

**EcoHealth Economic Valuation Framework**  
Quantifying the Health Return on Investments  
in Greenspace

**Survey Design:  
Credit Valley  
Conservation Authority**

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Prepared for the Greenbelt Foundation and EcoHealth Ontario in partnership with Punjabi Community Health Services and Credit Valley Conservation Authority

**By Green Analytics Corp.**

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Possibility grows here.

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# 1. Background

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Punjabi Community Health Services (PCHS) is a health service provider organization with a mandate to improve the quality of life of the community members. Since 1990, PCHS has been actively engaging community members in health-centred programs to address the needs of seniors and people with mental health issues and addictions by offering education and awareness opportunities through a family-centric approach. Through a grassroots level community engagement model, PCHS has positioned itself to provide culturally specific programming to the South Asian community in the Peel region. The organization has branches in Mississauga, Brampton, Calgary and Punjab, India.

PCHS, in association with Credit Valley Conservation Authority (CVC), has developed a mental health program with the goal to engage 200 seniors from the South Asian ethnic community who meet periodically during the week to encourage them to participate actively in nature-based programming. Seniors involved with PCHS speak Punjabi, Hindi, Urdu and English. Most of these seniors live in and around the built environment where access to greenspaces is limited to playgrounds or small neighbourhood trails.

The proposed programming includes a PowerPoint presentation/video to educate and build awareness of seniors around local greenspaces, followed by guided walks and nature-based activities in the Terra Cotta Conservation Area. As part of the programming, seniors will have opportunities to engage in mindfulness exercises, yoga in the forest, games using elements of nature and natural materials, poetry, storytelling, singing, and dancing. In addition, participants would be led on walking tours in their local communities. Table 1 outlines details of proposed activities and time schedules.

TABLE 1: List of activities and time schedules

<b>NO.</b>	<b>ACTIVITIES</b>	<b>DURATION</b>	<b>LENGTH OF TIME IN NATURE</b>
1	Trip to Terra Cotta Seniors from PCHS Brampton	9:00 a.m. - 2:00 p.m.	3 Hours
2	Trip to Terra Cotta Seniors from PCHS Mississauga	9:00 a.m. - 2:00 p.m.	3 Hours
3	Trip to Terra Cotta Seniors from PCHS Malton	9:00 a.m. - 2:00 p.m.	3 Hours
4	Trip to Terra Cotta Seniors from PCHS Caledon	9:00 a.m. - 2:00 p.m.	3 Hours
5	Presentation at PCHS Monday AM	11 a.m. - 12:00 a.m.	N/A
6	Presentation at PCHS Tuesday AM	11 a.m. - 12:00 a.m.	N/A
7	Presentation at PCHS Tuesday PM	1:00 p.m. - 2:00 p.m.	N/A
8	Presentation at PCHS Wednesday AM	11 a.m. - 12:00 a.m.	N/A
9	Presentation at PCHS Thursday AM	11 a.m. - 12:00 a.m.	N/A
10	Presentation at PCHS Thursday PM	1:30 p.m.- 2:30 p.m.	N/A
11	Presentation at PCHS Friday AM	11 a.m. - 12:00 a.m.	N/A
12	Presentation at PCHS Friday PM	12:00 p.m. - 1:00 p.m.	N/A
13	Walking Tour Close to the PCHS Center, Brampton	12:00 p.m. - 2:00 p.m.	1 Hour
14	Walking Tour Close to the PCHS Center, Mississauga	12:00 p.m. - 2:00 p.m.	1 Hour
15	Walking Tour Close to the PCHS Center, Malton	12:00 p.m. - 2:00 p.m.	1 Hour
16	Walking Tour Close to the PCHS Center, Caledon	12:00 p.m. - 2:00 p.m.	1 Hour

