Region of Peel
working with you

Request for Delegation

FOR OFFICE USE ONLY

MEETING DATE YYYY/MM/DD	MEETING NAME
2023/05/11	**Regional Council**

DATE SUBMITTED YYYY/MM/DD
2023/04/18

Attention: Regional Clerk
Regional Municipality of Peel
10 Peel Centre Drive, Suite A
Brampton, ON L6T 4B9
Phone: 905-791-7800 ext. 4582
E-mail: council@peelregion.ca

NAME OF INDIVIDUAL(S)
Quentin Hanchard / John MacKenzie

POSITION(S)/TITLE(S)
Chief Administrative Officer / Chief Executive Officer

NAME OF ORGANIZATION(S)
Credit Valley Conservation / Toronto Region Conservation Authority

E-MAIL	TELEPHONE NUMBER	EXTENSION
quentin.hanchard@cvc.ca and john.mackenzie@trca.ca	**(905) 670-1615**	**215**

INDIVIDUAL(S) OR ORGANIZATION(S) ADDRESS
1255 Old Derry Road, Mississauga, Ontario, L5N 6R4 (CVC) / 101 Exchange Avenue, Vaughan, ON, L4K 5R6 (TRCA)

REASON(S) FOR DELEGATION REQUEST (SUBJECT MATTER TO BE DISCUSSED)
Joint CA presentation on behalf of Credit Valley Conservation and Toronto and Region Conservation Authority regarding the 2021 and 2022 Peel Climate Change Performance Measurement System Final Reports. This delegation is in alignment with the Region's Climate Change Master Plan Progress Report for 2022 that will be presented on the same meeting date by Region of Peel staff.

A formal presentation will accompany my delegation ☑ Yes ☐ No

Presentation format: ☑ PowerPoint File (.ppt) ☐ Adobe File or Equivalent (.pdf) ☐ Picture File (.jpg) ☐ Video File (.avi,.mpg) ☐ Other

Additional printed information/materials will be distributed with my delegation : ☑ Yes ☐ No ☐ Attached

Note:
Delegates are requested to provide an electronic copy of all background material / presentations to the Clerk's Division if possible 72 hours, but not less than 24 hours, prior to the meeting start time. Delegation requests and/or materials received after 9:30 a.m. on the Wednesday prior to the meeting will not be provided to Members.

Delegation requests received less than 72 hours prior to the meeting start time that relate to an item listed on the agenda will be added to the agenda only upon the approval of Council or Committee at the meeting.

Delegates should make every effort to ensure their presentation material is prepared in an accessible format. Once the above information is received in the Clerk's Division, you will be contacted by Legislative Services staff to confirm your placement on the appropriate agenda.

In accordance with Procedure By-law 56-2019, as amended, delegates appearing before Regional Council or Committee are requested to limit their remarks to 5 minutes and 10 minutes respectively (approximately 5/10 slides). Delegations may only appear once on the same matter within a one-year period, unless a recommendation pertaining to the same matter is included on the agenda within the one-year period and only to provide additional or new information.

Please save the form to your personal device, then complete and submit via email attachment to council@peelregion.ca

V-01-100 2022/05

Region of Peel
working with you

Request for Delegation

Notice with Respect to the Collection of Personal Information
(Municipal Freedom of Information and Protection of Privacy Act)

Personal information contained on this form is authorized under Section 5.4 of the Region of Peel Procedure By-law 56-2019, as amended, for the purpose of contacting individuals and/or organizations requesting an opportunity to appear as a delegation before Regional Council or a Committee of Council. The completed Delegation Request Form will be redacted and published with the public agenda. The Procedure By-law is a requirement of Section 238(2) of the Municipal Act, 2001, as amended. Please note that all meetings are open to the public except where permitted to be closed to the public under legislated authority. All Regional Council and Committee meetings are live streamed via the internet and meeting videos are posted and available for viewing subsequent to those meetings. Questions about collection may be directed to the Manager of Legislative Services, 10 Peel Centre Drive, Suite A, 5th floor, Brampton, ON L6T 4B9, (905) 791-7800 ext. 4462.

Please save the form to your personal device, then complete and submit via email attachment to council@peelregion.ca

2021 Peel Climate Change Performance Measurement System

Final Report

Prepared in consultation with KPMG

November 2022

Credit Valley Conservation
inspired by nature

Toronto and Region Conservation Authority

Table of Contents

1.0 Introduction

Since 2007, the Region of Peel has provided climate change special levy funding to address unfunded and underfunded activities that mitigate the impacts of climate change. As leaders in developing holistic, science-based solutions to environmental concerns at a watershed scale, Conservation Authorities are uniquely positioned to pursue efforts that have historically cut across sectors, stakeholder groups and political jurisdictions. In 2016, Peel Council requested the establishment of performance indicators to further assess the effectiveness of achieving the desired climate change outcomes. Toronto and Region Conservation Authority (TRCA) began developing the Performance Measurement System and Key Performance Indicators (KPIs) in 2019 in collaboration with Credit Valley Conservation (CVC) and the Region of Peel. TRCA retained KPMG Canada to provide expertise in performance measurement.

The Measurement System project establishes a consistent methodology to align Peel Conservation Authority (CA) programs. Shared KPIs have been developed to measure the collective performance of TRCA and CVC climate change initiatives. The Measurement System evaluates the initiatives' success in achieving shared outcomes that support their respective strategic goals in alignment with the Region's Climate Change Master Plan (CCMP). The Measurement System aligns 44 cost centres between TRCA and CVC into eight (8) program areas each with their own KPI as well as greenhouse gas (GHG) emissions reduction. The resulting methodology and indicators draw from best practices in the field of performance measurement, placing a high emphasis on simplicity and ease of implementation. The trade-off to this approach is the loss of comprehensiveness around the more nuanced co-benefits that result from actions taken to address climate change. However, the high-level analysis of the Measurement System will significantly improve the transparency and performance measurement of programs delivered by both Peel CAs with the special levy funding.

This performance report provides a summary of the accomplishments of the Peel Climate Change Performance Measurement System Project during 2021, specifically:

- How well each of the Program Areas and the initiative are performing;
- Useful information that can be used to identify Program Areas for improvements; and
- A demonstration of accountability for the use of Climate Change Initiative funding.

The next step in the development of this performance measurement system will be to set targets for each of the KPIs as well as any recommended changes for further alignment improvements.

2.0 Performance Measurement Results by Program Area

The following table summarizes the performance indicators calculated for the main objectives of each Program Area. All indicators are calculated on a 1 to 5 scale, where 5 = Very Effective, and 1 = Not Effective (Figure 1). Details regarding each Program Area can be found in Appendix A.

Figure 1: Peel Climate Change Performance Measurement System Scale

ADAPTATION PERFORMANCE REPORT

Climate Science

OBJECTIVE: Reduced negative impacts of climate change (due to useful and effective plans for protection and recovery measures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The usefulness of program area outputs for planning or implementing protection and recovery measures.	

ACTIONS – The projects and activities contributing to this program area are quite diverse and include applied research, knowledge dissemination and advice, and training for external (municipalities) and internal (CAs) users on climate change impacts and possible mitigation measures. Focus areas include water quality, flooding, erosion, extreme heat, and ecosystem biodiversity.

RESULTS

There was a wide range within the individual scores for the outputs rated. Six (6) representative outputs scored a 4 or 5, suggesting that many of the activities under this program area are potentially useful to very highly useful in implementing measures to reduce the negative impacts of climate change. The selection of a rater who had limited knowledge of one of the representative outputs resulted in a lower rating for that output and the overall indicator score.

Outputs for this program area are critical to developing and applying monitoring and implementation measures for climate change adaptation. They provide useful resources to reduce the negative impacts of climate change through actions and the provision of expert advice. Additionally, outputs provide sound research for the development of business cases and other rationales for use in explaining and justifying climate change adaptation measures to a variety of stakeholders and other audiences.

Flood Management

OBJECTIVE: Mitigated risk of flooding (resulting from the construction and maintenance of structural flood protection measures and the usefulness of flood protection information).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The usefulness of program area outputs for predicting and mitigating flood impacts, as well as the benefits of flood protection infrastructure that is developed.	

ACTIONS – The actions contributing to this program area involve the development and dissemination of information regarding flood probabilities, potential flood impacts, and flood mitigation options as well as construction and maintenance of flood protection infrastructure.

RESULTS

All outputs selected from the research programs in this program area were rated between 4 and 5, indicating that many activities within this program area ranked from potentially useful to very highly useful in predicting and mitigating flood impacts as well as developing flood protection infrastructure. The program that supports the construction and maintenance of flood protection infrastructure was found to have a very high return on investment based on berm upgrades which protect affected lands and properties to the 500-year event.

Outputs for this program area provide valuable information to help prioritize flood mitigation measures, pond cleanout, and infrastructure repair and upgrade. Outputs also provide accurate, up-to-date mapping to identify future flood risks and inform municipal planning documents. Overall, outputs contribute directly to the identification of flood risks and inform successful flood risk mitigation.

Erosion Management

OBJECTIVE: Mitigated risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of implementation and maintenance of effective erosion risk reduction measures.	

ACTIONS – The projects and activities contributing to this program area involve the maintenance of existing erosion control infrastructure and the construction of new erosion control structures to protect high priority sites where Region of Peel sanitary infrastructure or watermains may be at risk.

RESULTS

Erosion Risk Management (ERM) activities were scored based on the extent to which the annual plan was implemented. The program area received a score of 5, as all remedial works were implemented as planned in 2021. As targeted, 214 infrastructure hazard monitoring sites in Region of Peel were inspected before the end of the monitoring season, as well as an additional 28 sites that received repeated post-storm inspections. The ERM team encountered challenges related to pandemic restrictions, however all 2021 targets and objectives were achieved without delay.

Restoration and Natural Heritage Science

OBJECTIVE: Reduced impacts of climate change related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Reduced impacts of climate change related extreme weather events through enhancements to the natural heritage system and the usefulness of research information for implementing climate change protection measures.	

ACTIONS – The projects and activities in this program area include a wide range of restoration projects (aquatic and wetland restoration, riparian and valley restoration, stream and natural channel restoration, and terrestrial restoration), as well as Low Impact Development (LID) and natural green infrastructure projects and two research programs (urban natural heritage, and biodiversity conservation and management).

RESULTS

Outputs from restoration projects which reduce the negative impacts of extreme weather events generally scored high, with five projects scoring 4 and one 5. Projects within high climate change vulnerability areas tended to score higher, but most projects were assessed to have a measurable impact on flooding and water quality degradation mitigation at a regional scale.

Outputs from research projects also scored very well, with users indicating that the outputs were either already used to inform climate change mitigation and adaptation in the Region of Peel or will be used in the near future. The outputs – which include best practice guides, policies and strategies – provide highly useful guidance for site prioritization, species selection, impact assessments and plan review.

Forest Management

OBJECTIVE: Increased forest health and ability to withstand climate related extreme weather events (due to the removal of hazard trees and increased forest resilience).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of implementation of hazard tree removal plans and the increased ability of forests to withstand extreme weather events resulting from forest management measures.	

