Ecosystem Service Payments as a Climate Solution: an examination into Successful Aspects of Ecosystem Service Payment Policy Programs

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Abstract

The purpose of this research was to examine ecosystem service payment policy programs that take the form of tax-incentive programs. Various Canadian programs were examined to gain insights into program successes and/or challenges. A great deal of academic literature looks at the ecosystem service payment policy of individual programs, yet few compare multiple programs. This research addresses this gap, as it compares multiple programs across various regions. A qualitative methodological approach was used, whereby professionals with expertise in ecosystem service payment programs were interviewed. Programs were evaluated based on the following criteria: some measurable indicators of success, impacts on broader public policy and the political context, and recognition of social-power relations. The ecosystem service payment policy programs examined through this research study included: the Canadian Ecological Gifts Program; the Manitoba Riparian Tax Credit Program; the Ontario Conservation Land Tax Incentive Program; and the Ontario Managed Forest Tax Incentive Program. An Ecological Economics approach was applied by examining improved ways of increasing conservation lands through regulatory market-based public policy programs. Overall, the examination of social-power relations in these programs provided an original and thoughtful approach. The final analysis and evaluation found that the programs typically had some measurable indicator of success and a broader impact on public policy and the political context, yet the programs did not always acknowledge social power relational issues. Taking the evaluation and analysis of these programs, I provided four recommendations for future PES policy programs in Canada. First, to provide a standardized form of measurement for the programs, to increase transparency, to include Indigenous consultation in the policy-making process, and to provide avenues for knowledge sharing about ecosystem services and payment for ecosystem service programs.

Forward

Throughout my MES journey, I have gained a variety of new skills and knowledge through coursework and experience, such as urban planning courses, environmental policy courses, a fieldwork course, Ecological Footprint and Biocapacity courses, and experience as a data analyst for experiential learning. This experience presents a variety of learnings and knowledge that I was able to apply to my studies that focused on nature-based solutions in climate change mitigation and adaptation strategies. The three main components of my plan of study include climate solutions in urban planning; Ecological Footprint and Biocapacity; and biodiversity conservation.

The major research I have conducted for the MES program reflects the focus of my studies on nature-based climate change mitigation and adaptation strategies. Payments for ecosystem services is a policy tool used to change the land use of a given area to conserve the ecosystem services in that area. This research examines several policy documents, land-use planning themes, biodiversity conservation literature, and an Ecological Footprint and Biocapacity report. Overall, this paper contributed to advancing my knowledge of nature-based climate change mitigation and adaptation solutions. Through my coursework, experiential learning, and conducting this research I completed my learning objectives by learning about urban planning knowledge and skills; becoming knowledgeable about public policies in Toronto, Ontario, and Canada; wrangling mega-data sets to create Ecological Footprint and Biocapacity accounts at the national and community level; surveying bumblebee populations; and researching biodiversity conservation.

Dedication and Acknowledgements

I am dedicating my major research to my mom. She has been an inspiration to me throughout my life and my academic journey. The value she places on education and her encouragement has guided me throughout my life and will forever inspire me to continue learning and growing.

I would like to express my gratitude to my major research supervisor, Dr. Mark Winfield, for his ongoing support, encouragement, and advice throughout the creation of my research. I am also greatly appreciative of Ecological Footprint Director, Eric Miller, for fostering an enthusiastic and caring learning environment in classes and at work. This provided me with incredible opportunities and skills that will have a momentous impact on my future.

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1. Acronyms:

Acronym	Definition
ALUS	Alternative Land-Use Service
EG&S	Ecosystem Goods and Services
ES	Ecosystem Services
CEGP	Canadian Ecological Gifts Program
CLTIP	Conservation Land Tax Incentive Program
CRA	Canada Revenue Agency
GHG	Green-House Gases
HEHE	Healthy Environment and a Healthy Economy
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	International Panel on Climate Change
MA	Millennium Ecosystem Assessment
MECCC	Ministry of Environment and Climate Change Canada
MFTIP	Managed Forest Tax Incentive Program
MNRF	Ministry of Natural Resource and Forestry
MPAC	Municipal Property Assessment Corporation
MRTC	Manitoba Riparian Tax Credit
NbS	Nature-based Solutions
NCP	Nature’s Contributions to People
NDP	New Democratic Party

NGOs	Non-Governmental Organizations
PCF	Pan-Canadian Framework
P.E.I	Prince Edward Island
PES	Payments for Ecosystem Services
SNA	System of National Accounts
SEEA	System of Environmental-Economic Accounting

2. Introduction:

The economic systems that have dominated society for centuries continually perpetrate deficiencies. One major deficiency is the extraction of resources from the environment. Although there are many other deficiencies in capitalist economic systems, environmental failures are what I will focus on throughout this paper. These market failures happen because the economic system fails to include a comprehensive value of the environment. The majority of the time the environment is only valued for the natural resources that the environment produces, such as timber from forests. This fails to monetarily include other benefits that the environment provides (to humans and non-humans). For instance, forests provide other services such as carbon sequestration, flood prevention, shade and heat protection, and spaces for recreational activities. Failure to include the value of these services results in market failures consisting of environmental externalities. One approach to limit these market failures is through the monetary valuation of ecosystem services (ES) in payment for ecosystem service programs.