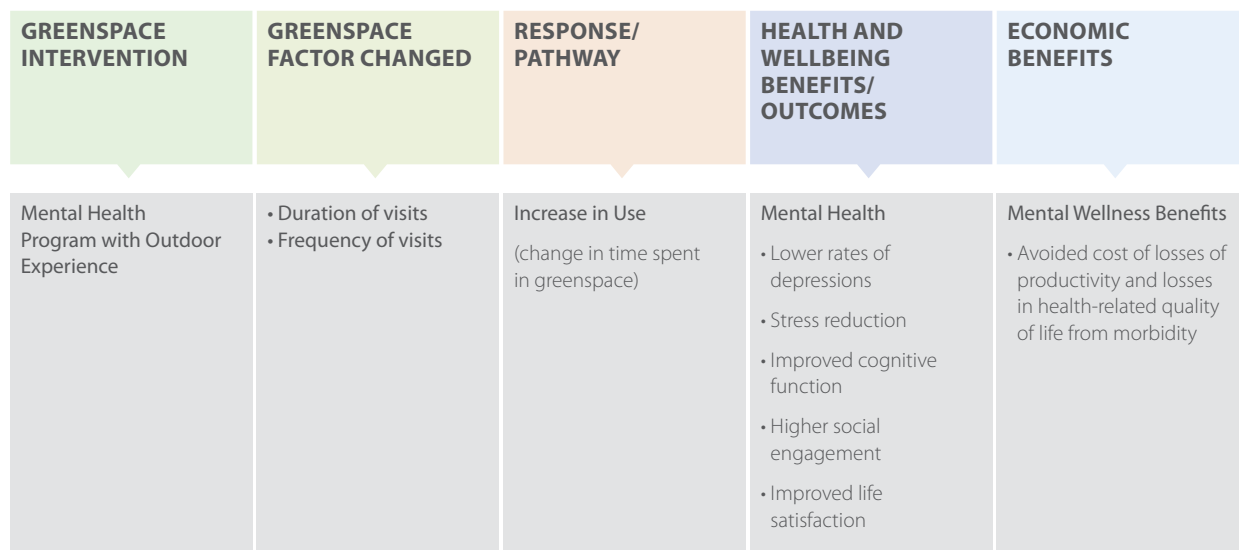
The proposed budget to deliver the activities is \$7,700, which includes transportation costs (bus rental), staffing costs, program development and administration costs.

## 2. Framework Overview

The economic framework developed to support this case study links greenspace investments to improvements in health and well-being resulting in, for example, health system savings, prevented lost productivity associated with poor health and illness, and reduced mortality. Figure 1 demonstrates the connection between greenspace investments and health and wellbeing returns on investment.

The conceptual framework provides analysts and decision-makers information on the ecohealth benefits of potential greenspace investments when evaluating policies, programs and actions. It is meant to enhance the decision-making process by complementing other factors and information under consideration. The conceptual framework makes links between greenspace investments, health outcomes, and economic benefits to inform the decision-making process.

FIGURE 1: Investing in the development of an outdoor mental health program



Assigning a monetary value to greenspace investments is challenging, given the difficulties in identifying quantifiable health outcomes attributed to a policy, program, or planning decision. The evidence connecting greenspace investments to health outcomes is strongest in the following three areas:

1. Physical health improvements associated with higher levels of physical activity
2. Mental health improvements associated with spending time in nature
3. Health improvements associated with reduced exposure to air pollution (specifically reduced respiratory symptoms and incidences of cardiovascular disease) and avoided health system costs and lost productivity associated with extreme heat

The approach applied in this case study relies on a number of assumptions supported by evidence from the literature. These assumptions draw on the most robust and well-regarded studies or integrate consistent trends shown across studies. The approach also structures the calculations in such a way that the model could be refined in the future as more locally relevant data becomes available or to reflect changes in assumptions or new knowledge.

## 3. Mental Wellness Benefits

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A strong body of academic literature indicates that spending time in a natural environment promotes health and wellbeing (Summary of supporting data is available in Section 7). The proposed mental health program is designed to bring mental wellness improvements to the Punjabi community.

The mental wellness benefits that result from participating in the program will also generate economic value. The improved mental wellness condition of program participants will reduce direct and indirect costs (e.g., healthcare costs, insurance costs, loss of productivity, etc.) related to mental health problems and illness. Participants' gains in life satisfaction can also be quantified and measured by the replacement cost of experiencing a similar improvement in life satisfaction.



