

Authors:

Steve Winkelman

Green Resilience
Strategies

Edward Nichol

ACT, SFU

Deborah Harford

ACT, SFU

Taking Action on **Green Resilience:**

**CLIMATE CHANGE ADAPTATION
AND MITIGATION SYNERGIES**

NOVEMBER 20TH, 2017

Workshop Conclusions: Livable Cities Forum Pre-Event | September 17, 2017 | Victoria, BC



ACT Adaptation to
Climate Change Team



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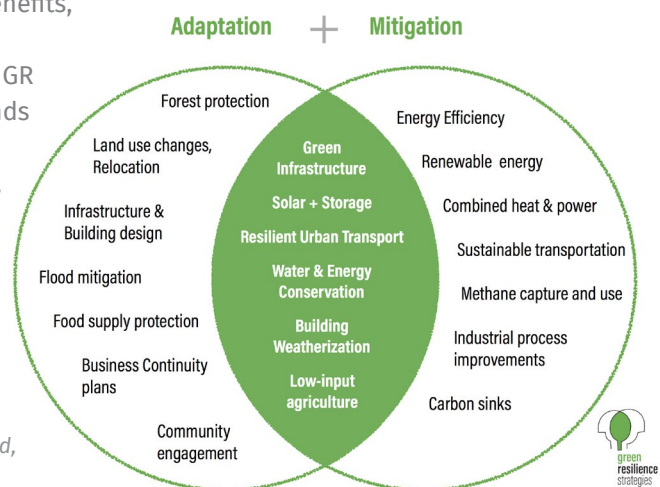
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EXECUTIVE SUMMARY

Climate change impacts are already causing environmental, social, health, and economic problems for Canadian communities, and these are projected to increase. There is widespread recognition that we must plan responses to these impacts (**climate change adaptation**), and that reducing greenhouse gas (GHG) emissions (**climate change mitigation**) is a crucial priority if we are to minimize them. Communities can maximize the effectiveness of actions and increase funding opportunities by advancing these approaches through integrated “**Green Resilience**” (GR) strategies.

This report draws together content and conclusions from a workshop entitled “Taking Action on Green Resilience” hosted by ACT, SFU and the consulting firm Green Resilience Strategies (GRS) at the 2017 ICLEI Canada Livable Cities Forum in Victoria, BC. The workshop brought together 40 public and private sector climate change practitioners from across Canada with expertise in urban planning, municipal policy, energy systems, buildings, engineering and communication. This report provides examples of GR measures, summarizes key benefits, provides insights on how to identify, fund and implement GR opportunities, and recommends new or updated research, analysis, technical assistance, incentives and regulations identified by participants as necessary to advancing GR practices.

*Green Resilience Strategies (2017)
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City of Toronto*



Presenters provided **examples of GR measures** and action areas, including energy efficiency, green infrastructure, public transit and transportation, water use, buildings, and agriculture. They also described advantages of GR, including the potential for multiple co-benefits, expanded funding sources, increased return on investments, saved time and resources, and accelerated implementation and scale up.

Participants used a **Green Resilience Matrix** framework (Figure 2) to identify opportunities to maximize the climate adaptation and mitigation (A+M) benefits of their top expenditures and investments in adaptation, mitigation and infrastructure - a “Follow the Money” approach that can help leverage infrastructure planning to advance GR and reduce the costs of critical infrastructure projects. Following this introductory exercise, participants identified a variety of GR opportunities in their home jurisdictions, including examples for infrastructure, green infrastructure, buildings, energy, and community planning.

Participants then received an **overview of funding mechanisms**, sources and approaches that municipalities can consider using to pay for GR measures, including aligning A+M funding to maximize opportunities and leveraging infrastructure finance to achieve A+M benefits. Examples of funding and finance sources and tools that have potential application for GR strategies include climate funds, capital programs and operating budgets, targeted taxes and fees, incentives and rebates, finance tools, innovative programs and federal funding sources. However, public funding only represents one quarter of capital expenditures in Canada (Figure 3) and it likely will be essential to mobilize private investment in order to implement adequate infrastructure adaptation and GHG mitigation. A multiple-benefits approach to GR can create access to funding sources beyond those designed to support climate action, and strategically packaging projects for multiple funders and investors can accelerate implementation based on policy and investor priorities.