The purpose of this research is to explore payment for ecosystem service programs in public policy in Canada that fall under the category of tax subsidies. In this exploration, I aim to understand what successes and challenges these payments for ecosystem service programs have faced by applying a public policy evaluation analysis. To analyze these programs, I will apply three criteria; is there a measurable indicator of success for the program; has the program had any effects on broader public policy or the policy context; and does the program recognize social power relations. This examination and analysis will be applied to four payments for ecosystem service policy programs in Canada: The Canadian Ecological Gifts Program (CEGP); the Manitoba Riparian Tax Credit Program (MRTC); the Ontario Conservation Land Tax Incentive Program (CLTIP), and the Ontario Managed Forest Tax Incentive Program (MFTIP). All these programs reflect a tax subsidy given to landowners in Canada. I use qualitative methodology for this paper, specifically a broad literature review and primary data collection from personal interviews with professionals in the field of Ecological Economics and ecosystem services.

Payments for ecosystem services (PES) provides a valuable environmental conservation practice for climate change mitigation and adaptation. There are several examples of these programs all around the world, but it is important to recognize that each program is different depending on the political context and geographical setting. Examining specific types of these programs for a specific region can provide valuable insights into the successes and challenges of these programs and offer suggestions for the future. Additionally, I apply one evaluative criterion that examines the social power relations of these programs. This attempts to fill a gap in ES and PES research since many studies solely focus on the environmental and economic consequences.

I will begin this paper by providing further elaboration on the methodology. Following this, I will dive into the comprehensive theoretical literature review. This includes a brief historical examination of ES in the field of Ecological Economics; define important terminology to assist in clarifying the scope of this paper; explore different valuation techniques and different forms that PES programs can take; articulate critical debates in the field and touch on the relationship between Indigenous knowledge and environmental conservation. Following the literature review, I provide an exhaustive summary of each of the four payments for ecosystem service policy programs that are being analyzed in this paper. Additionally, a fifth program will be discussed since it has major relevance in the Canadian context, however, it will not be considered in the analysis since it is outside the scope of this paper. Next, I will provide an analysis for each of the four programs, based on the three evaluative criteria. I will also provide accessory discussion points that are relevant to the context and scope of the paper but are outside the main analysis and evaluation. Finally, I will end by providing four recommendations.

3. Methodology:

I use qualitative methodology for my paper, including primary research collected from personal interviews and secondary research through a literature review, which I discuss in more detail below. In this research study, I am evaluating four payments for ecosystem service (PES) programs in public policy in Canada. The four PES programs have similar features, which is why they were chosen for this

evaluation. All programs reflect a Pigouvian-style PES program, in which they distribute tax subsidies to landowners in Canada. Each of the four programs is operated by the government through a certain provincial or federal ministry in Canada. Three of the programs are at the provincial level of government and one is at the federal level, allowing for some contrasting analysis to be made. The four programs are CEGP operated through the federal government; the MRTC operated through the Manitoba provincial government, the CLTIP operated through the Ontario provincial government, and the MFTIP also operated through the Ontario provincial government.

Three evaluative criteria are being used to analyze the successes and challenges that these programs have had. The criteria are meant to cover a range of analyses that includes technical, economic, and social measures. Additionally, the criteria are left intentionally broad to allow for a more extensive analysis. The first criterion examines whether there are measurable success indicators for each program. Since it is left broad, this criterion includes qualitative and quantitative indicators of success, such as newspaper articles detailing personal experiences, or data on the amount of land entered into the program over time. The second evaluative criterion examines if the program has had an impact on broader policy or the political context. Again, this is left intentionally broad to allow for an examination into any kind of effect that the PES program has had on the political context in the province or the country. For instance, if there is a positive or negative effect on aspects such as other policy documents or municipal stakeholders. The third evaluative criterion I apply is if there is recognition of social power relations in the PES program. An examination into social power relations can often be overlooked in PES programs, particularly in developed countries that don’t include poverty alleviation in the program's goals. Yet this is still an important criterion to include since ES can have negative effects outside of environmental and economic areas of society.

A. Primary Data

I interviewed six individuals in their professional capacity, as individuals knowledgeable about ES and PES programs. Initially, I contacted 27 individuals in total, meaning I had a success rate of 22%. Some reasons I received for not participating in interviews included not having the relevant knowledge

for the questions, not having enough time, or having no response. Each person was contacted by email that was either found on a public website or was referred to me. The participants were selected based on having professional experience and/or an educational background related to ecosystem services. Additionally, to gain a broader perspective I chose individuals from a broad range of industries, including private, public, and non-profit sectors. Each interview was completed over Zoom and lasted roughly 30 minutes to one hour and 30 minutes, depending on how much detail and discussion occurred.

I prepared eight questions that each interviewee answered while allowing for an open and organic discussion that could have brought about additional clarification questions or questions of interest. See Table 1, Appendix 1 for the interview questions. The first two questions ask for the interviewee to introduce themselves, their professional experience, and how they were introduced to the concept of ES and PES programs. The next group of questions asks interviewees what programs they are aware of (or engage with professionally), and what they find makes these programs or the political setting of the program particularly successful or unsuccessful. The following two questions relate to programs as climate solutions. They ask interviewees if programs can or cannot act as climate solutions and if they believe programs are necessary climate solutions. The final question asks interviewees if they have any additional comments about programs or ES they want to make and did not get the chance to with the questions asked. After conducting the interviews, I analyzed the transcribed recordings and grouped information into themes. These themes are applied to the analysis of the PES programs.