## 4. Survey Design

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Three surveys (two participant surveys and one program administrator survey) were developed to capture the data necessary to populate the economic framework. The participant surveys are designed to collect background information, health status and program benefits. The administrator survey is designed to record details of each individual daily session and to gather feedback from session participants and program leads.

### 4.1. Pre-program Survey for Participants

The pre-program survey includes five sub-sections that collect information on demographics, pre-event life satisfaction, health status, leisure and cultural life, and living environments. The pre-program survey form is attached in Appendix 1.

### 4.2. Post-program Survey for Participants

The post-program survey includes three sub-sections that collect information on participants' post-event health status, post-event life satisfaction and event feedback. Some of the questions on health status and life satisfaction are identical to questions in the pre-survey. The post-program survey should be distributed to participants upon completion of the outdoor sessions. The post-program survey form is attached in Appendix 2.

### 4.3. Program Administrator Survey

The program administrator survey is designed to collect information about the number of participants, total time spent in natural environments, outdoor activities organized, and feedback received during each daily session. Section A should be completed during the presentation. Section B should be completed during outdoor activities. Section C should be completed at the end of each daily session. The program administrator survey form is attached in Appendix 3.

## 5. Economic Value Calculations

This section outlines the general methodologies and examples of estimating the economic value of various health benefits resulting from participating in the PCHS mental health program.

### 5.1. Economic Value of Improved Mental Wellness

Self-reported life satisfaction, happiness, and improved mental wellbeing are associated with spending time in greenspaces. By spending time in natural environments, the program participants are expected to experience improvement in their overall mental wellbeing. Improved mental wellness leads to direct savings (e.g., healthcare costs) and indirect savings (e.g., productivity loss).

This approach measures participants' improvement in mental wellness by quantifying the survey results of two mental health-related questions: the pre-survey question C2 and post-survey question F5. The questions provide a measurement of participants' self-reported mental wellbeing before and after the program. The improvement in participants' mental wellbeing should be quantified into percentages by assigning scores to answers of question C2 and F5 (e.g., Assuming scores with a linear relationship are applied to those questions' answers - Excellent = 100, Very good = 75, Good = 50, Fair = 25, Poor = 0) and measuring the average change for all pre- and post-surveys.

Assuming that the survey results indicate an X% improvement in participants' overall mental wellbeing, the economic value of such progress is calculated following the function below:

#### **Economic Value of Improved Mental Wellness:**

*= Total number of program participants \* Average of percentage improvement in participants' mental wellbeing (X%) \* Annual economic burden of mental problems and illness per person (\$1,950)*

The first two parts of the function require input from survey results, while the last part is adopted from the literature. Lim and colleagues (2008) estimated that the annual economic burden of mental health problems and illness for Canada in 2003 was \$50,847. Their estimate includes direct medical cost, cost of productivity loss and loss in health utilities. After adjusting for inflation, the amount is equal to \$67,268 million in 2019\$. Per individual, the economic burden of mental illness in Canada is \$1,950.

The proposed calculation provides an estimate of the economic value of improved mental wellness attributed to the avoided economic burden of mental problems and illness.

## 5.2. Economic Value of Improved Life Satisfaction

Numerous studies attribute spending time in the nature to higher levels of self reported life satisfaction. The economic value of improved life satisfaction can be measured by its replacement cost, i.e. the economic cost required to experience a similar level of improved satisfaction. The most common measurement of replacement cost is to evaluate the amount of income rise (additional wealth) that results in an equivalent increase in life satisfaction scores.

Both the pre-survey and post-survey include a section on participants' life satisfaction. Section B of the pre-survey measures the base level of life satisfaction using the Satisfaction with Life Scale (SWLS). Section H of the post-survey measures life satisfaction after the outdoor experience offered in the program. By comparing the results of these two survey sections, the administrator would be able to find the average increase in life satisfaction scores.