Based on these discussions, workshop participants proposed recommendations on key needs for GR planning, funding and implementation in the following categories: Research & Analysis, Capacity Building & Technical Assistance, and Policies. Key recommendations include:

1. Pursue Research & Analysis on:

- **Trade-offs, conflicts and synergies between A and M measures** in specific sectors
- **Monitoring & evaluation of GR measures** (quantitative and qualitative, ex ante- and ex post)
- **Strategic siting of green infrastructure** to achieve multiple benefits
- Opportunities to deploy GR solutions to benefit **vulnerable populations**
- **Life cycle costs of infrastructure**, taking into account climate change scenarios
- Quantification of the A+M benefits of **microgrids** that include renewables, storage, energy efficiency, district thermal energy and combined heat and power
- Best practices for **multi-use flood barriers** to enhance public space and access to waterfronts, active transportation and ecosystem restoration
- Optimization of A+M benefits of **smart growth and transit-oriented development**
- Impacts of **disruptive technologies** and the **sharing economy** model on GR opportunities
- Incorporating resilience into the **Energy Service Company (ESCO)** model
- GR strategies for combining **insurance**, integrated planning and capital investments

2. Develop Capacity Building & Technical Assistance guidance documents, training programs and tools to help municipal practitioners and decision makers to:

- **Identify opportunities** for GR measures
- **Estimate benefits and costs** of GR measures
- Engage stakeholders and develop effective **communication strategies** for GR benefits
- **Integrate** GR into municipal plans, infrastructure projects, capital and operating budgets
- **Identify and mobilize funding** and investment sources for GR measures
- **Implement** GR measures
- **Monitor and evaluate** the impacts of GR measures

3. Promote Public Policies to:

- **Fund and support GR research** (per the above recommendations)
- **Fund and support technical assistance programs** (per the above recommendations)
- Include A+M in **professional education and certification requirements** for planners, engineers, architects, and other relevant professional associations
- Increase authority for and scope of **local improvement charges** to promote A+M
- Apply **GR screens for public infrastructure** and private investments
- Integrate A+M considerations into **capital management plans and operational budgets**
- Develop a **National Building Strategy** that incorporates GR
- Include GR measures in **community amenity requirements for new developments**
- Optimize use of **green infrastructure** to address energy, flood and urban heat concerns
- Mandate **integrated climate plans** and actions to maximize A+M benefits
- Incorporate GR principles in **urban design regulations** and guidance
- Enable zoning, land use and financial tools for **relocating housing from high risk areas**
- Account for community assets (e.g., green infrastructure) in **disaster risk reduction** support
- **Link GR policies** with other strategies: natural heritage, biodiversity, public health, etc.
- Develop **incentive-based insurance policies and pricing tools** focused on prevention and encouraging municipal action on GR

The following **messages** emerged from the workshop as priorities to guide future progress on Green Resilience:

- **Improve communication** on opportunities, costs and benefits within and between government agencies, communities, stakeholders
- **Consider education as a strategic investment**, and treat every investment as an education opportunity
- **Collaborate across institutions and silos** (governments, professions, academia, the public, companies, museums, media, etc.) to identify and advance integrated solutions

- **Address critical needs for research, technical assistance and policy** to support implementation
- **Ask and Answer the “Climate Question”** to ensure that public policies and expenditures advance low-carbon resilience
- **Follow the Money** – Leverage the budgets of multiple municipal agencies, regional bodies and public sector organizations to fund comprehensive green resilience projects and programs
- **Mobilize private investment** to support green resilience solutions
- Take a **multiple-benefits approach to green resilience to open up multiple funding sources** beyond climate change and to advance other policy and investor priorities
- Pursue both **fail-safe and safe-fail** strategies
- **Integrate community and infrastructure system design** to be flexible, redundant and accessible
- **Plan ahead to avoid the “I wish we would have ...” regret** -- use scarce funding wisely to maximize A+M benefits
- **Think beyond climate change:** Many businesses and government agencies simply want to lower energy costs and minimize operational disruption of critical infrastructure and services
- **Pursue “Strategic Opportunism”**
 - Align with and capitalize on political priorities
 - Package projects and programs for multiple funders and investors

Based on these conclusions, we recommend the following as **next steps** to assist municipalities and practitioners to build understanding and momentum for GR planning and implementation:

1. **Create a cross-country dialogue regarding** climate resilience and GHG mitigation
2. **Form working groups to advance recommendations on research, capacity building and policies** to support implementation of green resilience solutions.
3. **Conduct targeted GR workshops** for specific communities, sectors and professions
4. **Apply the Green Resilience Matrix tool** (see Figure 2) to identify opportunities to align public expenditures and advance A+M synergies
5. **Develop a GR primer** that can be used to identify implementation opportunities and of solutions in a variety of sectors and communities.