B. Secondary Data

In addition to the primary data, I gathered secondary data through a literature review. The literature review consists of two parts, a theoretical examination, and a practical examination. In the theoretical examination, I collected information on the broader concept of ES and PES programs. I included a brief historical examination into the field of Ecological Economics, where the concept originated. Additionally, I defined important concepts and explained forms of payment programs and valuation techniques including the benefits and limitations. I also examined the importance of recognizing

Indigenous Knowledge in biodiversity conservation. The final section of the theoretical examination investigates limitations and critiques of ecosystem services and payment programs. This literature review provides the theoretical structure for my major paper, adding background information to the concept of ecosystem service and payment programs. The other half of the literature review includes a practical examination of the payment programs that are being analyzed in this paper. This section provides information about the structures of the various programs, including the length of the program; the purpose and goals of the program; how the program operates; who operates the program; what legislation and policies are affected by the program; and details of the tax rebate and requirements for the tax rebate.

C. Methodological Justification

The choice to use qualitative methodology, including mixing together primary data from interviews and secondary data from literature reviews, reflects the nature of this study. Particularly the uniqueness of the topic of payment for ecosystem service programs that reflect a tax subsidy program. Interviews provided knowledge from experts who are familiar with the programs and possibly worked with them in the past. While the literature review grounded the research in the broader topic of ES and PES programs. Furthermore, the research was concluded in seven months, with approximately four months being committed to conducting interviews.

4. Literature Review:

A. Historical examination

From the formal conception of the field of Ecological Economics in the 1980s (Splash, 2011, 340), ES have been a defining concept in research and application in the field (Costanza et al., 2017, 2). Ecological Economics started as a movement to bring together different perspectives and ideologies in addressing the environmental crisis (Splash, 2011, 340). The crisis is undeniably, yet “only belatedly recognized” as linked to how the economy is managed (Splash, 2011, 340). Environmental problems were often pushed to the periphery of economics studies, mainly being discussed in sub-disciplines such as resources or environmental economics (Splash, 2011, 341).

The term "ecosystem services" (ES) was initially used in the book *Extinction* by P.R. Ehrlich and A.H. Ehrlich 1981 (Ehrlich & Ehrlich 1981). Roughly 15 years later, in 1997, two significant publications were released about ES; *Nature's Services: Societal Dependence on Natural Ecosystems* edited by Gretchen Daily and "The Value of the World's Ecosystem Services and Natural Capital" by Robert Costanza, et al. published in *Nature*. These two publications marked the beginning of an increase in academic research and application of the ES concept (Costanza et al., 2017, 2). Daily's book transpired from a meeting in October of 1995 where the idea was proposed to harmonize all available information into a "quantitative global assessment of the value of ecosystem services" (Costanza et al., 2017, 2-3). The amalgamation took the literature on 17 ES and using a basic value-transfer technique found the value for the entire biosphere (Costanza et al., 2017, 3). These results were published in *Nature*, presenting that the average value of the biosphere was USD 33 trillion per year (Costanza et al., 2017, 3).

Since 1997 the field of Ecological Economics and the ES concept has grown substantially. Between 1997 and 2017, there have been "over 17,000 papers published that use the term 'ecosystem services' in the title, abstract, or keywords." (Costanza et al., 2017, 10). Additionally, there was the creation of the Common International Classification of Ecosystem Services (2013), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2012), the Millennium Ecosystem Assessment (2001), and the Final Ecosystem Goods and Services Classification System (2013). These international initiatives represent growth and international legitimacy for the concept and measurement of ES.

B. Defining Importance Concepts

B1. Ecosystem Services

The Millennium Ecosystem Assessment (MA) defines ES as the "benefits people obtain from ecosystems" (Millennium Ecosystem Assessment, 2005, 26-27). These benefits are categorized into four areas by the MA, "provisioning, regulating, supporting, and cultural services" (Millennium Ecosystem Assessment, 2005, 26). Examples of ES are food or fibre within the provisioning category, disease control

or climate regulation within the regulating category, and aesthetic or spiritual benefits within the supporting and cultural services categories (Millennium Ecosystem Assessment, 2005, 6). Many academics and professionals use the MA definition and categorization as the foundation for understanding the ES concept (Barbier et al., 2009, 251-252; Borie & Hulme, 2015, 487; Costanza et al., 201, 5; Dupras et al., 2015, 97; Hein et al., 2015, 88; Kumar, 2019, 5-6; Mace et al., 2012, 20; Managi, 2012, 6). It is important to note that sometimes the term 'ecosystem goods and services' is used (Voigt et al., 2013). Typically, this is done to distinguish between provisioning and the three other categories devised by the MA. However, the relationship between these categories is not always clearly defined and some academics have argued the MA confuses different concepts, such as economic goods versus ecosystem functions (McElwee, 2017, 100). Additionally, some academics expand the definitions to become more distinct. Costanza defines ES as "ecological characteristics, functions, or processes that directly or indirectly contribute to human wellbeing, whether humans perceive those benefits or not" (Costanza et al., 2017, 3-5). Yet, Costanza acknowledges that the basis of this definition stems from the definition set out by the MA (Costanza et al., 2017, 3). Additionally, Costanza provides a visual representation of defining ES, which illustrates the "complex interactions and feedbacks" that happen between human, social, built, and natural capital to produce ES. See Figure 1.

