Green Roofs and Infrastructure: Challenges, Opportunities and Gaps

MBAR
MOBILIZING *BUILDING ADAPTATION AND RESILIENCE*

Defining a 'Green Roof'

The term 'green roof' in this research addresses everything from roof gardens with contained planters to a roof completely covered in plants. This definition is meant to cover all contexts for placement of plants on a roof.

Benefits of Green Roofs

Aesthetic
- Beautification
- Greening spaces

Air
- Cool the air
- Clean the air

Amenity
- Increase outdoor space
- Usable social space

Biodiversity
- Increase
- Ecological resilience

Garden
- Community gardens
- Urban agriculture

Landscape
- Replace pervious surfaces lost to development

Sound
- Acoustic performance

Stormwater
- Filter stormwater
- Reduce peak runoff

Temperature
- Reduce urban heat island effect

Research Parameters

Research Focus

This research focuses on challenges, opportunities and gaps to the integration of green roofs with building infrastructure in B.C. and the potential they offer as an adaptation strategy to buffer the effects of changing climate.

Research Objectives

- **Investigate** challenges and constraints to the implementation of green roofs in B.C.
- **Explore** market supply and demand to better understand green roof industry capacity in B.C.
- **Assess** consumer and industry awareness to determine stakeholder issues and concerns.
- **Identify** current practices for installation and long-term maintenance of green roofs.
- **Discuss** potential solutions to gaps in information, processes and education.

Methodology

A series of 25 in-depth key informant interviews were conducted to gain a better understanding of the current forces at work in the green roof industry in B.C. at this point in time. Based on a literature review, questions were formulated and the interviews were divided into four categories: research and design, installation, maintenance, policy and warranty.

Challenges

- B.C. is unique with its **range of climate zones**.
- At present in B.C. there are currently almost **no policies** or by-laws surrounding the implementation of green roofs.
- Green roofs are **expensive**.
- Some **strata buildings** may experience the challenge of **not having direct control of their funding** and have diffculty financing basic building repairs.
- Green roof **maintenance and potential repair** may be low on the list of priorities or is just not in the budget.

Gaps

- **Clearly distinguish the responsibilities of the roof industry**, which has well established measures of performance, and those of the green roof industry, which does not install green roofs.
- Greater design attention needs to be paid to provide **consistent technical details**.
- In the case of the roofer and the green roofer, **lack of respect** for the work the other does can potentially lead to failures that affect the reputations of both.

Steps to Help Facilitate the Construction Process

Preparation
- Leak detection test done before green roof is installed, ideally.
- Sweep roof surface clear of all debris before green roof is installed.
- Do not use roof as a staging area once the roof has been inspected for leaks.
- Provide awareness for different trades as to what is involved with green roof installation.

Coordination
- Careful coordination of trades working on the roof once the membrane has been approved.
- Timing can be a critical issue.
- Communicate clearly on proper sequencing of construction and installation phases.
- Coordination of trades: HVAC, electrical, landscape contractors, etc... to prevent damage to roof membrane and green roof elements.
- After green roof installation check for deficiencies and remedy prior to final approvals.

Installation
- Materials will need to be lifted onto the roof with a crane.
- Careful handling of product during installation.
- Protect the membrane when working on it.
- Where possible use scissors instead of sharp tools like knives that can damage the membrane if they slip.

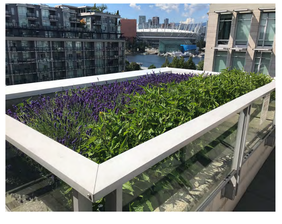
Maintenance

"The maintenance is still relatively high and if we don't allow for enough time to maintain it, then they can go downhill with the establishment of weeds, uneven irrigation or bare patches. I would expect that if any green roof grows with zero maintenance for a couple of seasons it could start to develop problems that could wreck parts of it." – a landscape contractor

Maintenance Challenges

- Cost
- Access
- Neglect
- Watering
- Animals
- Wind
- Cigarettes
- Inappropriate plants
- Other trades

The increase in frequency and intensity of extreme weather events have prompted the need to *re-contextualize the pros and cons of green roofs*.