For more information on Green Resilience and related upcoming events, please contact **Steve Winkelman** of **Green Resilience Strategies** at swink@greenresilience.com or **Deborah Harford** of **ACT, SFU** at adapt@sfu.ca.

INTRODUCTION

Climate change impacts are causing environmental, social, health, and economic problems across communities, and these impacts are projected to increase in severity in the future. There is widespread recognition that we must plan responses to these impacts (**climate change adaptation**), and that reducing greenhouse gas (GHG) emissions (**climate change mitigation**) is a crucial priority if we are to minimize them. Typically, climate change mitigation and adaptation have been approached as separate endeavours, but they can be advanced together through “**Green Resilience**” (GR) strategies that both reduce GHGs and increase resilience to climate change impacts.

On September 17, 2017 ACT (the Adaptation to Climate Change Team) at Simon Fraser University and the consulting firm Green Resilience Strategies (GRS) hosted a pre-conference workshop at the 2017 ICLEI Canada Livable Cities Forum entitled Taking Action on Green Resilience: Adaptation and Mitigation Synergies. The workshop was attended by 40 participants from across Canada from a wide variety of disciplines, including small to large jurisdictions at a variety of stages of progress on climate action. The workshop aimed to explore the synergies between climate change mitigation (M) and adaptation (A) planning in order to help municipalities attract additional funding, accelerate implementation and increase returns on investment in climate change and infrastructure solutions.

This summary draws together content from the workshop presentations provided by ACT and GRS combined with selected results from the group discussions and breakouts. It provides examples of GR measures, summarizes key benefits, provides insights on how to identify, fund and implement GR opportunities, and recommends new or updated research, analysis, technical assistance, incentives and regulations identified by participants as necessary to advance GR practices.

WHAT IS GREEN RESILIENCE?

Green Resilience solutions both reduce GHG emissions and enhance resilience to climate change impacts. Without integrated, proactive low-carbon resilience planning, governments and companies risk wasting time and money on adaptation projects that miss energy efficiency opportunities, and/or emissions reduction efforts that are not resilient.

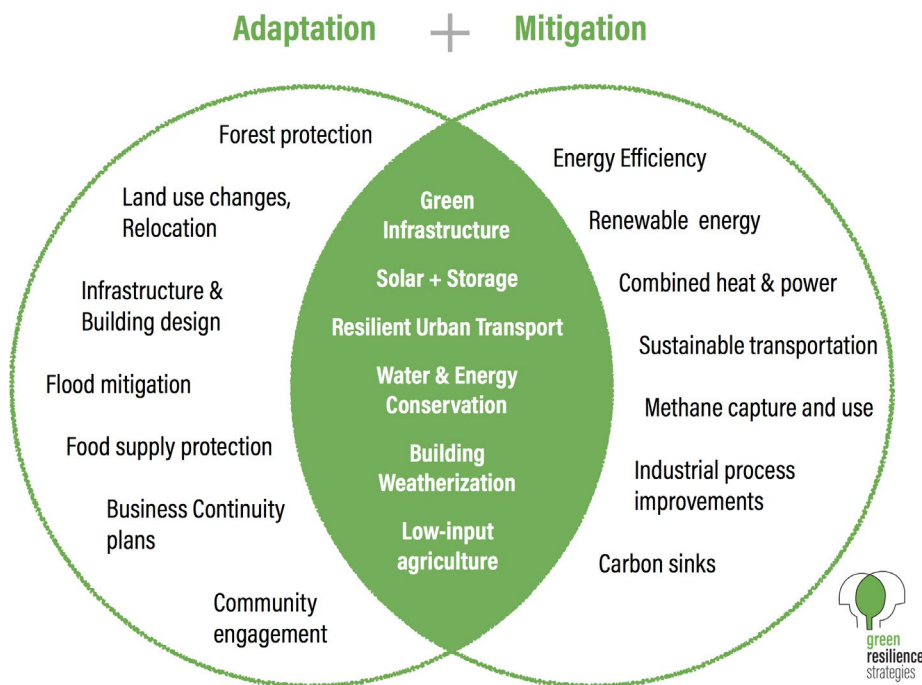


Figure 1: Climate Adaptation and Mitigation Synergies

Green Resilience Strategies (2017)