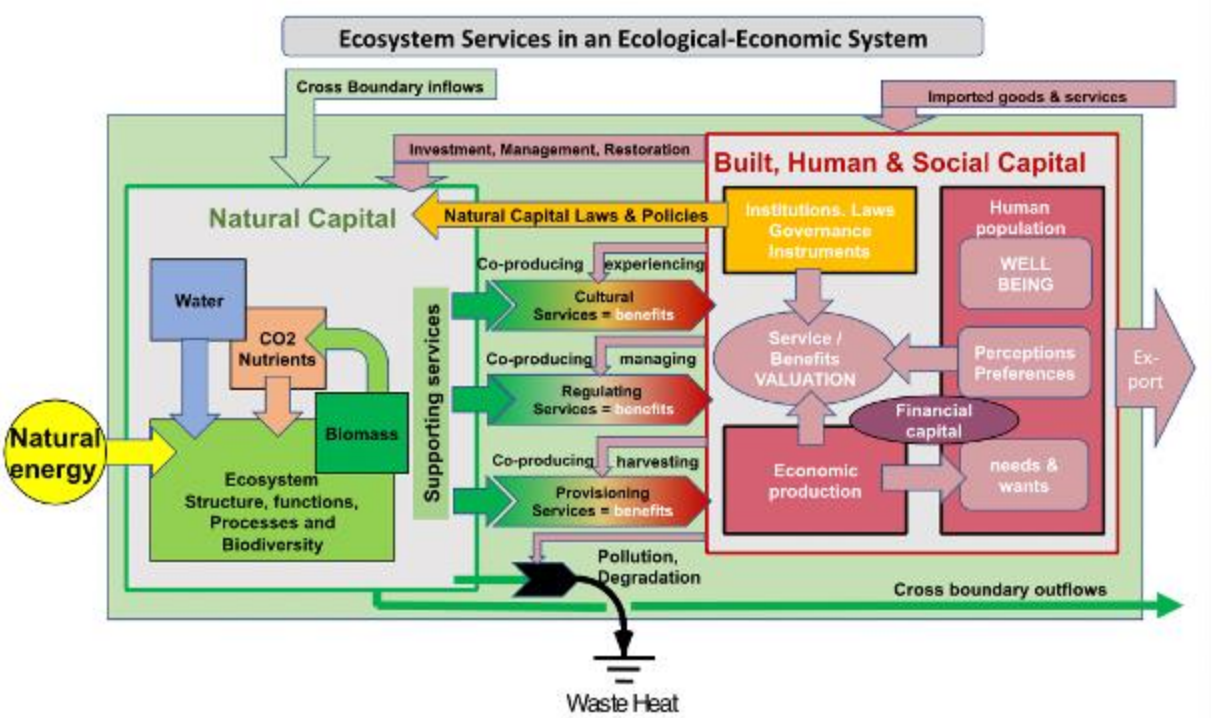

Figure 1: "A dynamic system capturing the complex interactions needed to produce ecosystem services at the regional scale" (sourced from Costanza, 2017, 6).

One distinctive element of Costanza's definition is that it does not matter whether humans recognize the benefits they are being granted from ES. Kumar defines ES as influencing "human well-being" and representing a value for society (Kumar, 2019, 4). Interestingly, the emphasis is on collective society, beyond individual well-being. Managi adds to the definitions by identifying that all people are benefiting from ES, yet dependency on ES is variant for different circumstances (Managi, 2012, 6). Managi makes an important distinction, that not all people benefit from or depend on ES equally. Thus, policy programs that regulate ES must consider social power relations, and how they create inequities in ES.

Given the lack of uniformity in defining ES, it creates ambiguity regarding the term and how it is being used (McElwee, 2017, 100; Mitsch et al., 2012, 28). Additionally, it creates competing definitions and categorizations among international and national organizations (McElwee, 2017, 100). Albeit the most widely used cited definition is from the MA (McElwee, 2017, 100). For this paper, I will use the term 'ecosystem services' to refer to the ecosystem functions, processes, and characteristics that directly

or indirectly contribute to human well-being and society, whether or not the benefits are being perceived and equally distributed. This definition attempts to combine the various definitions above.

In addition to defining ES, it is important to acknowledge the inherent relationship ES has with the economic system. ES has been degrading because of human actions, one explanation being the excess demand from economic growth and production. ES have and continue to be exploited to produce goods and services to grow the economy. However, the only ES monetarily valued in the economy is natural capital (Adamowicz and Olewiler, 2021, S33; Clift and Druckman, 2016, 212) or more closely related to the provisioning services as defined by MA. Understanding that natural capital is an "indispensable form of capital asset" is essential to understanding the ES concept (Kumar, 2019, 6). Natural capital provides necessary components that support humanity's economic activities. Although, the concept of ES also goes beyond that by identifying that the environment provides more than only natural capital that humans are benefiting from. There are benefits that ecosystems provide to humans that support life (Managi, 2012, 6). Incorporating these other benefits monetarily into the economy, along with natural capital, is one way to provide a more holistic picture of the value of the environment. (Adamowicz and Olewiler, 2021, S33).

