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Smart Blue Roof Applicability in the IC&I Sector for Rainwater Attenuation and Retention

March 22nd, 2018

Bernadeta Szmudrowska Credit Valley Conservation

TRIECA Conference

Smart Blue Roofs?



Next Level Stormwater Management



Industrial

Institutional

Commercial





Shift from Municipal Lands to Private Lands



Retrofitting Urban Areas with End of Pipe SWM Facilities



1. Capital costs (construction, land acquisition etc.)

2. Ongoing O&M costs (dredging, thermal mitigation etc.)

costs falling on municipalities

AN INTEGRATED APPROACH IS NECESSARY





Smart Blue Roofs

The Evolution of Rooftop Stormwater Managemenet

Conventional Flat Roof

Blue Roof

From Green to Blue

- Primary focus on green roofs in the past
- Less research attention placed on blue roofs

Conventional Roofs

Roof Functions

Rainwater collection

FLAT ROOFS = A HIDDEN RESOURCE

Solar reflectance

Roof Impacts

- Thermal transfer
- Thermal radiation
- Stormwater discharge

Shading, waterproofing and insulation

Structural Capacity

24 hr. ponding tests being conducted

structural capacity and waterproof membranes exist

Internet of Things (IoT)

Smart Cities

Air Pollution

Control of CO₂ emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection

Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing

Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care

Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care

Vital signs monitoring in high performance centers and fields.

Structural Health

Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Smartphones Detection

Detect iPhone and Android devices and in general any device which works with WI6 or Bluetooth interfaces

Perimeter Access Control

Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels

Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels

Measurement of the energy radiated by cell stations and and WiFi routers.

Traffic Congestion

Monitoring of vehicles and pedestrian affluence to optimize driving and welking routes.

Smart Roads

Warning messages and diversions according to climate conditions and unexpected events like accidents or trafficijams.

Smart Lighting

Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping

Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps

Sound monitoring in bar areas and centric zones in real time.

and the

XX

Water Leakages

Detection of Equid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis

Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location

Search of individual items in big surfaces like warehouses or harbours.

(Forbes, 2015)

Quality of Shipment Conditions

Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Water Quality

Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

to optimize the trash collection routes. Smart Parking Monitoring of parking spaces availability in the city.

Golf Courses

Selective irrigation in dry zones to reduce the water resources required in the green.

Waste Management

Detection of rubbish levels in containers

Infrastructure Canada: Smart Cities Challenge

"Making Canadian communities smarter by being innovative and using data and connected technology will strengthen communities and create opportunities to implement innovative technologies."

Putting the Smart in Blue Roofs

Technical and Financial Feasibility Study

"Automated Real-time IoT Smart Blue Roof Systems for the IC&I Sector for Flood and Drought Resilience and Adaptation"

Project Support

FEDERATION OF CANADIAN MUNICIPALITIES MUNICIPALITÉS

FEDERATION CANADIENNE DES

Region of Peel Working for you

Project Team

Ryerson Urban Water

Enviro-Stewards Engineers & Scientists

CVC's Project Goal

To assess the technical and financial feasibility of a smart blue roof system assuming that the CVC office is a typical ICI sector flat-roof building and ensuring project transferability to the broader ICI sector.

Head Office Site

Rain Water Harvesting (RWH)

 $\underline{\text{Storage}} = 5000 \text{ L}$

Source: Roof Water and Ground Water

<u>Use:</u> supply nonpotable water to toilets in the building

CVC's Existing Roof

Total roof area 644 m²

Key Project Considerations

- Urban pests
 - (mosquitoes, geese and birds etc.)
- Safety and redundancy
- IT Security Breaches
- Operation and maintenance
- Transferability to the IC&I sector
- Optimal configuration and design

Blue Roof Designs

Modular Tray System

Retrofit Hydraulic Structures

Retrofit Hydraulic Structures with Check Dams

Conceptual design of a community in Louisville, Kentucky

Uptake & Implementation

Project Phases

Phase 1 -3 completion date: March 2019

Supplementary Project Information

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The Bailey Broom Factory Re	adevelopment Project	Feasibility study	Brownfields	City of Kingston, Ontario and RAW Factory Inc.	/ \$174,800
Midland Bay Landing		Feasibility study	Brownfields	Town of Midland, Ontario	\$136,100
2017-2019 Road (Pavement)) Data Collection Program	n/a	Data collection and reporting	City of St. Albert, Alberta	\$46,000
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Project Contacts

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