Graphic concept modified with acknowledgement of David MacLeod, City of Toronto

During the workshop, Steve Winkelman of Green Resilience Strategies provided examples of green resilience measures for a variety of sectors, including:

- **Energy efficiency, distributed renewables, district energy systems, microgrids:** ↓ GHGs, ↑ reliability, ↑ business continuity
- **Green infrastructure:** ↓ flood damage, ↓ heat island, ↓ building energy, ↑ pedestrian comfort
- **Public transit flood protection, active transportation:** ↓ GHGs, ↑ network efficiency & reliability
- **Water use efficiency and wetland treatment:** ↓ energy use, ↑ preparedness for floods & drought
- **Low-carbon, resilient buildings:** ↓ energy use, ↓ GHGs, ↑ business continuity, ↓ flood damage
- **Climate smart agriculture:** ↑ soil organic carbon storage, ↑ flood water retention, ↑ food security

WHY IS GREEN RESILIENCE IMPORTANT?




Integrating climate change adaptation and mitigation (A+M) through GR measures can:

- ✓ **Achieve multiple co-benefits**
 - Health, social, economic, biodiversity, and more
- ✓ **Expand funding sources**
 - Multiple benefits = multiple potential funders and investors
- ✓ **Increase return on investments**
 - In Mitigation, Adaptation and Infrastructure
- ✓ **Save time and resources**
 - Integrated planning prevents duplication of efforts
 - Avoid missed GHG reduction opportunities and risk of building in future vulnerability
- ✓ **Accelerate implementation and scale up**

IDENTIFYING AND PURSUING GREEN RESILIENCE OPPORTUNITIES: FOLLOW THE MONEY

A useful starting point for identifying GR opportunities is to “Ask the Climate Question” in regards to municipal expenditures and investments: “Are they reducing GHG emissions and enhancing climate resilience?” Workshop participants used the Green Resilience Matrix framework below to help identify opportunities to maximize the A+M benefits of their top expenditures and investments in Adaptation, Mitigation and Infrastructure. This “Follow the Money” approach can help leverage infrastructure planning to advance integrated A+M, apply funding to enhance resilience, and reduce the costs of critical infrastructure projects.

Figure 2: Green Resilience Matrix

Green Resilience Matrix Identifying Climate Adaptation + Mitigation Synergies WHAT ARE YOUR TOP INVESTMENTS? (A, M, I)			
INVESTMENTS	Adaptation	Mitigation	Infrastructure
Ask the Climate Question			
#1			
#2			
#3			

Green Resilience Strategies, 2017

Workshop participants were encouraged to “connect the dots” between A+M measures, as illustrated in the following examples:

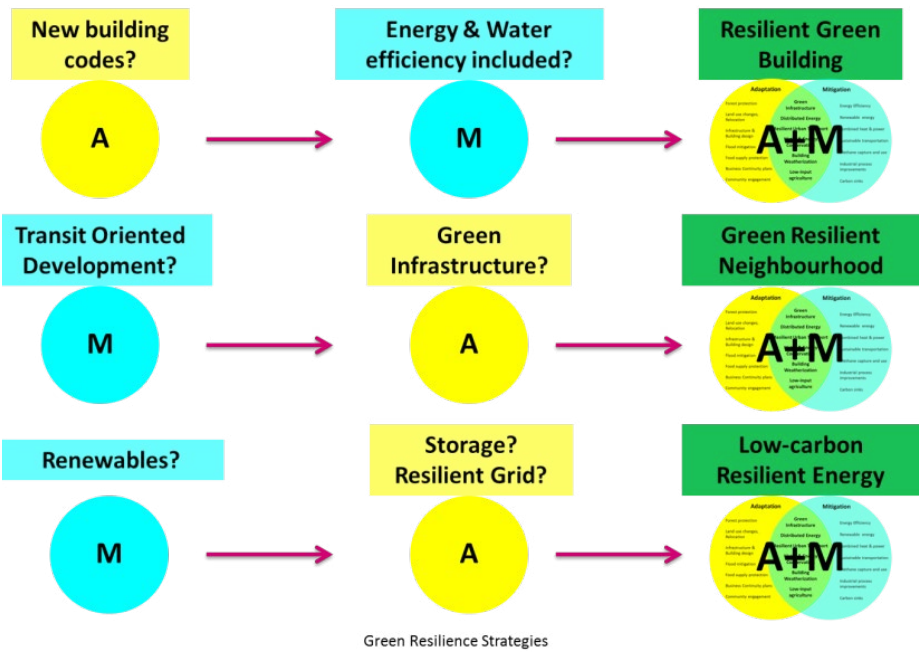


Figure 3: Examples of Adaptation and Mitigation Synergies

Participants identified and discussed a number of integration opportunities based on experience in their home communities:

1. Infrastructure

- **Low-carbon, resilient infrastructure:** Incorporate GR practices (e.g., solar panels, energy efficiency and storage, ecosystem-based approaches) when expanding infrastructure or upgrading infrastructure and buildings (e.g., for seismic risks).