ACTIONS – The projects and activities in this program area include a wide range of forest monitoring, inventory, management planning, outreach, and stewardship as well as active management projects and programs to address hazard trees, forest health and disease prevention, canopy expansion, invasive species, and resilience to extreme events.

RESULTS

All programs in this program area scored between 4 and 5, indicating that the associated projects and activities have a significant influence on improving forest health and reducing the negative impacts of extreme weather events with the municipalities affected. Tree plantings in particular were cited as having a high value based on their significant influence on reducing the negative impacts of extreme weather events.

Outputs for this program, including tree plantings and invasive species control, contribute directly to forest resilience. Stakeholders indicated that they would like to see greater collaboration and alignment between Conservation Authorities and other landowners and managers, specifically in smaller urban settings.

Green Infrastructure

OBJECTIVE: Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Reduced risks of major water resource degradation.	

ACTIONS – Projects in this program area include stormwater management (SWM) and LID research and evaluation projects, demonstration projects and information dissemination regarding these emerging technologies, and neighbourhood stormwater management projects.

RESULTS

Six (6) representative SWM/LID projects scored high, indicating that the expertise provided through in-field evaluations of emerging SWM/LID technologies, demonstration projects, and knowledge transfer projects is highly to very highly useful or potentially useful. The role of these projects in providing municipalities with guidance towards implementing SWM/LID to meet increasingly stringent stormwater management criteria was identified as very important.

All three Sustainable Neighbourhood Action Program (SNAP) projects scored a 4, with evaluators indicating that SNAP projects were highly useful or potentially useful in identifying specific SWM/LID retrofit opportunities. Evaluators also highlighted the Sustainable Technologies Evaluation Program (STEP) and SNAP's effective leveraging of grant funding to support SWM/LID implementation.

KNOWLEDGE AND AWARENESS PERFORMANCE REPORT

School Programs

OBJECTIVE: Positive changes in the behaviour of students regarding support for and participation in climate change adaptation and mitigation activities.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of changes in knowledge, awareness, and attitudes of students.	

ACTIONS – The activities and outputs contributing to this program area include the planning and delivery of climate change related education and awareness programs to students.

RESULTS

Most school programs were offered online as a result of the COVID-19 pandemic. Virtual programming was guided by CA staff and included hands-on, teacher-led components to enhance student learning and attentiveness. Additionally, due to the late start of data collection for the Performance Measurement system, surveying was not aligned with program delivery and evaluation. In many cases, surveying followed program delivery by several months, resulting in a lower response rate.

The majority of students and teachers surveyed either agreed (4) or strongly agreed (5) that school programs increased students' knowledge and awareness of climate change issues, laying an effective foundation for behaviour change. Hands-on programming which enabled student engagement with local natural environments received positive feedback, as well as programming which promoted tangible actions to increase positive habits. 1,423 trees were planted through school programs. Teachers responded well to professional development sessions which support engagement of schools in environmental leadership and climate action initiatives within the context of a national certification program.

Community Engagement and Stewardship

OBJECTIVE: Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of changes in knowledge, awareness, and attitudes of program participants.	

ACTIONS – The activities and outputs contributing to this program area include the planning and delivery of climate change related education and engagement programs to the community.

RESULTS

Delivery of some programs was limited or modified due to COVID-19 public health restrictions. Additionally, due to the late start of data collection for the Performance Measurement system, surveying was not aligned with program delivery and evaluation. In many cases, surveying followed program delivery by several months, resulting in a lower response rate.

All six (6) representative programs were scored 4 or higher, indicating a very positive impact. Participants reported that they were likely to change their behaviour and encourage others to change their behaviour. Programming involved outdoor activities and experiential learning with a focus on community-level climate action. Climate actions taken by participants included planting trees and participating in land and water stewardship, both on public lands and urban and rural residential properties.

MITIGATION PERFORMANCE REPORT

Greenhouse Gas (GHG) Emissions Reduction

OBJECTIVE: GHG emissions reduced through climate change initiative programs that have significant activities directed toward GHG emissions reduction or have GHG emissions reduction/carbon sequestration as a tangible co-benefit.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Extent of GHG reduced through emissions reduction and carbon sequestration.	An indicator scoring system that will allow the assessment of the effectiveness of this cross-cutting program area is under development. Total GHG emissions reduction/sequestration is provided as an interim indicator until a more effective indicator is developed.

ACTIONS – Activities and outputs contributing to this program area include engagement of the public, community groups, business and government actions to reduce GHG emissions or sequester carbon. GHG reduction activities are carried out in many of the program areas. In this initial year, the focus of this section was on activities in four program areas – Climate Science, Forest Management, Green Infrastructure, and Community Engagement and Stewardship. These activities included both those carried out by individuals (for example, tree plantings and home retrofits) and those carried out by corporations (for example, building retrofits and fuel switching).

RESULTS

In this first year of the Performance Measurement system, a straightforward total GHG emissions reduction and carbon sequestration value has been generated. In future years, this value will be evolved into an indicator that allows the evaluation of the effectiveness of the program area.

Estimated annual GHG emissions reduction due to building retrofit and fuel switching projects in 2021:
5,060 $tC0_2e$/year.

Estimated average annual sequestration in subsequent years due to trees and shrubs planted in 2021:
248 $tC0_2e$/year.

Total emissions reduction/sequestration of **5,308 $tC0_2e$/year.**

Appendix A: Program Area Reports

CLIMATE SCIENCE

OBJECTIVE: Reduced negative impacts of climate change (due to useful and effective plans for protection and recovery measures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The usefulness of program area outputs for planning or implementing protection and recovery measures.	**3.79** **Effective**

1.0 Actions

The projects and activities contributing to this program area are quite diverse and include applied research, knowledge dissemination and advice, and training for external (municipalities) and internal (CAs) users on climate change impacts and possible mitigation measures. Focus areas include water quality, flooding, erosion, extreme heat, and ecosystem biodiversity.

2.0 How the indicator score was calculated

The calculation was based on the ratings of three (3) programs or parts of programs:

(1) Water and Climate Change Risk Assessment [101-008] (internal component only)
(2) Real Time Water Quality [101-046]
(3) Climate Science Applications Program [129-93]

Nine (9) outputs were selected from the three programs. A description was provided to an intended user of that output, who rated the usefulness (or potential usefulness) of the output to plan or implement adaptation measures on a 1-5 scale. These ratings were averaged, after weighting them by the program budgets, to calculate the indicator score.

3.0 Explanation of the rating

There was a wide range within the individual scores for the outputs rated. Six (6) representative outputs scored a 4 or 5, suggesting that many of the activities under this program area are potentially useful to very highly useful in implementing measures to reduce the negative impacts of climate change. The selection of a rater who had limited knowledge of one of the representative outputs resulted in a lower rating for that output and the overall indicator score.

Outputs for this program area are critical to developing and applying monitoring and implementation measures for climate change adaptation. They provide useful resources to reduce the negative impacts of climate change through actions and the provision of expert advice. Additionally, outputs provide sound research for the development of business cases and other rationales for use in explaining and justifying climate change adaptation measures to a variety of stakeholders and other audiences.

FLOOD MANAGEMENT

OBJECTIVE: Mitigated risk of flooding (resulting from the construction and maintenance of structural flood protection measures and the usefulness of flood protection information).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The usefulness of program area outputs for predicting and mitigating flood impacts, as well as the benefits of flood protection infrastructure that is developed.	**4.54**
	Very Effective

1.0 Actions

The actions contributing to this program area involve the development and dissemination of information regarding flood probabilities, potential flood impacts, and flood mitigation options as well as construction and maintenance of flood protection infrastructure.

2.0 How the indicator score was calculated

The calculation was based on the ratings of five (5) programs or parts of programs:

Research Programs:
(1) Climate Change Flood Risk Assessment [101-045]
(2) Flood Forecasting and Warning [101-043]
(3) Water and Climate Change Risk Assessment [101-008]
(4) Flood Remedial Works [129-19] (non-infrastructure portion only)

Flood Protection Infrastructure:
(5) Flood Remedial Works [129-19] (flood protection infrastructure portion only]

The calculation was carried out in two parts.

Part 1 – Three outputs were selected from each of the four research programs (programs (1)-(4)). A description of each output was provided to an intended user of that output, who rated the usefulness (or potential usefulness) of the output for developing flood protection measures on a 1-5 scale. The rating for each of these four programs was the average of their output ratings.

Part 2 – The value of the land and property that has been protected from flooding due to program 5 (flood protection infrastructure) was estimated. This program was rated on a 1-5 scale, based on the value of protected land and property compared with the funding that was used for infrastructure activities.

Overall outcome indicator - The five ratings were averaged, after weighting them by the program budgets.

3.0 Explanation of the rating

All outputs selected from the research programs in this program area were rated between 4 and 5, indicating that many activities within this program area ranked from potentially useful to very highly useful in predicting and mitigating flood impacts as well as developing flood protection infrastructure. The program that supports the construction and maintenance of flood protection infrastructure was found to have a very high return on investment based on berm upgrades which protect affected lands and properties to the 500-year event.

Outputs for this program area provide valuable information to help prioritize flood mitigation measures, pond cleanout, and infrastructure repair and upgrade. Outputs also provide accurate, up-to-date mapping to identify future flood risks and inform municipal planning documents. Overall, outputs contribute directly to the identification of flood risks and inform successful flood risk mitigation.

EROSION MANAGEMENT

OBJECTIVE: Mitigated risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of implementation and maintenance of effective erosion risk reduction measures.	**5.00**
	Very Effective

1.0 Actions

The projects and activities contributing to this program area involve the maintenance of existing erosion control infrastructure and the construction of new erosion control structures to protect high priority sites where Region of Peel sanitary infrastructure or watermains may be at risk.

2.0 How the indicator score was calculated

The calculation was based on the rating of one (1) program:

(1) Erosion Maintenance Projects [129-35]

The calculation of this indicator involved determining the extent to which the erosion control plan for the year had been implemented. This was done by assigning points to various categories of planned activities once the plan was finalized and then, at the end of the year, calculating the points associated with the actual projects that were carried out during the year. The indicator was the ratio of the points achieved to the points planned, converted to a 5-point scale.

3.0 Explanation of the rating

Erosion Risk Management (ERM) activities were scored based on the extent to which the annual plan was implemented. The program area received a score of 5, as all remedial works were implemented as planned in 2021. As targeted, 214 infrastructure hazard monitoring sites in Region of Peel were inspected before the end of the monitoring season, as well as an additional 28 sites that received repeated post-storm inspections. The ERM team encountered challenges related to pandemic restrictions, however all 2021 targets and objectives were achieved without delay.

RESTORATION AND NATURAL HERITAGE SCIENCE

OBJECTIVE: Reduced impacts of climate change related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Reduced impacts of climate change related extreme weather events through enhancements to the natural heritage system and the usefulness of research information for implementing climate change protection measures.	**4.08** **Very Effective**

1.0 Actions

Projects and activities in this program area include a wide range of restoration projects (aquatic and wetland restoration, riparian and valley restoration, stream and natural channel restoration, and terrestrial restoration), as well as Low Impact Development (LID) and natural green infrastructure projects and two research programs (urban natural heritage, and biodiversity conservation and management).