Assuming that on average, participants' life satisfaction increases by **Y point**, the economic value of such improvement is calculated following the function below:

### **Economic Value of Improved Life Satisfaction:**

*= Total number of program participants \* Average increase in individual life satisfaction score (Y point) \* Replacement cost per one unit of life satisfaction score (\$57,200)*

The first two parts of the function require input from survey results, while the last part is adopted from the literature. Lora and Chaparro (2008) find that to increase average life satisfaction by one point (on a 0-10 scale) in a developed country, a per capita income rises of US\$26,000 would be needed. When converting to a 1-7 scale, a one-point increase in life satisfaction is equivalent to an approximate CAD\$57,200 (\$2019) increase in annual per capita income.

The calculation provides an estimate of the economic value associated with an increase in life satisfaction. The economic value represents the equivalent amount of wealth increase among participants to enjoy a similar improvement in life satisfaction.

## 6. Supporting Research

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Self-reported life satisfaction, happiness, and improved wellbeing are associated with spending time in nature. Maller, a leading authority on the health benefits of nature, contends that increasing access and exposure to greenspace and natural areas may be the most effective population-wide strategy for promoting mental wellbeing (Maller et al., 2006). Maller's statement reflects over 30 years of research demonstrating that contact with nature reduces stress and increases a sense of personal wellbeing (Hartig et al., 2014; Shanahan et al., 2016). Empirical studies have shown that being in nature reduces cortisol levels and blood pressure (Van den Berg & Custers, 2011; Hartig et al., 2003). While explanatory pathways are not well understood, studies consistently find that people feel better in nature. Contact with nature is positively associated with increased self-esteem, higher life satisfaction, cognitive function and better job performance (Bowler et al., 2010; Bratman et al., 2012; Kaplan & Kaplan, 1989; White et al., 2013). Hazer and colleagues (2018) found an increase in time spent in nature reliably predicts a statistically significant reduction in perceived stress in a population. Shanahan and colleagues (2016) found that individuals who made extended visits to greenspaces had lower rates of depression and high blood pressure. Based on their analysis, visits to outdoor greenspaces of 30 minutes or more during the course of a week could reduce the population prevalence of depression and high blood pressure by up to 7% and 9%, respectively.

The natural environment contributes to human wellbeing in a variety of ways, one of them being the improved life satisfaction for residents. Biedenweg and colleagues (2016) identified eleven environment-specific social indicators that have positive correlations to overall life satisfaction, which include sense of place, outdoor activities, and social and cultural activities. Capaldi and colleagues (2014) also found that those who are more connected to nature usually experience more positive emotions, and higher levels of vitality and life satisfaction compared to those less connected to nature.

Literature also indicates that a positive association exists between greenspaces and mental health. Van den Berg and colleagues (2017) found that purposeful visits to greenspaces are a mediator linking greenness indirectly with mental health. A study by Barton and Rogerson (2017) concluded that spending time in greenspace facilitates interaction and attachment, fosters wellbeing and increases opportunities for green exercise, all of which promote better mental health and wellbeing.

# 7. Appendices

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## 7.1. Appendix 1: Pre-program Survey for Participants

The pre-program survey should be delivered to participants prior to commencing the program. This survey mainly collects participants' background information.

### Section A – Participant Demographics

*This section includes questions to collect the basic demographics information of program participants. Questions are adapted from the Canadian Community Health Survey.*

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**A1.** What is your age? .....

**A2.** What is your gender?

Male  Female  Prefer not to say  Prefer to self-describe .....

**A3.** Which language(s) do you speak well enough to conduct a conversation?

English  French  Punjabi  Hindi  Urdu

Other – please specify .....

## Section B – Pre-event Life Satisfaction

This section includes questions to measure the overall level of life satisfaction of program participants. Questions are adapted from the Satisfaction with Life Scale (SWLS).

Below are five statements that you may agree or disagree with. Using the scale as presented in the table, indicate your agreement with each item by filling in the circle.

	Strongly disagree	Disagree	Slightly disagree	Neither agree of disagree	Slightly agree	Agree	Strongly agree
<b>B1.</b> In most ways, my life is close to my ideal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>B2.</b> The conditions of my life are excellent.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>B3.</b> I am satisfied with my life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>B4.</b> So far, I have gotten the important things I want in life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>B5.</b> If I could live my life over, I would change almost nothing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Section C – Healthy Life

This section includes questions to collect information regarding participants' overall health conditions and life habits. Questions are adapted from the Canadian Index of Wellbeing and Nova Scotia Quality of Life Index.