Building Type & Structure

Design and implementation of green roofs differ with different building occupancies and different building structures: wood frame vs concrete. Building occupancy classification often determines the most appropriate type of green roof.

Residential: Single Family

In 2018 the City of Vancouver issued 1200 permits for single family residential homes, 10 had green roofs.
(City of Vancouver data)

Residential: Condominium/Strata

"We have no shortage of buildings across the Lower Mainland that are in a state of disrepair or not properly maintained just because of the housing affordability issue. Adding a component that is going to require a really high standard of care, its going to jeopardize these buildings."
– an industry leader

Commercial

"We have found that lower buildings up to three or four stories do better. This is due to the city constructing all these buildings that are starting to create wind tunnels and as you get higher up are destructive. They are awful."
– a landscape architect

Industrial/Warehouse

"Then I look at a warehouse like Costco which has, I think there are 6 Costcos in the Lower Mainland, and ask:
'Why are there no green roofs?"
– an industry leader

Key Drivers for Policy

For policy to be unbiased and fair to all invested groups, interview responses identified key drivers.

"British Columbia is a very diverse place, climate-wise, and there isn't a one-size-fits-all approach to green roofing across the province. Generally, I think green roofing has not offered regional models that could work in different climate zones across the province." – an industry regulator

Climate	Choose plants based on climate zone
	Provision for climate change
	Recommend specific green roof designs for regional climate zones

"I think the policy needs to incorporate some aspect or requirement for maintenance of the green roofing that is installed on a building but ultimately policy is about driving the requirement for this" – an industry regulator

Maintenance	Verification of maintenance completion
	Required education in green roof maintenance
	Designate authority to verify maintenance completion
	Communication of maintenance requirements to the building owner

"The industry is so driven by cost and a lot of the green roofs are given to landscape contractors and there are a handful of quality, skilled landscape contractors out there. But the greater majority of landscape contractors, unfortunately, are very cost driven and don't have a high level of staff on hand." – an architect

Qualifications	Designate who can design and install green roofs
	Required educational components for design and installation
	Certifying consultant to oversee installation of both roof and green roof system

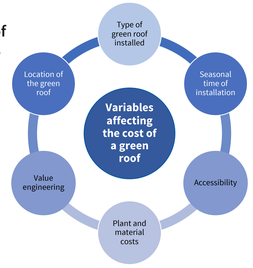
"[Green roof] policy is all about answering. Policy can answer the question of quality assurance and I think it should, but its primary purpose is to answer a different kind of question which is, 'What are we going to do about …', and the issue might be stormwater management and a woefully undersized stormwater system for the municipality." – an industry regulator

Stormwater Management	Metrics for stormwater management
	Incentivize stormwater capture
	Recycle stormwater on site

Green Roof Economics

The cost to implement a green roof system is seen as a major obstacle in the green roofing industry.


Photo: Next Level Stormwater Management



Opportunities

Recommendations

Economic

- For best practices and a successful outcome, do not cut costs on materials used or the installation process.
- Tax incentives would help to ease the impact of the capital cost to install a green roof.
- Development of a local supply chain would help to bring down market costs.

Process

- A requirement for maintenance, with municipal oversight on compliance.

Education

- The industry needs a more consistent set of educational and training requirements for those who install green roofs and then a way to enforce them.

Communication

- Better communication with the owner on how the green roof is to be maintained after installation, and after the supplier's warranty has expired.
- Smokers should be banned, or signs should be placed with explicit instructions on disposing of cigarette butts.

Caution

- Not recommended for the residential market, unless the owner is educated and aware of the responsibilities involved. The market in general needs time to mature.
- Not recommended for strata unless subsidies or incentives are offered, because of how strata corporations are structured.

Future Directions

Structural

- Lighter weight systems
- Increase built-in water retention

Ecological

- Mycorrhizal networks for long-term plant performance
- Integrate green roof with site stormwater management

General

- Longevity strategies to support 100-year green roofs
- Certified professional oversees installation of roof and green roof assemblies

Questions about this poster or interested in being involved in the MBAR project?
Contact mbar@bchousing.org

Subscribe to our newsletter at bchousing.org/subscribe

YouTube

BC HOUSING RESEARCH CENTRE