2.0 How the indicator score was calculated

The calculation was based on the ratings of nine (9) programs:

Restoration and Protection Programs:

(1) Aquatic and Wetland Restoration – Peel [301-330]
(2) Wetland – Climate [129-36]
(3) Riparian and Valleyland - Climate [129-37]
(4) Stream Restoration – Climate [129-46]
(5) Terrestrial – Climate [129-45]
(6) Natural Channel Project Implementation [128-69]
(7) Green Infrastructure – Climate [129-44]

Applied Research Programs:

(8) Urban Natural Heritage [301-355]
(9) Biodiversity Conservation and Management [301-357]

The calculation was carried out in two parts.

Part 1- One (1) project that was intended to reduce the negative impacts of extreme weather events was selected from each of the restoration and protection programs. A summary of each project was provided to a six-member expert panel, who developed a consensus rating on a 1-5 scale of the overall impact of each project on reducing the negative impacts of extreme weather events.

Part 2 – Three (3) outputs were selected for each of the research programs for a total of six (6) outputs. A description of each output was provided to an intended user of that output, who rated the usefulness (or potential usefulness) of the output for implementing climate change protection measures on a 1-5 scale. The output ratings for each program were averaged.

Overall outcome indicator - The nine (9) ratings (seven (7) impact ratings for programs 1 through 7 and two (2) usefulness ratings for programs 8 and 9) were averaged after weighting them by the program budgets.

3.0 Explanation of the rating

Outputs from restoration projects which reduce the negative impacts of extreme weather events generally scored high, with five projects scoring 4 and one 5. Projects within high climate change vulnerability areas tended to score higher. There was consensus that most projects will have a measurable impact on flooding and water quality degradation mitigation at a regional scale.

Outputs from research projects also scored very well, with users indicating that the outputs were either already used to inform climate change mitigation and adaptation in the Region of Peel or will be used in the near future. The outputs – which include best practice guides, policies and strategies – provide highly useful guidance for site prioritization, species selection, impact assessments and plan review.

FOREST MANAGEMENT

OBJECTIVE: Increased forest health and ability to withstand climate-related extreme weather events (due to the removal of hazard trees and increased forest resilience).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Increased ability of forests to withstand climate change related extreme weather events through the implementation of forest management measures.	**4.92** **Very Effective**

1.0 Actions

The projects and activities in this program area include a wide range of forest monitoring, inventory, management planning, outreach, and stewardship as well as active management projects and programs to address hazard trees, forest health and disease prevention, canopy expansion, invasive species, and resilience to extreme events.

2.0 How the indicator score was calculated

The calculation was based on the ratings of four (4) programs:

(1) Invasive Species Control Program [301-308]
(2) Peel Planting Programs [301-305]
(3) TRCA Forest Management – Peel [129-52]
(4) Reforestation Program – Private Lands [129-51]

A summary of each of the four (4) programs was provided to an expert panel composed of four member organizations, who developed a consensus rating on a 1-5 scale of the overall impact of each project towards increasing forest resilience. These ratings were averaged, after weighting them by the program budgets, to calculate the indicator score.

3.0 Explanation of the rating

All programs in this program area scored between 4 and 5, indicating that the associated projects and activities have a significant influence on improving forest health and reducing the negative impacts of extreme weather events. Tree plantings in particular were cited as having a high value based on their significant influence on reducing the negative impacts of extreme weather events.

Outputs for this program, including tree plantings and invasive species control, contribute directly to forest resilience. Stakeholders indicated that they would like to see greater collaboration and alignment between Conservation Authorities and other landowners and managers, specifically in smaller urban settings.

GREEN INFRASTRUCTURE

OBJECTIVE: Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Reduced risks of major water resource degradation.	**4.31**
	Very Effective

1.0 Actions

Projects in this program area include stormwater management (SWM) and low-impact development (LID) research and evaluation projects, demonstration projects and information dissemination regarding these emerging technologies, as well as neighbourhood stormwater management projects.

2.0 How the indicator score was calculated

The calculation was based on the ratings of six (6) programs or parts of programs:

SWM/LID Programs:

(1) Stormwater Technologies/SWM Infrastructure Performance Risk Assessment [101-048]
(2) Integrated Water Management Implementation [101-190]
(3) Integrated Water Management Guidance and Training [101-021]
(4) Sustainable Technologies [129-99] (stormwater portion only)

Sustainable Neighbourhood Programs:

(5) Sustainable Neighbourhoods (Sustainable Neighbourhood Action Program) [301-315]
(6) Sustainable Neighbourhood Action Program (SNAP) [129-94]

Ten (10) representative projects were selected from the six (6) programs that underlie this outcome objective. Seven (7) projects were selected from SWM/LID programs and three (3) projects were selected from Sustainable Neighbourhoods programs. A description of each project was provided to an intended user of that project, who rated its usefulness (or potential usefulness) in implementing or managing a SWM/LID project on a 1-5 scale. These ratings were averaged, after weighting them by the program budgets, to calculate the indicator.

3.0 Explanation of the rating

Six (6) representative SWM/LID projects scored high, indicating that the expertise provided through in-field evaluations of emerging SWM/LID technologies, demonstration projects, and knowledge transfer projects is highly to very highly useful or potentially useful. The role of these projects in providing municipalities with guidance towards implementing SWM/LID to meet increasingly stringent stormwater management criteria was identified as very important.

All three Sustainable Neighbourhood Action Program (SNAP) projects scored a 4, with evaluators indicating that SNAP projects were highly useful or potentially useful in identifying specific SWM/LID retrofit opportunities. Evaluators also highlighted the Sustainable Technologies Evaluation Program (STEP) and SNAP's effective leveraging of grant funding to support SWM/LID implementation.

SCHOOL PROGRAMS

OBJECTIVE: Positive changes in behaviour of students regarding support for and participation in climate change adaptation and mitigation activities.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of changes in knowledge, awareness, and attitudes of students.	**4.36** **Very Effective**

1.0 Actions

The activities and outputs contributing to this program area include the planning and delivery of climate change related education and awareness programs to students.

2.0 How the indicator score was calculated

The calculation was based on the ratings of six (6) programs. All programs or parts of programs were rated:

(1) Conservation Youth Corps [301-326] – Only programs with direct access to students were rated from July to December.

(2) Environmental Education [601-611] – Rated from July to December. Excludes outdoor education centre programming due to COVID-19 restrictions and closures.

(3) Albion Hills Environmental Weeks (Environmental Leaders of Tomorrow) [129-71] – Rated from July to December. Excludes outdoor education centre programming due to COVID-19 restrictions and closures.

(4) Stewardship Partnership Services [129-54] – Only Watershed on Wheels virtual classroom programming was rated from July to December. The Native Plants Program and Rain to Runoff Program were not rated.

(5) Conservation Youth Corps [128-73] - Rated from July to December.

(6) Ontario Eco Schools for Peel Region (Eco-Schools Expansion Program) [129-80] - Rated from July to December.

Each program or part of a program was rated based on surveys that measured students' knowledge and attitudes toward climate change. The ratings were averaged and weighted by the program budgets to determine the overall indicator score.

3.0 Explanation of the rating

Most school programs were offered online as a result of the COVID-19 pandemic. Virtual programming was guided by CA staff and included hands-on, teacher-led components to enhance student learning and attentiveness. Additionally, due to the late start of data collection for the Performance Measurement system, surveying was not aligned with program delivery and evaluation. In many cases, surveying followed program delivery by several months, resulting in a lower response rate.

The majority of students and teachers surveyed either agreed (4) or strongly agreed (5) that school programs increased students' knowledge and awareness of climate change issues, laying an effective foundation for behaviour change. Hands-on programming which enabled student engagement with local natural environments received positive feedback, as well as programming which promoted tangible actions to increase positive habits. 1,423 trees were planted through school programs. Teachers responded well to professional development sessions which support engagement of schools in environmental leadership and climate action initiatives within the context of a national certification program.

COMMUNITY ENGAGEMENT AND STEWARDSHIP

OBJECTIVE: Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of changes in knowledge, awareness, and attitudes of program participants.	**4.48** **Very Effective**

1.0 Actions

The activities and outputs contributing to this program area include the planning and delivery of climate change related education and engagement programs to the community.

2.0 How the indicator score was calculated

The calculation was based on the ratings of six (6) programs. All programs were rated:

(1) Peel Rural Stewardship [301-314]
(2) Urban Outreach and Restoration [301-338]
(3) Regional Community Outreach [301-332]
(4) West Humber Stewardship Program - [128-74]
(5) Etobicoke-Mimico Stewardship [129-55]
(6) Etobicoke Headwaters Sub-watershed Regeneration [129-59]

Each program or part of a program was rated based on surveys that measure participants' knowledge and attitudes toward climate change. The ratings were averaged and weighted by the program budgets to determine the overall indicator score.

3.0 Explanation of the rating

Delivery of some programs was limited or modified due to COVID-19 public health restrictions. Additionally, due to the late start of data collection for the Performance Measurement system, surveying was not aligned with program delivery and evaluation. In many cases, surveying followed program delivery by several months, resulting in a lower response rate.

All six (6) representative programs were scored 4 or higher, indicating a very positive impact. Participants reported that they were likely to change their behaviour and encourage others to change their behaviour. Programming involved outdoor activities and experiential learning with a focus on community-level climate action. Climate actions taken by participants included planting trees and participating in land and water stewardship, both on public lands and urban and rural residential properties.

GREENHOUSE GAS (GHG) EMISSIONS REDUCTION

OBJECTIVE: GHG emissions reduced through climate change initiative programs that have significant activities directed toward GHG emissions reduction or have GHG emissions reduction/carbon sequestration as a tangible co-benefit.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Extent of GHG reduced through emissions reduction and carbon sequestration.	An indicator scoring system that will allow the assessment of the effectiveness of this cross-cutting program area is under development. Total GHG emissions reduction/sequestration is provided as an interim indicator until a more effective indicator is developed.

1.0 Actions

Activities and outputs contributing to this program area include engagement of the public, community groups, business and government actions to reduce GHG emissions or sequester carbon. GHG reduction activities are carried out in many of the program areas. In this initial year, the focus of this section was on activities in four program areas – Climate Science, Forest Management, Green Infrastructure, and Community Engagement and Stewardship. These activities included both those carried out by individuals (for example, tree plantings and home retrofits) and those carried out by corporations (for example, building retrofits and fuel switching).