**C1.** In general, would you say your physical health is:

Excellent  Very good  Good  Fair  Poor

**C2.** In general, would you say your mental health is:

Excellent  Very good  Good  Fair  Poor

Below are three statements that you may agree or disagree with. Using the scale as presented in the table, indicate your agreement with each item by filling in the circle.

	Strongly disagree	Disagree	Slightly disagree	Neither agree or disagree	Slightly agree	Agree	Strongly agree
<b>C3.</b> During the past week, I regularly engaged in good quality exercise.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>C4.</b> During the past week, I regularly ate healthy meals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>C5.</b> During the past week, I regularly visited green spaces (e.g., parks, trails, community gardens, schoolyards, etc.).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Section D – Leisure and Culture**

*This section includes questions to collect information regarding participants’ time spent on leisure and cultural activities. Questions are adapted from the Canadian Index of Wellbeing and Nova Scotia Quality of Life Survey.*

For each of the activities listed in the questions below, please indicate the total number of times you participated in each activity in a typical month. If you do not participate in the activity, please report “0” (zero) or leave the space blank.

**D1.** In a typical month, I would participate in sports (e.g., baseball, badminton, tennis, etc.)  
..... times.

**D2.** In a typical month, I would be socializing with friends (e.g., chatting with a friend, going for coffee with friends, getting together at friends’ home, etc.)  
..... times.

**D3.** In a typical month, I would attend cultural events (e.g., religious ceremonies/festivals, extended family get togethers and volunteering activities)  
..... times.

**D4.** In a typical month, I would spend time on my personal hobbies (e.g., reading, knitting, woodworking, etc.)  
..... times.





## 7.2. Appendix 2: Post-program Survey for Participants

The post-survey should be delivered to participants at the end of the program. This survey collects participants' feedback on benefits received from participating in the program.

### Section F – Events Detail

*This section includes questions to collect participants' program participation details and general experience.*

**F1.** How many hours did you spend in natural environments during today's outdoor experience?

.....

**F2.** Have you participated in physical exercise (e.g., yoga) during today's outdoor experience?

.....

**F3.** Have you participated in group activities (e.g., group games, storytelling, singing, dancing) during today's outdoor experience?

.....

**F4.** How likely is it that you would recommend the program to a friend or colleague?

.....

**F5.** Overall, how would you rate the program?

Excellent  Very good  Good  Fair  Poor

**F6.** What did you like about the program?

.....  
 .....

**F7.** What did you dislike about the program?

.....  
 .....

**F8.** Since participating in the program have you visited Terra Cotta conservation area on your own, or with friends and family?

Yes  No If Yes, How many times? .....

**F9.** Since participating in the program have you visited other parks, natural areas, or trails?

Yes  No If Yes, How many times? .....



### 7.3. Appendix 3: Program Administrator Survey

The program administrator survey is designed for program organizers to record program use.

#### Section H – Complete Following Presentation

---

- H1. Session Date: .....
- H2. Today’s session was delivered by: .....
- H3. Total number of male participants: .....
- H4. Total number of female participants: .....
- H5. Before the presentation, what percentage of participants understood the purpose of this program?  
 > 75%    50%-75%    25%-50%    < 25%
- H6. After the presentation, what percentage of participants understood the purpose of this program?  
 > 75%    50%-75%    25%-50%    < 25%

#### Section I – Complete Following Outdoor Activities

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- I1. Total time spent in natural environment: .....
- I2. Total number of group activities organized: .....
- I3. Please specify group activities organized: .....
- I4. Among all group activities organized today, which one was most popular?  
 .....

#### Section J – Complete when Session Completed

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- J1. How would you rate the program delivered today?  
 Excellent    Very good    Good    Fair    Poor
- J2. How was your interaction with participants throughout the session today?  
 Excellent    Very good    Good    Fair    Poor

**J3.** Have you received any feedback from participants?

.....  
.....

**J4.** Do you have any feedback regarding program design, time management or engagement with participants?

.....  
.....

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