B2. Payments for Ecosystem Services

One-way governments have attempted to conserve the environment and ecosystem functions through PES policies. The earliest definition of PES comes from Sven Wunder, stating that PES is "a voluntary transaction where a well-defined ecosystem service (or a land-use likely to secure that service) is being 'bought' by a (minimum one) ecosystem service buyer from a (minimum one) ecosystem service provider, if and only if the ecosystem service provider secures ecosystem service provision (conditionality)." (Wunder, 2005, 3; Tacconi, 2012, 29; James and Sills, 2019, 2-3). However, as PES policy programs were being developed it became clear that Wunder's definition of PES was too narrow (James and Sills, 2019, 2-3). Eventually, Wunder's definition was adapted, particularly in the journal *Ecological Economics* to be broader and capture more forms of PES programs (James and Sills, 2019, 3). A more extensive definition was suggested, PES is a "transfer of resources between social actors, which

aims to create incentives to align individual and/or collective land use decisions with the social interest of the management of natural resources." (Muradian, et al., 2010, 1205; James and Sills, 2019, 3; Tacconi, 2015, 30; Farley & Costanza, 2010, 2063). These are examples of the narrowness and broadness of PES program definitions. Another proposed definition is that PES is "a positive economic incentive where environmental service providers can voluntarily apply for a payment that is conditional either on environmental service provision or on an activity linked to environmental service provision." (Engel, 2016, 133). This definition lands in between the broad and narrow definitions, touching on the voluntary, incentive, and payment aspects while also allowing for some level of breadth by saying environmental service provisions. Engel uses Figure 2 to visualize PES programs. Costanza takes another approach to define PES, classifying them as "payments to landowners or managers to provide or protect ecosystem services" (Costanza et al., 2017, 11-12). Although Costanza's definition seems simpler, it reflects a narrower definition by defining payments. Similarly, to the ES definitions, there is a lack of consensus and standardization in academia and in professional practice.

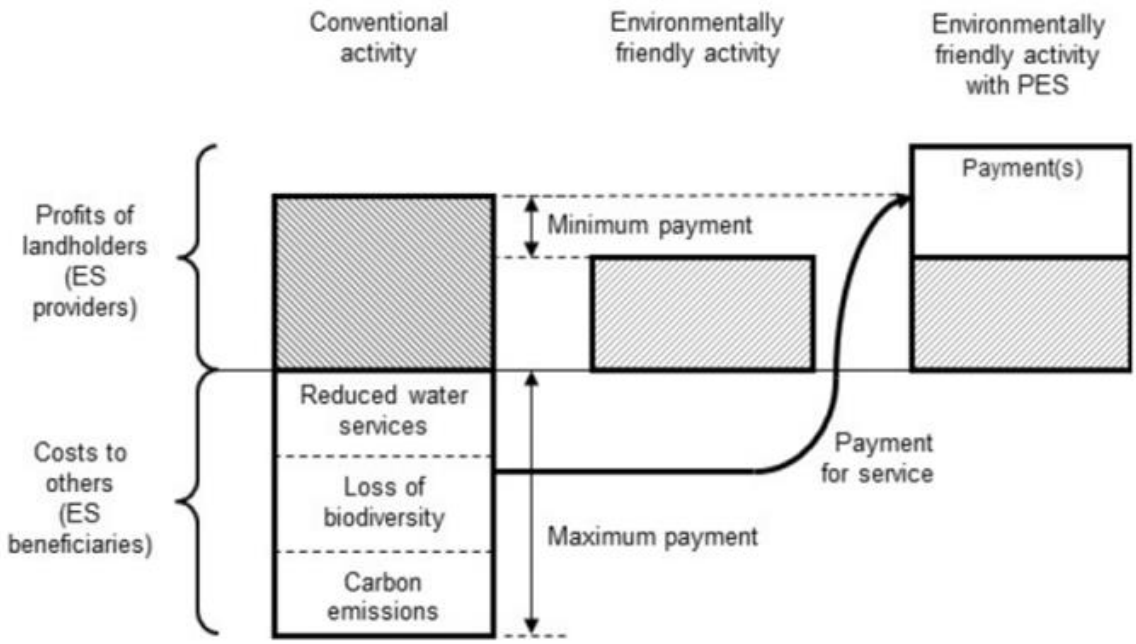

Figure 2: The logic of PES (sourced from Engel, 2016, 133; adapted from Wünscher et al., 2008).

Although there is an array of definitions used by various academics, there are typically key elements to each definition. One important defining feature of PES programs is that they are incentive-based. Typically, these are economic incentives, however, this is not always the leading factor for PES programs (Tacconi, 2012, 30). Due to the incentive structure, PES programs include some kind of charge, such as user fees, subsidies, taxes, or permits (Jack et al., 2008, 9465). Another important piece of PES programs is that they are voluntary. This discerns PES programs from a "command and control" approach to conservation policy (James and Sills, 2019, 2-3; Tacconi, 2012, 32). A third key feature of the definition of PES programs is the "directness of the transfer" (Tacconi, 2012, 30). This piece refers to the direct networks between the providers of the ES and the individuals gaining from the ES (Tacconi, 2012, 30). Establishing direct transfer safeguards that the provider of ES is compensated for their work or for the opportunity costs of participating in the PES program. (James and Sills, 2019, 3). A fourth element sometimes considered necessary to the definition is commodification, which refers to ES being assessed in a measurable unit (Tacconi, 2012, 30; James and Sills, 2019, 3). Although this element is necessary for the "Coasian perspective", others have argued that it is not necessary within an extended definition of PES programs (James and Sills, 2019, 3). A broader definition allows for ES to be measured along a range of easily measurable services, such as carbon, to not easily measurable services such as aesthetics (James and Sills, 2019, 3; Tacconi, 2012, 30; Muradian et al., 2010, 276) Additionally, there are scenarios where PES are compensated on the land-use rather than being commodified (Namirembe et al., 2014, 89; James and Sills, 2019, 3). For this paper I will apply a broader definition to PES programs, defining them as voluntary programs for providers of ES (individually or collectively) to apply for positive economic incentives to provision ES or an activity that is linked to provisioning ES. This definition combines aspects of the definitions by Engel and Muradian (Engel, 2016, 133; Muradian et al., 2010, 276). Since I will be examining tax incentive PES programs, a narrow definition is not applicable to this style of PES program.