2.0 Main principles behind the calculations

The 13 programs included in this assessment include:

Emissions Reduction:

(1) Water and Climate Change Risk Assessment [101-008] (internal component only)
(2) Sustainable Neighbourhoods (Sustainable Neighbourhood Action Program) [301-315]
(3) Sustainable Neighbourhood Action Program (SNAP) [129-94]
(4) Sector-Based Climate Mitigation Programs [129-87]
(5) Pearson Eco-Industrial Zone [129-95]

Carbon Sequestration:

(6) Peel Planting Programs [301-305]
(7) TRCA Forest Management – Peel [129-52]
(8) Reforestation Program – Private Lands [129-51]

(9) Sustainable Neighbourhood Action Program (SNAP) [129-94]
(10) Sustainable Technologies [129-99]
(11) Peel Rural Stewardship [301-314]
(12) Urban Outreach and Restoration [301-338]
(13) Regional Community Outreach [301-332]

For building retrofits and fuel switching, the calculation was based on an estimate of the annual emissions reduction expected from the actions taken in 2021.

In the case of tree and shrub plantings, tree planting activities for the current year (2021) were used to estimate the average annual sequestration in subsequent years.

3.0 Explanation of the results

In this first year of the performance measurement system, a straightforward total GHG emissions reduction and carbon sequestration value has been generated. In future years, this value will be evolved into an indicator that allows the evaluation of the effectiveness of the program area.

Estimated annual GHG emissions reduction due to building retrofit and fuel switching projects in 2021:
5,060 $tC0_2e$/year.

Estimated average annual sequestration in subsequent years due to trees and shrubs planted in 2021:
248 $tC0_2e$/year.

Total emissions reduction/sequestration of **5,308 $tC0_2e$/year.**

2022 Peel Climate Change Performance Measurement System

Final Report

Prepared in consultation with KPMG

May 2023

Credit Valley Conservation
inspired by nature

Toronto and Region Conservation Authority

Table of Contents

1.0 Introduction

At a time when few Canadian municipalities understood the need to address climate change, the Region of Peel (the "Region") began committing funding to address this important priority starting in 2007. This commitment to advance unfunded and underfunded adaptation and mitigation activities through a special levy was, and continues to be, a demonstration of both leadership in action and a strong partnership with the two Conservation Authorities (CAs) that operate in Peel. Conservation Authorities have a successful history of providing holistic, science-based environmental solutions at the intersection of watershed health and climate mitigation, and the special levy funding has supported their continued effective and efficient delivery of programs and services that benefit residents and visitors of Peel Region and beyond.

In the interest of accountability and transparency, Peel Council requested more information in 2016. A better understanding of the impact of the special levy climate change funding and the effectiveness of the funded programs as contributors to the Region's desired Peel Climate Change Master Plan outcomes was sought. KPMG Canada was retained to provide expertise in advancing this request. The resulting Peel Climate Change Performance Measurement System (the "Measurement System") was created to systematically track and report on the performance of program areas on a regular basis. Specifically, the Measurement System is designed to answer:

- How well each of the program areas are performing,
- Where improvements can be made within the various program areas, and
- How regional investments are achieving shared climate change outcomes.

1.1 Measurement System Development

In developing the Measurement System, a consistent methodology established shared Key Performance Indicators (KPIs) that measure the collective performance of Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) climate change initiatives. It aligns 44 cost centres between TRCA and CVC into eight program areas (each with their own KPI), as well as calculating a greenhouse gas (GHG) emissions reduction value.

The KPIs use a qualitative approach to provide information regarding the likelihood of a program area achieving defined outcomes. This is a recognized distinction from the certainty defined by program evaluation. The chosen methodology draws from best practices in the field of performance measurement, and places emphasis on ease of implementation by prioritizing annual replicability while minimizing subjectivity using templates and defined scoring systems. The KPIs are presented as scores, measuring performance relative to the objectives established for each program area.

The inaugural deployment of this system was launched in 2021, with the first report published by TRCA and CVC and was received by the Region in 2022. The Measurement System being employed – the first of its kind across Ontario municipalities and CAs – is also designed for continuous improvement. As such, the expectation is a responsive approach to emerging issues and needs, including ones that may only arise through the implementation process. Improvements to the 2022 Measurement System include:

- Modifications to strengthen data validity and reliability while maintaining ease of implementation and annual use. For example, reducing the chances of reviewer conflict of interest by including additional reviewer selection guidance.
- Refinement of methodologies, questions and processes where needed. For example, the Erosion Management program area added a new methodology to better account for measuring the effectiveness of the implemented erosion control projects.
- An emerging approach to define, identify and integrate what are referred to as 'co-benefits' – the positive results that occur in addition to the benefits associated with the main program area objective.

- Setting a guideline that only program area scores with an annual percent change of +/- 20% should be considered significant. This guideline reflects the inherent variability that exists within the Measurement System annually – for example, different reviewers and initiatives are selected each year.

1.2 Measurement System Scoring

Consistent with the first report, this second publication provides an overall score for each program area, a summary of how well each of the program areas are performing and information that can be used to identify program improvements.

All indicators are calculated on a 1 to 5 scale, where 5 = Very Effective, and 1 = Not Effective (*Figure 1*).

Figure 1: Peel Climate Change Performance Measurement System Scale

2.0 2022 Performance Report

2.1 2022 Performance Report Highlights

- Each of the eight program areas scored as either Effective or Very Effective in achieving the intended results sought.
- Scores ranged from 3.8 to 4.8 out of 5.
- Forest Management had the greatest percent change from 2021 at -16%. This did not exceed the acceptable percent change threshold of +/- 20%.
- Two program areas changed category according to the Measurement System scale:
  - Climate Science scored Effective in 2021 and Very Effective in 2022.
  - Community Engagement and Stewardship scored Very Effective in 2021 and Effective in 2022.

2.2 Performance Report Structure

The following performance report consists of two parts:

- **Part 1: Overview Performance Report (2.3)** – This section includes a one-page overview table which provides the KPI score as well as the rating and percent change for the main objectives of each of the eight program areas as well as GHG emissions reduction. The program areas are grouped and reported according to the three overarching Measurement System models: Adaptation, Knowledge and Awareness, and Mitigation.

- **Part 2: Program Area Performance Reports (2.4)** – This section includes a one-page summary report for each of the eight program areas, as well as one for GHG emissions reduction. These reports will provide high-level information on program area actions and the main factors that affected the results. Detailed program area performance reports – including actions/activities undertaken, program area methodology and explanation of the rating – can be found in Appendix A.

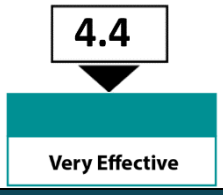
2.3 Overview Performance Report

Adaptation Performance				
Program Area	**Program Area Objective**	**Score / 5**	**Rating**	**% Change from 2021**
Climate Science	Reduced negative impacts of climate change (due to the implementation of useful and effective plans for protection and recovery measures).	**4.4**	**Very Effective**	+12% Non-significant change
Flood Management	Mitigated risk of flooding (due to the construction of protective infrastructure and the use of program area information for planning and implementing flood mitigation measures).	**4.7**	**Very Effective**	+4% Non-significant change
Erosion Management	Mitigated risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).	**4.8**	**Very Effective**	-4% Non-significant change
Restoration and Natural Heritage Science	Reduced impacts of climate change related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).	**4.5**	**Very Effective**	+8% Non-significant change
Forest Management	Increased forest health and ability to withstand climate related extreme weather events (due to the removal of hazard trees and increased forest resilience).	**4.1**	**Very Effective**	-16% Non-significant change
Green Infrastructure	Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).	**4.4**	**Very Effective**	+2% Non-significant change
Knowledge and Awareness Performance				
Program Area	**Program Area Objective**	**Score / 5**	**Rating**	**% Change from 2021**
School Programs	Positive changes in the behaviour of students and teachers regarding support for and participation in climate change adaptation and mitigation activities.	**4.1**	**Very Effective**	-6% Non-significant change
Community Engagement and Stewardship	Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.	**3.8**	**Effective**	-14% Non-significant change
Mitigation Performance				
Greenhouse Gas Emissions (GHG) Reduction	GHG emissions reduced through climate change initiative programs that have significant activities directed toward GHG emissions reduction or have GHG emissions reduction/carbon sequestration as a tangible co-benefit. *	* Score, Rating and % Change values will be addressed through an indicator scoring system that will allow the assessment of the effectiveness of GHG emissions reduction/ sequestration activities. It is under development.		

2.4 Program Area Performance Reports

Adaptation Performance Report

Climate Science

Objective	Score
Reduced negative impacts of climate change (due to the implementation of useful and effective plans for protection and recovery measures).	

Actions

- Applied research and monitoring of climate change impacts, risk factors and mitigation measures with a focus on ecosystem and watershed health (water quality, flooding, erosion, extreme heat and ecosystem biodiversity).
- Knowledge dissemination, advice and training to support climate change related strategies and plans for external (municipalities) and internal (CAs) users (for example: risk assessments, screening tools, carbon offset plans).

Results

- Ratings ranged from highly useful to very highly useful for implementing measures to reduce the negative impacts of climate change.
- Program outputs were valued by users for:
  - Providing an improved understanding of the impacts of climate change on ecosystems and watershed health.
  - Generating actionable data.
  - Identifying current and future gaps and vulnerabilities.
  - Supporting evidence-based decision making.
  - Providing the foundation for collaborative action between inter-agency partners.

Flood Management

Objective	Score
Mitigated risk of flooding (due to the construction of protective infrastructure and the use of program area information for planning and implementing flood mitigation measures).	

Actions

- Construction and maintenance of flood protection infrastructure (in some years).
- Development and dissemination of information regarding flood probabilities, potential flood impacts, and flood mitigation options.

Results

- Ratings ranged from highly useful to very highly useful for minimizing flood risks.
- Program outputs enabled users to improve flood response by reacting to real time water level alarms, conduct more informed flood risk assessments and prioritize capital improvement projects to prevent and mitigate flooding.
- Collaborative monitoring networks offer the potential to identify broader regional and provincial trends to inform flood criteria and flood potential thresholds when issuing provincial flood messages.
- The data provided by this program area will help to produce more accurate maps and forecast models that aid in the identification of flood vulnerable areas to inform sustainable planning and development.
- Detailed climate risk assessments have been initiated for priority watersheds within Peel, further detailed assessments across Peel could produce greater impact/cost-benefit on municipal flood mitigation efforts.
- More detailed cost-benefit and social vulnerability analysis performed in high-risk flood and erosion areas provided further support the optimization of assets, emergency preparedness, climate action plans and offered data to support funding application requirements.
- There was no construction and maintenance of flood protection infrastructure in 2022.

Erosion Management

Objective	Score
Mitigated risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).	

Actions

- Inspection and maintenance of existing erosion control infrastructure.
- Construction of new erosion control structures to protect high priority sites where Region of Peel sanitary infrastructure or watermains may be at risk.

Results

- Very effective annual plan implementation:
  - Two (2) remedial projects implemented.
  - 269 infrastructure hazard monitoring sites inspected.
  - Eight (8) sites received repeated post-storm inspections.
  - 27 erosion control structures constructed within the last five (5) years assessed and deemed to be in very good condition – reflecting soundness of recently constructed structures.

Restoration and Natural Heritage Science

Objective	Score
Reduced impacts of climate change related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).	