2. Green Infrastructure

- **Comprehensive GR strategies:** Maximize installation and maintenance of natural or “green” infrastructure in buildings, parking lots, roads, alleys and parks to achieve multiple benefits, including: GHG reductions, improved air quality, flood protection, storm surge buffering, urban cooling, energy savings, water storage, improved fire and drought resilience, biodiversity benefits, health benefits (physical and mental), quality of life, access to green space and recreational opportunities.
- **Wetland water treatment:** Use natural and constructed wetlands to provide tertiary water treatment with minimal energy consumption while simultaneously reducing energy costs and storing carbon, enhancing flood resilience, benefitting biodiversity and adding green space.

3. Buildings

- **Resilient and green commercial buildings:** Incorporate passive design and green resilience practices when retrofitting buildings or updating building codes. Pursue LEED Pilot Credits for Resiliency.
- **Resilient and efficient houses:** Incorporate energy efficiency, water efficiency, sump pumps, backwater valves, and other resilience measures.
- **Deep energy retrofits:** Incorporate resilience (need policies for longer-term amortization).

4. Energy

- **Enhance heat recovery:** Capture waste heat from boilers, buildings and sewage systems for district heating; use cold water bodies and ice for district cooling.
- **Microgrids:** Incorporate distributed renewables, energy efficiency, management and storage, combined heat and power, and resilience during centralized grid power outages.

5. Community Planning

- **Green resilient neighbourhoods:** Incorporate multiple GR measures including district energy systems, green buildings, green infrastructure, ecosystem restoration, flood protection, transit-oriented development, active transportation and electric vehicles.
- **Low-carbon emergency centres:** Incorporate low-carbon measures such as solar panels and energy efficiency into centres designed as community refuge points (e.g., community cooling centers, storm shelters, wildfire evacuation sites).
- **Solar-powered traffic lights with battery storage** can maintain road networks during power outages. Mobile units could be deployed to busy intersections.

FUNDING AND FINANCING GREEN RESILIENCE MEASURES

Municipalities can pay for GR measures through budgetary allocations and climate change funds and can align A+M funding to maximize A → M and M → A opportunities. They can also access even greater funding by **leveraging infrastructure finance** to achieve A+M benefits. Edward Nichol of ACT presented a variety of funding and finance sources and tools that have potential application for GR strategies documented in ACT's 2015 report, "[Paying for Urban Infrastructure Adaptation in Canada](#)," e.g.:

1. Climate funds
2. Capital programs and operating budgets
3. Targeted taxes and fees (e.g., property taxes, user fees, development charges)
4. Incentives and rebates
5. Finance tools (e.g., bonds, tax increment financing)
6. Innovative programs (e.g., local improvement charge financing, density for benefit agreements, natural area tax exemption)

Municipalities can also fund GR by accessing **federal** funding sources such as support through the Federation of Canadian Municipalities (FCM) Municipalities for Climate Innovation Program, and by leveraging federal infrastructure investments.

Example: Carbon tax or cap-and-trade revenues based on GHG mitigation (e.g., Ontario’s cap-and-trade scheme) present a potential opportunity to fund green resilience. Adaptation synergies could be phased in through a range of measures, e.g.:

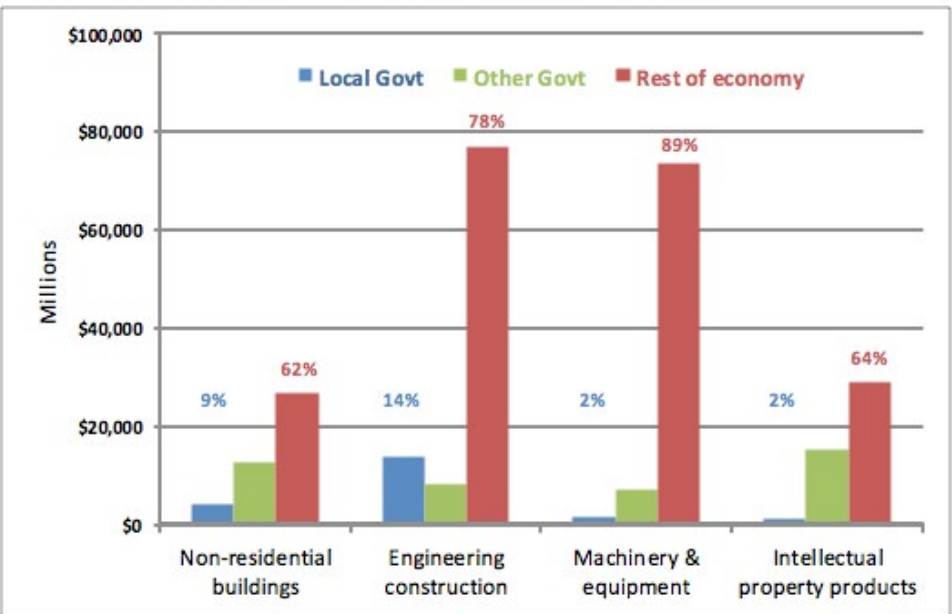
- Education on M → A opportunities (e.g., connect-the-dots check lists)
- No-cost options (strategic planning, capacity building)
- Low-cost options (self-funding, modest grants)
- Higher-cost options (requiring deeper cost-benefit analysis)

A similar approach can be taken to leverage infrastructure investments, such as developing screens for A+M criteria to ensure development projects build in long-term resilience and low-carbon efficiency.

Public funding sources only represent a quarter of capital expenditures in Canada (see Figure 4). ACT’s report concludes that **it will be essential to mobilize private investment** from businesses, home owners and public-private partnerships in order to implement adequate infrastructure adaptation, and work from GRS shows that this will also be necessary for integrating GHG mitigation measures to achieve GR.

A **multiple-benefits approach to GR can create access to funding sources** beyond those designed to support climate change action. Strategically packaging projects for multiple funders and investors can also attract more money and accelerate implementation based on policy and investor priorities such as critical infrastructure resilience, business continuity, reduction of operating and capital costs, economic development, disaster prevention, affordable housing, health, habitat protection, access to open space, etc.

2015 Non-residential Capital Investment in Canada



Data Source: CANSIM 031-0005

Green Resilience Strategies, 2017

Figure 4: 2015 Distribution of Capital Investment in Canada

RECOMMENDATIONS

Workshop participants proposed a variety of recommendations on key needs for GR planning, funding, development and implementation in the following categories:

Research & Analysis, Capacity Building & Technical Assistance, and Policies.

Research & Analysis

Research and analysis are needed on the following topics to advance GR and A+M synergies:

1. A+M Integration
 - **Trade-offs, conflicts and synergies between A and M measures** in specific sectors, and the enabling conditions for achieving A+M benefits.
2. Monitoring & Evaluation of GR Measures
 - Quantitative and qualitative **measurement of A+M synergies** and conflicts
 - Assessment of A+M impacts before implementation (ex ante).
 - Monitoring and evaluation of A+M impacts after implementation (ex post).
 - **GR metrics and indicators** at a time scale relevant to municipal administration cycles.
3. Green Infrastructure
 - **Strategic siting of green infrastructure to achieve multiple benefits** (flood protection, urban and building cooling, shading sidewalks and bike paths, air quality, biodiversity, etc.).
 - **Costs and benefits of scaling up green infrastructure**, including who pays and who benefits.
 - **Quantification of:**
 - **Costs and benefits of green vs. grey infrastructure** and combined green-grey strategies.
 - **Natural heritage resilience** benefits to strengthen the case for natural systems protection.
 - Benefits for **conservation of resources** that communities may undervalue due to their apparent abundance (e.g., water conservation in Great Lakes communities or urban forestry in communities surrounded by forest).
4. Infrastructure
 - **Life cycle costs of infrastructure**, taking into account climate change scenarios, the **opportunity costs** of business-as-usual practices, and the **avoided costs** for both green and hard infrastructure solutions, including avoided upgrades/retrofits.
 - **Interdependencies of infrastructure** (co-location, life-cycles, cascading failures, etc.) and how GR principles can help address these problems.
5. Energy
 - Quantification of the A+M benefits of **microgrids** that include renewables, storage, energy efficiency, district thermal energy and combined heat and power.
 - Approaches for **inventory of thermal resources** (boilers, buildings, sewers, transit systems, bodies of water) and assessment of the viability of utilizing waste energy.