PES programs are first initiated mainly as a tool for conserving the environment, yet now it is accepted that PES programs also can alleviate rural poverty (James and Sills, 2019, 4; Wunder, 2018, 1).

This has shifted the discussions around PES programs mainly from environmental effectiveness and cost-effectiveness to now including debates surrounding social equity and human welfare (Wunder, 2018, 4-6). This debate will be elaborated on further in section “E” of the literature review of this paper.

B3. Ecosystem Service Valuation and Assessments

When a government sets out to create a PES policy program, typically there is some form of valuation or assessment of ES done before creating the PES program. This is being done to understand the ES in the area and how to value the services that are being provided. An ES valuation is some form of measurement of the services being provided, often it can be an economic valuation where ES are commodified. However, broader definitions of ES valuation describe it as an “information system for tracking and analyzing the state of ecosystems and the services provisioned over time” (Hein, 2015, 86). For this paper, that definition will be used. There are various ways ES valuation can be done, for instance, the primary method is typically on-site analysis, secondary method of benefit or value transfer, or ecosystem accounting (Hein, 2015; Dupras, 2015; Costanza, 2017). These approaches will be elaborated on in section C of this literature review.

Ecosystem Assessments are another form of evaluation of ES done by governments before creating PES policy programs. ES assessments can be very similar to ES valuation, and sometimes the terms are used interchangeably. The distinction to be made is that ES assessments are often defined with a more comprehensive understanding than ES valuation. However, an ES valuation can be considered an ES assessment. ES assessments have been defined as an assessment that considers an ecosystem's functions and how those functions produce the provisioning services that benefit humans, and how those benefits are distributed to society (Preston, 2017, 2). Furthermore, it is described as a broad and interdisciplinary approach that requires multi-disciplinary fields to complete an ES assessment (Preston, 2017, 2-3). For this paper, an ES valuation will be defined as it is above, and considered to be a type of ES assessment as is defined above.

B4. Nature-Based Solutions

The concept of conserving ES through PES programs fits into the blanket definition of "Nature-based solutions" (NbS) for climate change mitigation and adaptation. NbS is a term used to describe climate mitigation and adaptation solutions that improve nature by focusing on societal challenges (Seddon, 2020, 2; Cohen-Shacham et al., 2016, 2; Reed et al., 2022, 3-4). The foundation of this concept lies in the understanding that human prosperity relies on the services produced by "healthy natural and managed ecosystems" (Seddon, 2020, 2; Millennium Ecosystem Assessment, 2005). In comparison to other types of solutions, such as engineered solutions. (Seddon, 2020, 1-2). Moreover, there is research suggesting that NbS can be done at a relatively low cost and provide "additional benefits" (Seddon, 2020, 1-2, 7). For instance, if NbS are implemented effectively they have the potential to diminish societies, communities, and individuals' sensitivity to climate change (Seddon, 2020, 6). However, there are limitations to NbS if they are not implemented adequately. For example, if NbS policies are not informed by reliable biodiversity science there is the risk of monoculture and loss of biodiversity (Seddon, 2020, 4). Additionally, if a NbS policy is structured around financial incentives, such as PES programs, there is a risk of land grabs and loss of local land rights (Seddon, 2020, 4). Furthermore, it must be recognized that NbS should not divert attention from necessary action to decarbonize the economy and other radical systemic changes (Seddon, 2020, 4; Anderson et al., 2019, 933). Albeit, with these limitations, there is still potential for PES programs and other NbS to have a successful and important impact on climate change mitigation and adaptation if they are implemented thoughtfully and effectively.

C. Different Valuation Techniques for PES Programs

Several approaches to valuing ES have been developed over the years. This paper looks at several techniques that can be classified into three main categories: primary methods, secondary methods, and ecosystem accounting. Additionally, I touch on exchange value techniques, which are used mostly for provisioning services. Each technique has different applications, benefits, and limitations, and these will be discussed throughout this section. There are many uses of ES valuation across time and space, some

examples are, raising awareness, policy analysis, urban and regional land-use planning, and establishing PES programs (Costanza, 2017, 10). Yet more will be discussed in detail, and how they relate to PES programs. See Table 2 Appendix 1, for a table summarizing the different valuation techniques.

C1. The Exchange Value

The exchange value method of valuing ES refers to ES that are traded in economic markets, for example, natural resources such as timber. Typically, this method applies to provisioning services, and it often is easier to measure than the social value of services (Barbier, 2009, 251-252; Farber, 2002, 388). Additionally, the exchange value method refers to ES that can be directly traded in typical economic markets using the price as the exchange value (Farber, 2002, 388). However, in this technique the ES are not commodified in the market, it is the goods produced using ES (Barbier, 2009, 252-253). A very similar but not identical approach to the exchange value is the "market price-based analysis" (Barbier, 2009, 252-253). In this case, it is "by directly relating the provision of the input to the level of the market output, it is possible to derive the financial returns provided by biodiversity" (Barbier, 2009, 252-253). This category is simpler to value in comparison to the next categories of valuation that will be discussed.