Actions

- A wide range of restoration projects (aquatic and wetland restoration, riparian and valley restoration, stream and natural channel restoration, and terrestrial restoration), as well as the implementation of Low Impact Development (LID) and natural green infrastructure projects.
- Two research focused programs (urban natural heritage, and biodiversity conservation and management) that assess climate change vulnerability and the effectiveness of habitat management practices, mapping of significant wildlife habitat, and impact thresholds to guide the management and conservation of wildlife.

RESULTS

- Restoration project ratings ranged from high to very high impact on reducing the negative effects of extreme weather events including the impact on reduced flooding, reduced erosion, reduced water quality degradation, and reduced negative impacts on species and natural features.
- Applied research output ratings ranged from highly useful or potentially useful to very highly useful or potentially useful.
- Applied research outputs provided an improved understanding of current and predicted future conditions of natural heritage features and supported the determination of priority actions needed to mitigate the impacts of climate change.
- Overall, users emphasized that projects and outputs were highly impactful in increasing climate change resilience through both:
  - immediate implementation actions.
  - knowledge-sharing initiatives.

Forest Management

Objective	Score
Increased forest health and ability to withstand climate related extreme weather events (due to the removal of hazard trees and increased forest resilience).	

Actions

- A wide range of forest monitoring, inventory, management planning, outreach and stewardship activities.
- Active management projects and programs to address:
  - hazard trees
  - forest health and disease prevention
  - canopy expansion
  - invasive species
  - resilience to extreme events

Results

- Ratings ranged from high to very high impact on forest resilience.
- A wide variety of proven activities contribute to improved forest resiliency with respect to climate change related extreme weather events.
- Forest resource inventories and management plans guided by science will have a positive effect on resiliency by identifying issues early on and the actions necessary to address issues and improve resilience.
- Species that are native and adapted to local conditions will ensure the appropriate succession and continued provision of forest ecosystem services thereby improving resilience.
- The importance of including both urban and rural planting projects and opportunities to improve resiliency was highlighted.

Green Infrastructure

Objective	Score
Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).	

Actions

- Projects include:
  - Stormwater Management (SWM) and Low Impact Development (LID) research and evaluation projects, demonstration projects and information dissemination regarding these emerging technologies.
  - Neighbourhood stormwater management projects with a focus on LID.

Results

- Ratings ranged from highly useful to very highly useful for the implementation of stormwater management or low impact development (SWM/LID) projects.
- Respondents emphasized the effectiveness of practical demonstrations of key inspection, monitoring and maintenance methods for SWM and LID assets.
- Program outputs contributed directly to the adoption of useful methodologies and tools by municipal partners, influencing current implementation of integrated stormwater management to benefit the environment, reduce property damage and decrease project costs.
- Reviewers acknowledged that lessons learned from the projects would improve future stormwater management implementation and climate change adaptation opportunities.

Knowledge and Awareness Performance Report

School Programs

Objective	Score
Positive changes in the behaviour of students and teachers regarding support for and participation in climate change adaptation and mitigation activities.	

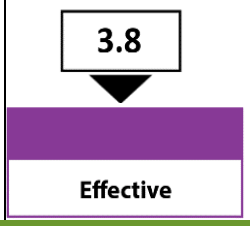
Actions

Planning and delivery of climate change related education and awareness programs for students and professional development training for teachers.

Results

- Results ranged from effective to very effective at encouraging changes in knowledge, awareness, and attitudes of students and teachers.
- Youth volunteers responded that they gained a good understanding of climate change and were likely to apply this knowledge to help reduce the impacts of climate change.
- A climate change-focused retreat allowed for deeper learning and engagement of youth volunteers.
- Curriculum-linked programming provided useful information and practical tips regarding climate change and conservation.
- Teachers and students felt more empowered to mitigate the effects of climate change following their participation in programming.
- New and meaningful ways to educate students and teachers on climate change continue to be developed.
- Survey responses by teachers regarding their students varied, possibly as a result of the grade level of student participants and the suitability of the survey questions.
- It is recommended that survey tools for this program area be reviewed and revised as appropriate to consider the variety of programs being offered and the diverse learning levels and experience of students.

Community Engagement and Stewardship

Objective	Score
Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.	

Actions

- Planning and delivery of climate change related education and engagement programs to the community.

Results

- Results ranged from effective to very effective at encouraging changes in knowledge, awareness, and attitudes of program participants.
- Most programs have both a hands-on action component as well as an education component.
- Participants enjoyed engaging in climate actions including tree plantings, land and water stewardship activities, and climate resiliency projects on urban and rural properties.
- Participants expressed satisfaction in feeling as though they were contributing and doing their part to mitigate the impacts of climate change.

  It is recommended that survey tools for this program area be reviewed and revised as appropriate to consider the level of knowledge of participants and the suitability of the survey questions.

Mitigation Performance Report

Greenhouse Gas (GHG) Emissions Reduction

Objective	Score
GHG emissions reduced through climate change initiative programs that have significant activities directed toward GHG emissions reduction or have GHG emissions reduction/carbon sequestration as a tangible co-benefit.	An indicator scoring system that will allow the assessment of the effectiveness of GHG emissions reduction/sequestration activities is under development. Total GHG emissions reduction/sequestration is provided as an interim indicator until a more effective indicator is developed.

Actions

- Measures GHG emissions reduction and sequestration activities in the following five program areas – Climate Science, Forest Management, Green Infrastructure, School Programs, and Community Engagement and Stewardship.
- Activities include:
  - actions by individuals (for example home retrofits)
  - engagement of schools, community groups and the public (for example tree and shrub planting programs and events)
  - mitigation carried out by participating businesses, organizations, CVC and TRCA (for example, energy efficiency improvements to buildings and processes, biofuels, fuel switching and waste diversion)

Results

A total GHG emissions reduction and total carbon sequestration value has been generated for 2022 to illustrate the emissions reductions and sequestration that are being achieved. In future, a metric will be developed to allow the evaluation of the effectiveness of the program area relative to an annual rate of change or progress toward a target.

2022 Results	**tCO_2e/year**
Estimated annual GHG emissions reduction due to building retrofit and fuel switching projects:	214
Estimated average GHG annual sequestration in subsequent years due to trees and shrubs planted:	546
Total emissions reduction/sequestration:	**760**

3.0 Adding Value through Co-benefits

Co-benefits can be defined as the positive results that occur in addition to the benefits associated with the main program area objective. They are a value-add to the core purpose of the work. Co-benefits are often included in climate change discussions as they demonstrate the ways in which climate action can help advance other broader societal, environmental or economic goals in important, though more indirect, ways.

The current scoring does not account for co-benefits. In the interest of a more fulsome accounting of the entire value of this climate change work, co-benefits are introduced at a high level in the 2022 performance reports of the program areas as a pilot initiative. Co-benefits were generated in a multitude of ways, through user feedback in some cases, and directly by program staff in others. Alignment with the Region's application of co-benefits in assessments will be explored on an ongoing basis as part of the continuous and iterative nature of the Measurement System. A few select examples of cited co-benefits are illustrated below.

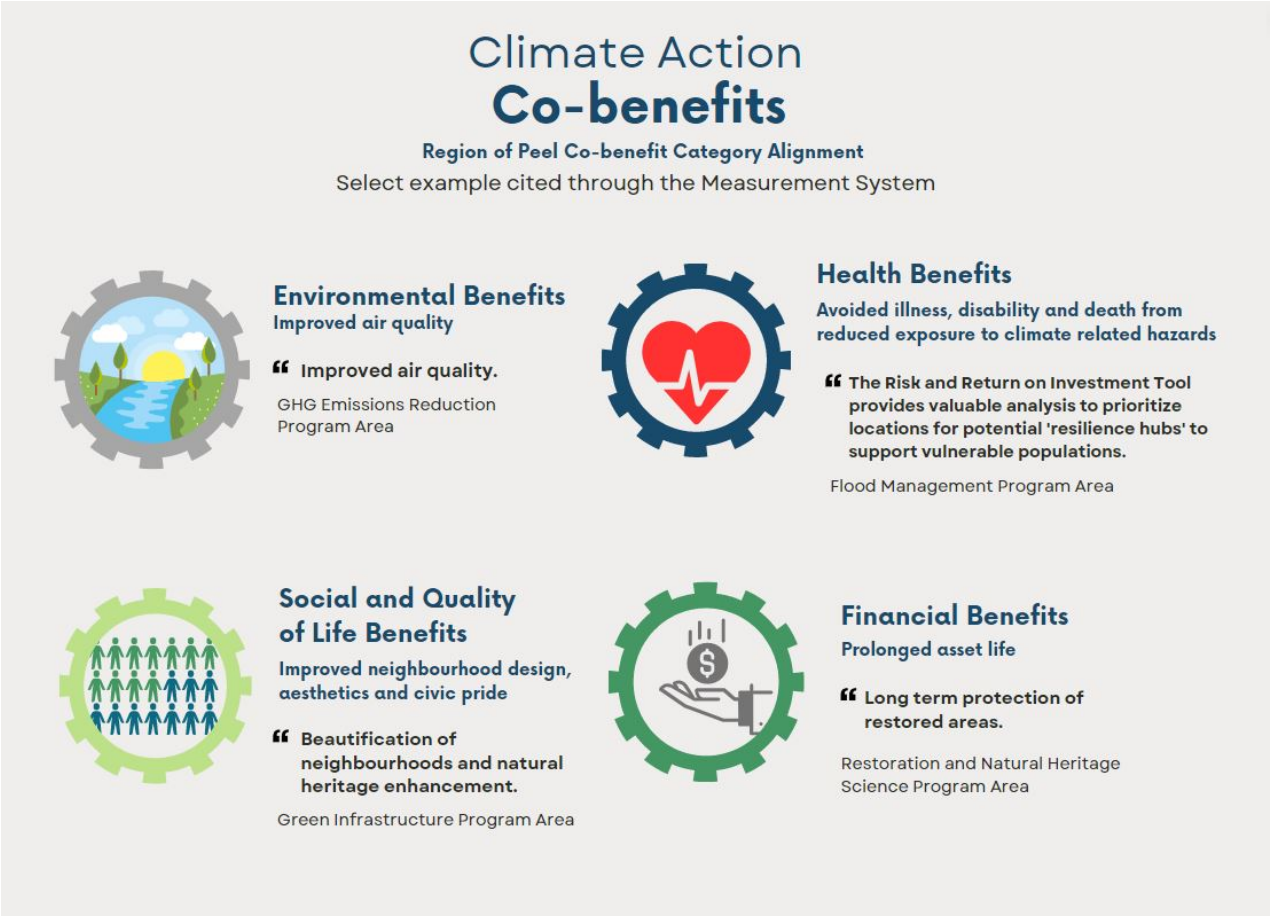


Figure 2: Examples of co-benefits cited by program areas showing alignment with the Region of Peel Climate Change Master Plan.

