinator health.

Social

Green roofs can create a space for people to gather and produce local food while also creating new job opportunities (GRHC, 2017). The Carrot Green Roof & Garden Project has been an ongoing Toronto-based project that began in 1996 (Carrot Common, 2017). It has become a multi-purpose space for people to meet, establish a community, and share their knowledge (Carrot Common, 2017). As a result, these spaces can provide an opportunity to enhance community skills and knowledge of food production and gardening practices. To add to their value, green roofs can also be used for educational facilities and related research purposes (Malina, 2011). Green roofs,

especially in areas facing issues of food security and poverty, can be a collaborative space to identify potential considerations for increasing value of green roof spaces.

Green roofs, or more generally urban greening, are considered as a means to beautify structures and buildings, making them resemble a tourist location (GRHC, 2017). In Chicago, green roofs have been used as a promotional tool symbolizing the city's commitment to becoming a green city (Loder, 11). This can increase the marketability of buildings with green roofs (GRHC, 2017). To add, green roofs can be installed in most climates with versatile functionality, making them adoptable in many cities (Pearce & Semaan, 2016).

Conclusion

Green roofs offer various benefits that lower long-term costs, promote sustainable environmental practices and provide a shared community space to learn and be productive. There are many cities around the world moving forward with green roof policies to reap these benefits and mitigate the effects of climate change.

It's important that a community garden space on a roof top be accessible to everyone. As such, there are important design considerations that need to be evaluated in the planning and development stages. These require further exploration based on municipal regulations and the specific needs of the community.

Works Cited

- Carrot Common. (2017). *What is The Carrot Green Roof?* Carrot Common. Accessed from <http://www.carrotcommon.com/carrot-green-roof.html>
- City of Chicago. (2000). *City of Chicago: Planning and Development 2000. Guide to the Chicago Landscape Ordinance. Planning and Development.* City of Chicago. Accessed from http://www.cityofchicago.org/city/en/depts/zlup/supp_info/landscape_ordinance.html
- City of Chicago. (2006a). *Building Green/Green Roof Matrix.* City of Chicago. Accessed from http://www.cityofchicago.org/city/en/depts/zlup/supp_info/sustainable_development.html
- City of Chicago. (2006b). *Environmental Action Agenda: Building the Sustainable City 2006.* Accessed from <http://www.urbanhabitatchicago.org/blog/chicago-2006-environmental-action-agenda/>
- City of Chicago: Department of Water Management. (2007). *Regulations for Sewer Construction and Stormwater Management.* City of Chicago. Accessed from http://www.cityofchicago.org/city/en/depts/water/provdrs/engineer/svcs/2009_sewer_constructionandstormwatermanagementrequirements.html
- City of Toronto. (2000). *Clean, Green and Healthy: A Plan for an Environmentally Sustainable Toronto.* Environmental Task Force. City of Toronto. Accessed from http://www.toronto.ca/council/environtf_clean_green.htm
- DCN News Services. (2017). "Toronto takes top spot for most green roofing installed: survey." Daily Commercial News. Accessed from <http://dailycommercialnews.com/en-US/Projects/News/2017/7/Toronto-takes-top-spot-for-most-green-roofing-installed-survey-1025815W/>
- Green Roofs for Healthy Cities.* GRHC. 2017. Web. Accessed from <https://www.greenroofs.org/about-green-roofs/>
- Guelph & Wellington Task Force for Poverty Elimination. (2016). *Position Statement: Household Food Insecurity.*
- Loder, Angela. *Greening the City: Exploring Health, Well-Being, Green Roofs, and the Perception of Nature in the Workplace.* University of Toronto, ProQuest Dissertations Publishing, 2011. Accessed from <http://go.utlib.ca/cat/9017555>

- Malina, C. (2011). "Up on the roof: Implementing local government policies to promote and achieve the environmental, social, and economic benefits of green roof technology." *Georgetown International Environmental Law Review* 23(3), 437-464. Accessed from <http://heinonline.org.myaccess.library.utoronto.ca/HOL/Page?handle=hein.journals/gintenlr23&collection=journals&id=448>
- Nurmi, V., Votsis, A., Perrels, A., & Lehvavirta, S. (2016). "Green Roof Cost-Benefit Analysis: Special Emphasis on Scenic Benefits." *Journal of Benefit-Cost Analysis*, 7(3), 488-522. doi:10.1017/bca.2016.18
- Pearce, A. & Semaan, M. *Assessment of the Gains and Benefits of Green Roofs in Different Climates*. Virginia Tech, Procedia Engineering, vol. 145, p.333-339. 2016. Accessed from <https://doi.org/10.1016/j.proeng.2016.04.083>
- Shiah, Guan Chyun. (2011). *The Green Roof Promotion Strategies for the Municipalities*. Applied Mechanics and Materials, vols. 71-18. Accessed from <https://doi.org/10.4028/www.scientific.net/AMM.71-78.3892>

Works Consulted

- Banting D., Doshi H., Li, J., Missios, P., Au, A., Currie, B. & Verrati, M. (2005). *Report on the Environmental Benefits and Costs of Green Roof Technology for the City of Toronto*. Ryerson University. Accessed from https://www1.toronto.ca/city_of_toronto/city_planning/zoning.../chapter2.pdf
- Getter, K. L., & Rowe, D. B. (2006). The role of extensive green roofs in sustainable development. *HortScience*, 41(5), 1276-1285.