C2. Primary Methods Technique

Primary method techniques for ES valuation encompass a variety of different approaches. The defining characteristic of all the approaches is that they are based on "on-site analysis" (Dupras et al., 2015, 97). The various techniques that will be discussed apply to different scenarios. One primary technique is the "avoided cost" method (Farber, 2002, 388). This method refers to the valuation of services that release society of other costs that would be induced if the ES was absent (Farber, 2002, 388). Another primary technique is the "replacement cost method" (Farber, 2002, 388). This valuation technique refers to valuing the ES that could be replaced with often, costly artificial systems (Farber, 2002, 388). A third primary method valuation technique is "factor-income" (Farber, 2002, 389). In this method, valuation is determined by valuing the "enhancement of incomes", for instance, improvements in water quality can grow the incomes of fishermen by increasing commercial fisheries' catch (Farber, 2002,

389). A fourth valuation technique is “travel cost”, in which the valuation is based on the costs necessary for travel, recreation, and tourism to the ES (Farber, 2002, 389; Barbier, 2002, 253). Another valuation technique is the “hedonic pricing” method where the value is determined by the price individuals are willing to pay for the associated ES (Farber, 2002, 389). “Contingent valuation” is another primary method technique in which hypothetical schemes are proposed to assess what people are willing to pay for some alternative ES (Farber, 2002, 389; Barbier, 2009, 253). In this valuation technique, typically individuals that benefit from an ES are surveyed to determine their “willingness to pay” (Barbier, 2009, 253). Finally, the “production function methods” is another primary valuation technique where if there is an adjustment in the supply of a factor input the additional value is settled (Barbier, 2009, 253). The logic is that if there are adjustments in the functions of ES that could affect the production that is marketed in the economy, then there will be changes in the “costs and prices of final goods and services” that are conveyed to people through the price system (Bariber, 2009, 253). All of these various techniques for the valuation of ES demonstrate primary method techniques since they use primary data and analysis. The benefit of conducting a primary method technique is that it uses primary data applicable to the specific context and setting. While the limitations of these techniques are that they are often resource intensive.

C3. Secondary Methods Technique

Another method for valuing ES is called the “benefit transfer method” or “value transfer method”. This technique uses the valuation of ES that are from one area to then derive the value of the same ES in another area, usually called the “policy site” (Barbier, 2009, 255; Costanza, 2017, 9; Dupras, 2014, 97). One approach to this technique, called the “unit value method” is based on the average values per unit of area that are then aggregated over a comprehensive list of valuation studies for a specific ecosystem (Costanza, 2017, 9). In some cases, there are adjustments made for the economic and ecological contexts of the policy site that is applying the transfer approach, typically referred to as “expert modified value transfer” (Costanza, 2017, 9). Additionally, there are other slight modifications to this secondary approach, where statistical models are developed to assist in transferring data and altering

dependencies, these are called “statistical value transfer” and “spatially explicit functional modelling” (Costanza, 2017, 9).

The most preferred reason for using secondary methods for ES valuation is that it lessens the cost and time that is needed for a valuation study (Dupras, 2014, 103). In some instances, this is preferred because it allows a professional to implement a policy faster and with a smaller commitment of resources than if they conducted a primary method approach (Dupras, 2014, 103). Although, there are several limitations to applying a secondary method approach to ES valuation. One is that it is necessary to have similar, comparable aspects and quality of the biophysical environment (Dupras, 2014, 98; Barbier, 2009, 255). Additionally, the valuation of ES using this approach also depends on the similarity of the aspects of communities that use the ES, “in terms of age, income, asset holdings, education, culture, and so on” (Barbier, 2009, 255).

C4. Ecosystem Accounting

Ecosystem Accounting (EA) has been defined as an “integrated approach to measure and monitor ecosystems, and the flows of services from ecosystems into economic and other human activity, in a way that is aligned with the System of National Accounts” (Hein et al., 2015, 87). The System of National Accounts (SNA) is an agreed-upon set of standards and recommendations on how measurements of economic activity ought to be gathered (*The System of National Accounts (SNA)*, 2023). The intention is for all countries to be able to use the SNA, with accommodations for various stages of economic development (*The System of National Accounts (SNA)*, 2023). A complementary system to the SNA was developed to analyze ecosystem capital, called the System of Environmental-Economic Accounting (SEEA) (Hein et al., 2015, 86). This system is “a comprehensive and integrated framework for organizing information on ecosystem state and ecosystem use, developed with a direct connection to the SNA” (Hein et al., 2015, 86). The SEEA was developed over 25 years, and officially adopted in 2012 with the SEEA Central Framework “as an international standard by the United Nations Statistical Commission” (Hein et al., 2015, 87; Vereinte Nationen, 2014). These environmental accounts in the SEEA are intended to

accompany the national accounts of the SNA by exhibiting the interdependency of ecosystems and economic activity (Hein et al., 2015, 87). Ecosystem accounting makes up one aspect of the SEEA. There are different ways that ecosystem accounts can be applied. The three principal functions of ecosystem accounts are having an extensive review and outline of ecosystem assets and their uses, measuring sustainability, and providing spatial analysis (Hein et al., 2015, 89). Additionally, spatial analysis of the ecosystem accounts provides opportunities for land-use planning by providing information on landscapes that should be protected and maintained (Hein et al., 2015, 90). With PES programs, ecosystem accounting provides data on local opportunity costs of conserving ecosystems and can potentially indicate the amount of compensation for PES programs (Hein et al., 2015, 90).