4.0 Next Steps

Continuous improvement considerations remain a priority for the ongoing development / refinement of this Measurement System. The overall goal of ensuring the integration and practical alignment with the Region's needs remains an area of focused dedication. To this end, the following next steps are recommended:

- Explore target setting, starting with GHG emissions reduction, for each KPI with a goal of ensuring integration and the most practical alignment with the Region's needs.
- Review co-benefits methodology and reporting.
- Include opportunities for improvement in program area reports.

Appendix A: Detailed Program Area Reports

CLIMATE SCIENCE

OBJECTIVE: Reduced negative impacts of climate change (due to the implementation of useful and effective plans for protection and recovery measures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The usefulness of program area outputs for planning or implementing protection and recovery measures.	**4.4** **Very Effective**

1.0 Actions

- Applied research and monitoring on climate change impacts, risk factors and mitigation measures with a focus on ecosystem and watershed health (water quality, flooding, erosion, extreme heat and ecosystem biodiversity).
- Knowledge dissemination, advice and training to support climate change related strategies and plans for external (municipalities) and internal (CAs) users (for example: risk assessments, screening tools, carbon offset plans).

2.0 How the indicator score was calculated

The calculation was based on the ratings of three programs or parts of programs:

Research on water management
CVC program(s)

(1) Water and Climate Change Risk Assessment (internal component only)
(2) Real Time Water Quality

Research on impacts to natural and human systems
TRCA program(s)

(3) Climate Science Applications Program

Eight outputs were selected from the 3 programs (4 water management research outputs and 4 outputs that contribute to research on the impacts to natural and human systems). A description was provided to an intended user of each output, who rated the usefulness (or potential usefulness) of the output to plan or implement adaptation measures on a 1-5 scale (5= Very highly useful or potentially useful, 1= of low or no potential usefulness). These ratings were averaged, after weighting them by the program budgets, to calculate the indicator score.

3.0 Explanation of the rating

All reviewers responded positively to this program area, particularly praising its usefulness in generating actionable data, identifying current and future gaps and vulnerabilities, supporting evidence-based decision making, and providing foundations for collaborative action between inter-agency partners.

Overall, reviewers noted that the outputs were critical to improving their understanding of the impacts of climate change on ecosystems and watershed health and identifying potential impacts in the future. The data generated and

communicated by the activities within this program area provided actionable information for municipal efforts including source protection, operational decision-making, natural asset management, spill response, and watershed planning.

Information generated and shared by the program area enabled participants to better understand the impacts of climate change, including specific phenomena such as flood frequency, water balance, and erosion potential. This information will enable participants to enact more focused and effective risk assessment programs and engage in proactive behaviours to reduce risks and impacts of climate change in future scenarios through evidence-based mitigation and adaptation measures.

4.0 Co-benefits

This Measurement System is based on scoring the objective of the program area and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes. To be included, they must be a significant outcome of the program area activities and must not be included as a consideration in the rating process for the objective.

Examples of co-benefits identified for Climate Science:

- Opportunities to inform natural heritage planning and management, for example, advancing projects linked to natural heritage and biodiversity such as the Region of Peel's Urban Forest Management Program.
- Increased public awareness of climate science through data visualization and "storification" of climate data through initiatives such as TRCA's Watershed and Ecosystem Reporting Hub.
- Use of local datasets to advance scientific methods and models (e.g., thermal regime modelling, hydrology models), collect updated data (e.g., updated monitoring plans) and inform restoration and green infrastructure implementation projects.
- GHG emissions reduction (through emissions reduction and carbon sequestration).

FLOOD MANAGEMENT

OBJECTIVE: Mitigated risk of flooding (due to the construction of protective infrastructure and the use of program area information for planning and implementing flood mitigation measures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The usefulness of program area outputs for planning and implementing flood mitigation measures and protective infrastructure.	**4.7** **Very Effective**

1.0 Actions

- Construction and maintenance of flood protection infrastructure (in some years).
- Development and dissemination of information regarding flood probabilities, potential flood impacts, and flood mitigation options.

2.0 How the indicator score was calculated

The calculation was based on the ratings of 4 programs or parts of programs:

Research Programs:
CVC program(s)

(1) Climate Change Flood Risk Assessment
(2) Flood Forecasting and Warning
(3) Water and Climate Change Risk Assessment

TRCA program(s)

(4) Flood Remedial Works (non-infrastructure work only. Flood protection infrastructure work was not implemented in 2022) *

Programs 1-3 each had 3 outputs selected and program 4 had 2 outputs selected for a total of 11 outputs. A description of each output was provided to an intended user of that output, who rated the usefulness (or potential usefulness) of the output for developing flood protection measures on a 1-5 scale (5 = very highly useful, 1 = of very little or no usefulness). These ratings were averaged, after weighting them by the program budgets, to calculate the indicator score.

*NEW: Flood protection infrastructure work is only implemented in some years. In those years, the program will be sub-divided into two parts – non-infrastructure work and flood protection infrastructure work. Each part will be rated separately. The objective and overall indicator for this program area have been revised to reflect this update.

3.0 Explanation of the rating

Reviewers found the information provided by this program area to be very useful in identifying and quantifying existing and future flood risks. They were impressed with the monitoring tools offered by this program area, citing the usefulness of real-time data provided by equipment such as the Cooksville Creek water level alarms. Participants expressed confidence in the flood risk assessments and floodplain mapping produced by this program area. They also

responded optimistically to the potential utility of flood data for land use planning and flood prevention and mitigation protocols.

Some reviewers suggested that the program area would benefit from the further development of climate models to refine understanding of future climate change scenarios. Likewise, some reviewers suggested that a more detailed cost-benefit analysis in high-risk flood and erosion areas would further support the optimization of assets, emergency preparedness and the availability of data to meet funding application requirements.

In general, reviewers responded well to the useful data and evidence-based analysis provided by the program area. With refinement, collaborative monitoring networks promise region-wide improvements to flood preparedness and response, through a better understanding of flood vulnerable areas, data-driven infrastructure improvements and responsible land use planning.

4.0 Co-benefits

This Measurement System is based on scoring the objective of the program area and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes. To be included, they must be a significant outcome of the program area activities and must not be included as a consideration in the rating process for the objective.

Examples of co-benefits identified Flood Management:

- Real-time monitoring stations inform provincial programs such as the Ontario Low Water Response program, providing detailed data and a more complete spatial and temporal understanding of hazards.
- The Risk and Return on Investment Tool provides valuable analysis to prioritize locations for potential “resilience hubs” to support vulnerable populations. It also supports improved calculation of land and property values and highlights the importance of maintaining and enhancing green infrastructure.

EROSION MANAGEMENT

OBJECTIVE: Mitigated risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of implementation and maintenance of effective erosion risk reduction measures.	**4.8** **Very Effective**

1.0 Actions

- Inspection and maintenance of existing erosion control infrastructure.
- Construction of new erosion control structures to protect high priority sites where Region of Peel sanitary infrastructure or watermains may be at risk.

2.0 How the indicator score was calculated

The calculation was based on the rating of 1 program:

TRCA program(s)

(1) Erosion Maintenance Projects

The calculation was carried out in two parts.

Part 1: This calculation involved determining the extent to which the erosion control plan for the year was implemented. This was done by assigning points to various categories of planned activities once the plan was finalized and then, at the end of the year, calculating the points associated with the actual projects that were carried out during the year. The score for part 1 is the ratio of the points achieved to the points planned, converted to a 5-point scale (5= 80% or more of plan score, 1=0-19% of plan score).

Part 2 (NEW): Using a specific assessment methodology, erosion control structures remediated within the previous 5 years* are inspected and given an asset condition score based on their current condition. The score for each structure inspected is converted to a 5-point scale (5 = very good condition, 1 = very poor condition). The score for part 2 is the average of the individual asset condition scores.

Overall indicator score: The score from part 1 and part 2 are averaged to calculate the overall indicator score.

*Due to the timing of inspections in relation to the development of this plan, in 2022 it was only possible to inspect 10 of the 27 structures constructed within the past 5 years. For the remaining 17 structures, the asset condition score they were given during their final annual warranty period inspection (3 years post-construction) was used to calculate the score for part 2. This did not affect the overall indicator score.

3.0 Explanation of the rating

The erosion risk management program area was rated as very effective. This reflects the implementation of inspections and remedial works as planned in 2022, and the overall reduced risk of damage to infrastructure from

erosion due to sound construction and maintenance of erosion control structures.

As targeted, 269 infrastructure hazard monitoring sites in Region of Peel were inspected before the end of the monitoring season, as well as an additional eight sites that received repeated post-storm inspections. The two remedial projects planned for 2022 – Malton Greenway Bank/Bed Stabilization Project and Ken Whillans Greenway Bed Stabilization Project – improved their respective assets from critical to stabilized and were also considered a success.

The 27 erosion control structures that were constructed within the past five years were found to be in good to very good condition, reflecting the soundness of the recently constructed structures.

4.0 Co-benefits

This Measurement System is based on scoring the objective of the program area and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes. To be included, they must be a significant outcome of the program area activities and must not be included as a consideration in the rating process for the objective.

Examples of co-benefits identified for Erosion Management:

- Protection/enhancement of natural habitat.
- Protection of parks and recreation features.

RESTORATION AND NATURAL HERITAGE SCIENCE

OBJECTIVE: Reduced impacts of climate change related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Reduced impacts of climate change related extreme weather events through enhancements to the natural heritage system and the usefulness of research information for implementing climate change protection measures.	**4.5** **Very Effective**

1.0 Actions

- A wide range of restoration projects (aquatic and wetland restoration, riparian and valley restoration, stream and natural channel restoration, and terrestrial restoration), as well as the implementation of Low Impact Development (LID) and natural green infrastructure projects.
- Two research focused programs (urban natural heritage, and biodiversity conservation and management) that assess climate change vulnerability and the effectiveness of habitat management practices, mapping of significant wildlife habitat, and impact thresholds to guide the management and conservation of wildlife.

2.0 How the indicator score was calculated

The calculation was based on the ratings of nine (9) programs:

Restoration and Protection Programs:
CVC program(s)

(1) Aquatic and Wetland Restoration – Peel

TRCA program(s)

(2) Wetland – Climate
(3) Riparian and Valleyland - Climate
(4) Stream Restoration – Climate
(5) Terrestrial – Climate
(6) Natural Channel Project Implementation
(7) Green Infrastructure – Climate

Applied Research Programs:
CVC program(s)

(8) Urban Natural Heritage
(9) Biodiversity Conservation and Management

The calculation was carried out in two parts.

Part 1- 1 project intended to reduce the negative impacts of extreme weather events was selected from each of the 7 restoration and protection programs. A summary of each project was provided to a four-member expert panel, who developed a consensus rating on a 1-5 scale (5 = very high impacts on reducing negative impacts, 1 = very low impacts on reducing negative impacts) of the overall impact of each project on reducing the negative impacts of extreme weather events. Consideration was also given to the project impact on reduced flooding, reduced erosion, reduced

water quality degradation, and reduced negative impacts on species and natural features.