6. Flood Protection
 - Best practices for **multi-use flood barriers** that increase public space and enhance access to waterfronts, active transportation and ecosystem restoration.
 - Strategies for accelerating implementation of fully connected flood barriers **on privately owned coastal land**, including defraying public costs of land acquisition.
7. Community-wide Solutions
 - **Mitigation, adaptation and economic benefits of integrated land use and sustainable urban redevelopment** (see US examples of “strong towns”).
 - Optimization of A+M benefits of **smart growth and transit-oriented development** to achieve **transportation network efficiency and redundancy**.
 - Zoning, land use and financial tools for **relocating housing from high risk areas** and assess A+M opportunities for relocated housing.
 - Thresholds for requiring relocation and preventing re-building.
 - Best practices for managed retreat in communities facing extreme risks.
8. Technology & Market Innovation
 - The influence of **disruptive technologies** – for example, how will shared vehicles and self-driving cars impact public transit, and do these approaches impact the vitality of future GR investments (e.g., would less parking demand correlate to greater opportunities for GR, such as green infrastructure?).
 - GR opportunities in **sharing economy** model – how can new market approaches and technologies reduce GHGs and increase resilience?
 - Incorporating resilience into the Energy Service Company (**ESCO**) model (e.g., maintaining business continuity).
 - Best strategies for combining **insurance**, integrated planning and capital investments to increase low-carbon resilience.
9. At-Risk Populations
 - Opportunities to deploy **GR solutions to benefit vulnerable populations**, e.g., through low-carbon resilient social housing.
 - Low-carbon, resilient **shelter-in place measures for medical and seniors’ facilities**.
 - Optimization of **social infrastructure** of buildings – gathering places during extreme events, sheltering in place, cooling, etc., in addition to green infrastructure.



Capacity Building & Technical Assistance

Develop **guidance documents, training programs and tools** to help municipal practitioners and decision makers to:

1. **Access baseline data** on impacts and emissions.
2. **Learn** about GR examples in multiple sectors, including case studies and best practices.
3. **Identify opportunities** for GR measures (e.g., check lists & decision tools: A→M, M→A, Infrastructure→ A+M) and key intervention points.
4. **Estimate benefits and costs** of GR measures (A, M, economic, social), to inform prioritization.
5. **Engage stakeholders**
 - Develop effective **communication strategies** for GR benefits (e.g., re-framing natural asset management as “community assets”).
 - Work with **unexpected partners** – e.g., museums, artists, etc. Connect with new audiences through new approaches (e.g., comic books, murals, exhibits, etc.).
6. **Integrate Adaptation, Mitigation and GR into:**
 - **Municipal plans** (climate, land use, transportation, energy, housing, infrastructure, ecosystem restoration, etc.).
 - **Infrastructure projects.**
 - **Capital and operating budgets** – and link the two.
 - Increase amortization periods (to 30-40 years) to enable GR retrofitting, including deep energy retrofits, replacement and new builds.
7. **Identify funding and investment** sources for GR measures.
8. **Mobilize funding and finance**
 - **Develop grant proposals**, especially for smaller municipalities.
 - **Mobilize private investment.**
 - **Package GR funding proposals** and investment pitches for multiple municipal departments, external funders and investors.
 - **Develop funding programs** and finance tools.



9. **Implement** GR measures.
10. **Monitor and evaluate** the impacts of GR measures (A, M, economic, social, etc.).

Policies

Participants identified policy needs and opportunities for federal, provincial and local government consideration:

1. Research
 - **Fund and support green resilience research** per the above recommendations.
2. Integrate **climate change knowledge** into decision tools, e.g.:
 - Update flood maps and precipitation IDF (Intensity-Duration-Frequency) curves to reflect future climate change scenarios.
 - Make floodplain mapping publicly available.
3. Capacity building and technical assistance
 - **Fund and support technical assistance programs** per the above recommendations.
 - Include A+M in **professional education and certification requirements** for planners, engineers, architects, and other relevant professional associations.
 - Provide **capacity-building grants** to support small communities with GR planning, including preparation of grant proposals and GR extension agents to support project development and implementation.
4. Funding
 - Increase authority for and scope of **local improvement charges** to promote A+M.
 - Shift tax revenue to **local governments** to increase funding for implementation and reduce dependence on property taxes.
 - **Ask the Climate Question:** assess the **A+M** impacts of policies, expenditures and infrastructure investments.
 - **Leverage mitigation, adaptation and infrastructure expenditures** to maximize A+M benefits.
5. Low-carbon, resilient infrastructure
 - Apply **GR screens** for public infrastructure and private investments.
 - Mandate **infrastructure climate plans and actions** to maximize A+M benefits.
 - Require that design processes optimize use of **demand-side measures and green infrastructure**.
 - Integrate A+M considerations into **capital management plans and operational budgets**.
 - Implement life-cycle accounting and asset management frameworks (taking into consideration projections of climate risks and carbon taxes).
 - Budget for adaptive design, mitigation measures and green resilience solutions.
6. Buildings
 - Develop a **National Building Strategy** that incorporates A+M.
 - Incorporate GR requirements in **building codes**.
 - Include A+M measures in **community amenity requirements for new real estate developments**.