Part 2 – 2 outputs were selected from program 8 and 3 outputs from program 9 for a total of 5 outputs. A description of each output was provided to an intended user of that output, who rated the usefulness (or potential usefulness) of the output for implementing climate change protection measures on a 1-5 scale (5 = very high impacts on reducing negative impacts, 1 = very low impacts on reducing negative impacts). The output ratings for each program were averaged.

Overall outcome indicator - The 9 ratings (7 impact ratings for programs 1 through 7 and 2 usefulness ratings for programs 8 and 9) were averaged after weighting them by the program budgets.

3.0 Explanation of the rating

Two distinct groups of programs were reviewed in this program area. Programs 1 through 7 comprised restoration implementation projects with direct impacts in the four key areas of flood reduction, erosion reduction, water quality improvement, and protection of species and natural features. Programs 8 and 9 comprised projects which collected and shared data on climate impacts on natural systems.

Overall, the program area rated as very effective. Reviewers were impressed with the direct improvements resulting from the implementation projects, commenting that most projects were highly effective in enhancing each of the four key impact areas. Reviewers emphasized the added value of projects in certain areas, noting the particular importance of flood reduction and habitat improvement in these geographic areas which included sections of the Greenbelt, the Etobicoke Creek watershed, and the Humber River watershed.

Outputs focused on knowledge generation and knowledge sharing were praised for the effectiveness of their outputs in increasing participants' understanding of the local impacts of climate change, the scale of these impacts, and the tangible actions needed to mitigate them. Data generated by these projects will be directly useful and relevant to municipal decisions concerning key natural heritage assets and systems.

4.0 Co-benefits

This Measurement System is based on scoring the objective of the program area and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes. To be included, they must be a significant outcome of the program area activities and must not be included as a consideration in the rating process for the objective.

Examples of co-benefits identified for Restoration and Natural Heritage Science:

- Long-term protection of restored areas.
- GHG emissions reductions (through carbon sequestration).

FOREST MANAGEMENT

OBJECTIVE: Increased forest health and ability to withstand climate related extreme weather events (due to the removal of hazard trees and increased forest resilience).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Increased ability of forests to withstand climate change related extreme weather events through the implementation of forest management measures.	**4.1** **Very Effective**

1.0 Actions

- A wide range of forest monitoring, inventory, management planning, outreach and stewardship activities.
- Active management projects and programs to address:
  - hazard trees
  - forest health and disease prevention
  - canopy expansion
  - invasive species
  - resilience to extreme events

2.0 How the indicator score was calculated

The calculation was based on the ratings of five (5) programs:

CVC program(s)

(1) Invasive Species Control Program
(2) Peel Planting Programs

TRCA program(s)

(3) TRCA Forest Management – Peel
(4) Reforestation Program – Private Lands
(5) Invasive Species Management (NEW in 2022)

A summary of each of the 5 programs was provided to an expert panel composed of four member organizations, who developed a consensus rating on a 1-5 scale (5 = very high impact on forest resilience, 1 = very little impact on forest resilience) of the overall impact of each project towards increasing forest resilience. These ratings were averaged, after weighting them by the program budgets, to calculate the indicator score.

3.0 Explanation of the rating

Overall, the ratings were high in this program area as the five individual programs encompass a wide variety of proven activities that address forest hazards; promote forest health and disease prevention; expand canopy area; and reduce the impacts of invasive species, resulting in improved forest resiliency to climate change and extreme events.

Panel members were impressed by the evidence-based forest inventory and management planning tools provided

through program area activities and commented on their value in understanding and addressing forest conditions and planning for climate resilience strategies. Furthermore, species that are native and adapted to local conditions will ensure the appropriate succession and continued provision of forest ecosystem services thereby improving resilience.

Guided by CVC and TRCA's forest management plans, the program area activities prioritized public lands while also supporting stakeholder and private lands through stewardship and outreach programs. Panel members highlighted the importance of including both urban and rural planting projects and opportunities to improve resiliency.

4.0 Co-benefits

This Measurement System is based on scoring the objective of the program area and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes. To be included, they must be a significant outcome of the program area activities and must not be included as a consideration in the rating process for the objective.

Examples of co-benefits identified for Forest Management:

- Improved urban aesthetics and reduced heat island effect.
- Education of the public through stewardship and public engagement.
- Improved wildlife habitat and wildlife refugia.
- GHG emissions reductions (through carbon sequestration).

GREEN INFRASTRUCTURE

OBJECTIVE: Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Reduced risks of major water resource degradation.	**4.4** **Very Effective**

1.0 Actions

- Projects include:
  - Stormwater Management (SWM) and Low Impact Development (LID) research and evaluation projects, demonstration projects and information dissemination regarding these emerging technologies.
  - Neighbourhood stormwater management projects with a focus on LID.

2.0 How the indicator score was calculated

The calculation was based on the ratings of six (6) programs or parts of programs:

SWM/LID Programs:
CVC program(s)

(1) SWM Infrastructure Performance Risk Assessment
(2) Integrated Water Management Implementation
(3) Integrated Water Management Guidance and Training

TRCA program(s)

(4) Sustainable Technologies (stormwater portion only)

Sustainable Neighbourhood Programs:
CVC program(s)

(5) Sustainable Neighbourhoods (Sustainable Neighbourhood Action Program) (stormwater portion only)

TRCA program(s)

(6) Sustainable Neighbourhood Action Program (SNAP) (stormwater portion only)

Ten representative projects were selected from the 6 programs that underlie this objective. (6 projects were selected from SWM/LID programs and 4 projects were selected from Sustainable Neighbourhoods programs). A description of each project was provided to an intended user of that project, who rated its usefulness (or potential usefulness) in implementing or managing a SWM/LID project on a 1-5 scale (5 = very highly useful or potentially useful, 1 = very low or no potential useful). These ratings were averaged, after weighting them by the program budgets, to calculate the indicator.

3.0 Explanation of the rating

This program area was rated highly useful to very highly useful by reviewers, who found the program area valuable in implementing green infrastructure projects, engaging residents through outreach, identifying new opportunities for SWM and LID implementation, and informing future adaptation strategies.

Reviewers felt that the programs provided clear direction for municipalities by offering easy-to-understand guidance documents outlining practical tools and methodologies for adoption by municipalities and other interested partners. Program outputs have been useful to Peel staff in ensuring the proper construction and maintenance of integrated stormwater management. Likewise, LID and SWM guidance has been instrumental in Peel's efforts to enhance stormwater management implementation and advance climate change adaptation.

Project outputs not only contributed to on-the-ground implementation but also provided valuable guidance for future implementation of SWM and LID technologies. The projects are expected to improve water quality and drainage. They are also expected to strengthen relationships with residents and contribute to future engagement and implementation opportunities.

4.0 Co-benefits

This Measurement System is based on scoring the objective of the program area and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes. To be included, they must be a significant outcome of the program area activities and must not be included as a consideration in the rating process for the objective.

Examples of co-benefits identified for Green Infrastructure:

- Development of tools and resources to assist municipalities in the management of stormwater assets.
- Guidance for municipal flood emergency response, operations and maintenance, and planning.
- Reduction in local flooding.
- Enhanced climate literacy in the community.
- Beautification of neighbourhoods and natural heritage enhancement.
- GHG emissions reduction (through direct emission reduction activities and carbon sequestration).

SCHOOL PROGRAMS

OBJECTIVE: Positive changes in behaviour of students and teachers regarding support for and participation in climate change adaptation and mitigation activities.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of changes in knowledge, awareness, and attitudes of students and teachers.	**4.1** **Very Effective**

1.0 Actions

Planning and delivery of climate change related education and awareness programs for students and professional development training for teachers.

2.0 How the indicator score was calculated

The following six (6) programs were planned to be rated in relation to the objective:

CVC program(s)

(1) Conservation Youth Corps
(2) Environmental Education

TRCA program(s)

(3) Albion Hills Environmental Weeks (Environmental Leaders of Tomorrow) *
(4) Stewardship Partnership Services
(5) Conservation Youth Corps
(6) Ontario Eco Schools for Peel Region (Eco-Schools Expansion Program)

Each program or part of a program was rated based on teacher or student surveys that measured their knowledge and attitudes toward climate change following their participation in a school program. 455 survey responses were received. The ratings were averaged and weighted by the program budgets to determine the overall indicator score.

*Albion Hills Environmental Weeks (Environmental Leaders of Tomorrow) was not rated this year due to the alignment of the program within the school year calendar and the remaining impacts of the pandemic on overnight programming in 2022. Programming that began in the fall of 2022 and completed in 2023 will be reflected in the 2023 report.

3.0 Explanation of the rating

This program area was rated as effective to very effective by survey respondents. High school students responded positively to programming which included both in-class and field trip learning as well as volunteer leadership opportunities outside of school time. They noted an increased understanding of climate change as well as an increased likelihood of acting on their newfound knowledge to reduce the impacts of climate change as a result of their participation. One student commented, “It was a good learning experience for work and learning about the environment and how people can help or affect climate change”.

Teachers’ responses regarding their students varied, possibly based on the grade level of student participants and the

suitability of the survey questions. It is recommended that survey tools for this program area be reviewed and revised as appropriate to consider the variety of programs being offered and the diverse learning levels and experiences of students.

Even with programming adjustments to account for pandemic impacts, programs were delivered effectively to students from elementary through high school. Participants expressed that the programs provided useful information and practical tips regarding climate change and conservation, feeling more empowered to help mitigate the effects of climate change after participating in the program.

Educators continued to explore new and meaningful ways to introduce and educate younger students regarding climate change concepts and integrate climate change research and science into programming and hands-on experiences for older students. The introduction of a climate change focused retreat allowed for deeper learning on conservation and climate change and engaged youth volunteers.

4.0 Co-benefits

This Measurement System is based on scoring the objective of the program area and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes. To be included, they must be a significant outcome of the program area activities and must not be included as a consideration in the rating process for the objective.

Examples of co-benefits identified for School Programs:

- Development among participants of a connection to and appreciation for nature and the natural environment.
- Social benefits including leadership skills development, mentorship, relationship building and community cohesion through cooperation and volunteerism.
- Physical and psychological benefits including time spent outdoors in nature, increased physical activity, and improved mental and emotional health.
- GHG emissions reduction (through carbon sequestration).

COMMUNITY ENGAGEMENT AND STEWARDSHIP

OBJECTIVE: Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of changes in knowledge, awareness, and attitudes of program participants.	**3.8** **Effective**

1.0 Actions

- Planning and delivery of climate change related education and engagement programs to the community.

2.0 How the indicator score was calculated

The calculation was based on the ratings of six (6) programs. All programs were rated:

CVC program(s)

(1) Peel Rural Stewardship
(2) Urban Outreach and Restoration
(3) Regional Community Outreach

TRCA program(s)

(4) West Humber Stewardship Program
(5) Etobicoke-Mimico Stewardship
(6) Etobicoke Headwaters Sub-watershed Regeneration

Each program was rated based on surveys that measure participants' knowledge and attitudes toward climate change following their participation in a community engagement program or activity. 727 survey responses were received. The ratings were averaged and weighted by the program budgets to determine the overall indicator score.

3.0 Explanation of the rating

Participants rated this program area effective to very effective, providing largely positive comments on the programs' contributions to community climate action. They also expressed an overall positive sense of contributing to conservation, environmental stewardship and climate change mitigation and resilience.

In addition to learning about the natural environment and climate change, most programs offered an opportunity for participants to take action as part of the experience. Participants engaged in both public and private land and water stewardship actions including tree plantings, habitat creation projects, and citizen science activities.

In 2022, the program area saw an increase in funding and delivery partnerships with community and government stakeholders as well as a significant uptake by corporations and businesses who wished to engage in community

climate actions. One corporate volunteer noted, “It was a great experience for me since it helped me bond with my colleagues in a unique way while working to support the environment. I never knew what a rain garden was before I did this activity, since then I've been researching and trying to understand different aspects of conservation. Thank you for providing us this experience!”

Survey results indicated that some participants did not notice changes to their understanding of climate change, thus impacting the program rating. This could be due to the variability in participants (families, residents, corporate volunteers, private landowners) and their baseline knowledge regarding climate change for the programs rated. Those individuals already well- versed in climate change issues may not have increased their knowledge very much by participating. It is recommended that survey tools and the data collection processes for this program area be reviewed and revised as appropriate to consider the varying experiences of program participants.

4.0 Co-benefits

This Measurement System is based on scoring the objective of the program area and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes. To be included, they must be a significant outcome of the program area activities and must not be included as a consideration in the rating process for the objective.

Examples of co-benefits identified for Community Engagement and Stewardship:

- GHG emissions reductions (through carbon sequestration).
- Improvements in community collaborations and community health and well-being.

GREENHOUSE GAS (GHG) EMISSIONS REDUCTION

OBJECTIVE: GHG emissions reduced through climate change initiative programs that have significant activities directed toward GHG emissions reduction or have GHG emissions reduction/carbon sequestration as a tangible co-benefit.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Amount of GHG emissions reduced annually through emissions reduction measures and carbon sequestration.	An indicator scoring system that will allow the assessment of the effectiveness of GHG emissions reduction/sequestration activities is under development. Total GHG emissions reduction/sequestration is provided as an interim indicator until a more effective indicator is developed.

1.0 Actions

- Measures GHG emissions reduction and sequestration activities in the following five program areas – Climate Science, Forest Management, Green Infrastructure, School Programs, and Community Engagement and Stewardship.
- Activities include:
  - Actions by individuals (for example home retrofits).
  - Engagement of schools, community groups and the public (for example, tree and shrub planting programs and events).
  - Mitigation activities carried out by participating businesses, CVC and TRCA (for example, energy efficiency improvements to buildings and processes, biofuels, fuel switching and waste diversion).

2.0 Main principles behind the calculations

The 15 programs or parts of programs included in this assessment include:

Emissions Reduction:
CVC program(s)

(1) Water and Climate Change Risk Assessment (internal component only)

TRCA program(s)

(2) Sustainable Technologies
(3) Sustainable Neighbourhood Action Program (SNAP)
(4) Sector-Based Climate Mitigation Programs
(5) Pearson Eco-Industrial Zone

Carbon Sequestration:
CVC program(s)

(6) Peel Planting Programs
(7) Sustainable Neighbourhoods (Sustainable Neighbourhood Action Program)
(8) Peel Rural Stewardship
(9) Urban Outreach and Restoration
(10) Regional Community Outreach
(11) Conservation Youth Corps *(ADDED in 2022)*

TRCA program(s)

(12) TRCA Forest Management – Peel
(13) Reforestation Program – Private Lands
(14) Sustainable Neighbourhood Action Program (SNAP)
(15) Conservation Youth Corps *(ADDED in 2022)*

Each year the GHG emissions reductions reflect a mixture of different actions depending on the priorities of the participating organizations. As a result, the magnitude of emissions reductions will vary as a result of the types of actions that are taken. In all cases, standard industry practices and associated published emissions factors are used.

For the emissions reductions, the calculation was based on an estimate of the emissions savings achieved in 2022 from the actions taken in 2022. In the case of tree and shrub plantings, tree planting activities for the current year (2022) were used to estimate the average annual sequestration in subsequent years.

3.0 Explanation of the results

A total GHG emissions reduction and total carbon sequestration value has been generated for 2022 to illustrate the emissions reductions and sequestration that are being achieved. In future, a metric will be developed to allow the evaluation of the effectiveness of the program area relative to an annual rate of change or progress toward a target.

2022 Results	**tCO_2e/year**
Estimated annual GHG emissions reduction due to building retrofit and fuel switching projects:	214
Estimated average GHG annual sequestration in subsequent years due to trees and shrubs planted:	546
Total emissions reduction/sequestration:	**760**

4.0 Co-benefits

This Measurement System is based on total GHG emissions reduction as an interim indicator and does not take into consideration the positive results that occur in addition to the benefits associated with the main objective. Co-benefits address these other outcomes.

The following GHG emissions reduction co-benefits align with those found in the Region's Climate Change Master Plan:

- Operational cost savings and avoidance from energy efficiency
- Reduced operation and maintenance costs
- Avoided fuel costs from shifts to more sustainable transportation and green fleet
- Increased property and asset value
- Local economic growth and investment
- Improved outdoor air quality from cleaner sources of energy
- Improved indoor air quality
- Improved traffic safety
- Increased employment opportunities from community benefits
- Complete communities

- Increased energy security
- Enhanced reputation and branding
- Increased public trust from more transparent responsive governance
- Improved air quality
- Helps keep global temperatures below 1.5 degrees Celsius

Climate Change Performance Measurement

A leading system for Region of Peel

Presented by: Quentin Hanchard
Chief Administrative Officer
Credit Valley Conservation

May 11, 2023

Credit Valley Conservation
inspired by nature

Toronto and Region Conservation Authority

- Funding since 2007
- Unfunded and Underfunded Priorities
- Region is a provincial frontrunner

- Generate useful and timely information
- Serve program/project managers and decision-makers
- Identify trends over time and recommendations for improvements

- 44 programs / cost centres grouped across 8 Program Areas, plus a comprehensive GHG emissions reduction category
- 8 logic models correlate activities to impacts
- 9 KPIs established

50 Subject matter experts engaged

8 Logic models developed

9 Key Performance Indicators (KPI) established

- Various methodologies used
- Questions posed are around:
  - effectiveness and/or usefulness of the products and services delivered each year;
  - project implementation executed vs planned work;
  - perception and/or experience surveys
  - the sum of GHG emissions reductions
- A score is calculated for each Program Area
- Details and changes are published in annual reports
- 2 reports published to date (2021, 2022)

2022 Results

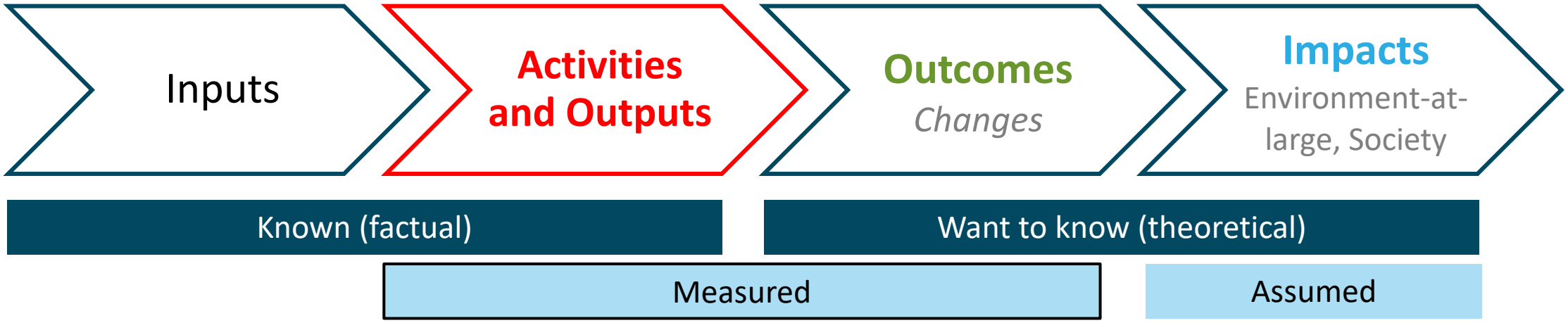
Program Area	Score / 5	Rating	% Change from 2021
Adaptation Performance			
Climate Science	**4.4**	**Very Effective**	+12% Non-significant change
Flood Management	**4.7**	**Very Effective**	+4% Non-significant change
Erosion Management	**4.8**	**Very Effective**	-4% Non-significant change
Restoration and Natural Heritage Science	**4.5**	**Very Effective**	+8% Non-significant change
Forest Management	**4.1**	**Very Effective**	-16% Non-significant change
Green Infrastructure	**4.4**	**Very Effective**	+2% Non-significant change
Knowledge and Awareness Performance			
School Programs	**4.1**	**Very Effective**	-6% Non-significant change
Community Engagement and Stewardship	**3.8**	**Effective**	-14% Non-significant change
Mitigation Performance			
Greenhouse Gas Emissions (GHG) Reduction	Score, Rating and % Change to be based on targets currently being developed		

- Target establishment
- Co-Benefits definitions, alignments and details
- Deepen emphasis on continuous improvement

Credit Valley Conservation
inspired by nature

Toronto and Region Conservation Authority

Measurement System Design



The Measurement System is designed
to score and describe how well
the Activities and Outputs perform

each year and over time

relative to the **Outcomes** and **Impacts** desired

Program Area	Program Area Intermediate Outcome *How well is the Program Area performing against this medium-term change*	Logic Model Used *Rationale towards long-term change*	Ultimate Outcome *Long-term change / Impact*
Climate Science	Reduced negative impacts of climate change (due to the implementation of useful and effective plans for protection and recovery measures).	Adaptation	Protection – to protect residents of the region and the natural environment against climate change-related extreme weather events; and Recovery – to facilitate recovery from the impacts of climate change that have occurred.
Flood Management	Mitigated risk of flooding (resulting from the use of Program Area outputs for planning and implementing flood mitigation measures and protective infrastructure).		
Erosion Management	Mitigated risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).		
Restoration and Natural Heritage Science	Reduced impacts of climate change related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).		
Forest Management	Increased forest health and ability to withstand climate related extreme weather events (due to the removal of hazard trees and increased forest resilience).		
Green Infrastructure	Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).		
School Programs	Positive changes in the behaviour of students regarding support for and participation in climate change adaptation and mitigation activities.	Knowledge and Awareness	To increase the knowledge and awareness of residents of the Region of climate change issues, with the ultimate aim of motivating behavior change.
Community Engagement and Stewardship	Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.		
Greenhouse Gas Emissions (GHG) Reduction	GHG emissions reduced through climate change initiative programs that have significant activities directed toward GHG emissions reduction or have GHG emissions reduction/carbon sequestration as a tangible co-benefit.	Mitigation	To decrease greenhouse gas emissions (GHGs) by means of both emission reduction measures and sequestration measures.