7. Community-wide planning
 - Mandate **integrated climate plans** and actions to maximize A+M benefits.
 - Incorporate GR principles in **urban design regulations and guidance**.
 - Optimize use of **green infrastructure** to address energy, flood and urban heat concerns.
 - Enable zoning, land use and financial tools (reducing reliance on property taxes) for **relocating housing from high risk areas**, preventing new development and supporting low-risk, low carbon urban development.
 - Account for community assets such as green infrastructure in **disaster risk reduction** support.
 - Link GR policies with other strategies: natural heritage, biodiversity, public health, etc.
8. Develop **incentive-based insurance policies and pricing tools** (e.g. based on kilometers driven, location within a floodplain, etc.) that are focused on prevention and encourage municipal action on GR.

SUMMARY MESSAGES

The following messages emerged from workshop conclusions as priorities to guide future progress on Green Resilience:

1. **Improve communication** on opportunities, costs and benefits within and between government agencies, communities, stakeholders.
2. **Consider education as a strategic investment**, and treat every investment as an education opportunity.
3. **Collaborate across institutions and silos** to identify and advance integrated solutions (governments, professions, academia, the public, companies, museums, media, etc.).
4. **Address critical needs for research, technical assistance and policy** to support implementation.
5. **Ask and Answer the “Climate Question”** to ensure that public policies and expenditures advance low-carbon resilience.
6. **Follow the Money** – Leverage the budgets of multiple municipal agencies, regional bodies and public sector organizations to fund comprehensive green resilience projects and programs.
7. **Mobilize private investment** to support green resilience solutions.
8. Take a **multiple-benefits approach to green resilience to open up multiple funding sources** beyond climate change and to advance other policy and investor priorities.
9. Pursue both **fail-safe and safe-fail** strategies.
10. **Integrate community and infrastructure system design** to be flexible, redundant and accessible.

11. **Plan ahead to avoid the “I wish we would have ...” regret:** use scarce funding wisely to maximize A+M benefits.
12. **Think beyond climate change:** Many businesses and government agencies simply want to lower energy costs and minimize operational disruption of critical infrastructure and services.
13. **Pursue “Strategic Opportunism”**
 - Align with and capitalize on political priorities
 - Package projects and programs for multiple funders and investors

USEFUL NEXT STEPS

The following actions would assist municipalities and practitioners to build understanding and momentum for Green Resilience planning and implementation:

1. **Create a cross-country dialogue regarding** integration of climate change adaptation and GHG mitigation
2. **Form working groups to advance recommendations on research, capacity building and policies** to support implementation of GR solutions.
3. **Conduct targeted GR workshops** for specific communities, sectors and professions
4. **Apply the Green Resilience Matrix tool** (see Figure 2) to identify opportunities to align public expenditures and advance A+M synergies
5. **Develop a GR primer** that can be used to identify implementation opportunities and solutions in a variety of sectors and communities.

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ACT (the Adaptation to Climate Change Team) at the Pacific Water Research Centre in SFU's Faculty of Environment brings leading experts from around the world together with industry, community, and government decision-makers to explore the risks posed by top-of-mind climate change issues and to identify opportunities for sustainable adaptation. act-adapt.org

Green Resilience Strategies was established in 2017 by Steve Winkelman to support low-emission, resilient urban planning and sustainable development. Green Resilience Strategies fosters inter-agency and public-private collaboration to identify common-sense solutions, strategic opportunities, catalytic projects and to advance lasting solutions. We provide technical assistance and strategic advice to public, private and non-profit clients on: integrated planning, policy development, stakeholder engagement, securing funding, implementation of policies and programs, performance evaluation, and capacity building. www.greenresilience.com

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