There are many benefits to creating ecosystem accounts as a method of ES valuation. One is that EA makes definitively clear the contributions that ecosystems make to the economy (Hein et al., 2015, 87). Additionally, EA includes benefits to society that are outside of the scope of what the SNA covers, such as regulating services and cultural services (Hein et al., 2015, 87). A third benefit of ecosystem accounts is that ecosystems can be tracked for changes in ecosystem assets over periods which justifies analysis for sustainable development (Hein et al., 2015, 87). A limitation specific to EA that is important to acknowledge is that it is “resource intensive” to create ecosystem accounts, and often can be restrained by data shortages (Hein et al., 2015, 90). Additionally, these accounts do not measure welfare, so not all benefits of ES can be integrated such as spiritual and cultural uses of ES (Hein et al., 2015, 90).

A limitation of all ES valuation techniques is the possibility of unreliable information and data (Costanza et al., 2017, 9-10). Another challenge that can apply to all valuation techniques is the issue of decision-making alongside the valuation process. Often social-power relations can affect how trade-offs are imposed, in any policy, and this affects how PES programs become regulated (Costanza et al., 2017, 10). Furthermore, an important limitation is that ES valuation has no measurement or tool to understand or prescribe measures for dealing with the long-term effects of climate change (Hein et al., 2015, 90). Another challenge with ES valuation for any technique is that there are no standard metrics or standards for how ES should be measured (McElwee, 2017, 102; Boyd & Banzhaf, 2007, 616). One reason for this

is due to the lack of complete understanding of ecological functions that are in ES (McElwee, 2017, 102). Moreover, since ES valuation is often costly, resource intensive, and complex, it can mean there is variability in the capacity to complete ES valuation, which leads to inconsistent metrics. (McElwee, 2017, 105). This can lead to oversimplification of ES valuation and PES programs. Finally, one of the most important limitations of all ES valuations is that they do not guarantee that there will be improved governance of the environment (Hein et al., 2015, 90).

D. Different forms of PES programs

PES policy programs can take a wide variety of forms, especially if a broader definition is being applied. Additionally, PES programs can be offered by various sectors of society which can alter the structure of a program. Some programs are offered by private companies, such as the water bottle company Vittel (Engel, 2016, 135-136). Others are offered by governments, such as the federal Costa Rica PES program (*Payments for Environmental Services Program | Costa Rica*, 2023). And there are examples of PES programs run by non-governmental organizations (NGOs), such as the Alternative Land-Use Service (ALUS) programs around Canada (*Alternative Land-Use Services*, 2023). There are two main types of PES programs identified in the literature, one is a Coasean PES program and the other is a Pigouvian PES program. Coasean programs reflect a much narrower definition of PES programs, whereas Pigou programs reflect a broader definition. Sattler and Matzdorf illustrate this with the visual below, see Figure 3.

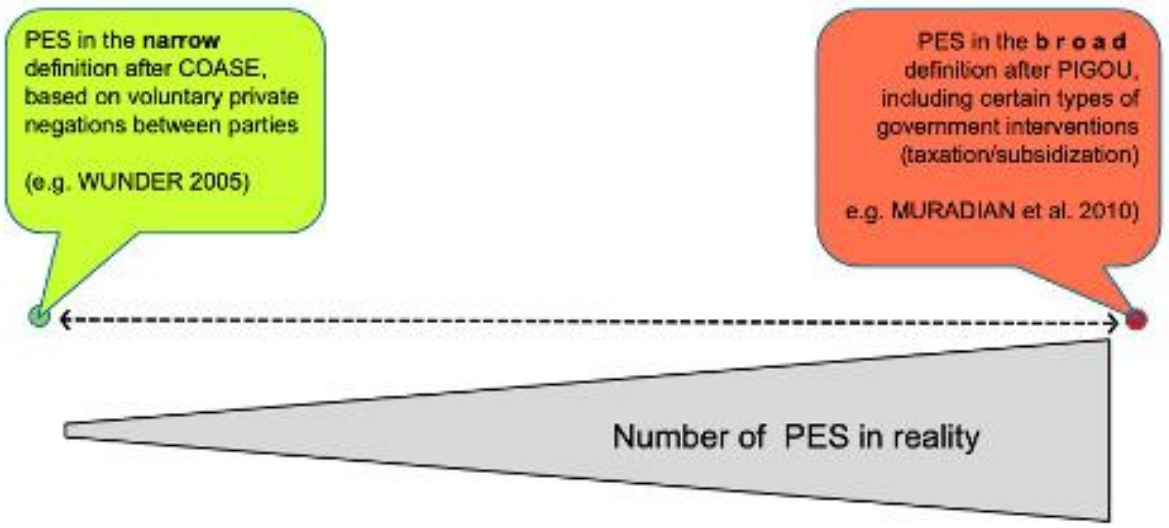

Figure 3: "Only a few existing PES approaches fit under the narrow concept of PES" (sourced from Sattler & Matzdorf, 2013, 4).

Coasean PES programs follow a structure of direct negotiation between the ES providers and the ES beneficiaries. In this case, the ES beneficiary directly compensates the ES provider using "private money" (Sattler and Matzdorf, 2013, 3). The most prominent example of this style of PES program is the private company, Vittel paying landowners to use agricultural practices that diminish the nitrate pollution in the area (Engel, 2016, 135-136; Sattler and Matzdorf, 2013, 3). This contract between Vittel and the farmers reflects a voluntary, and private direct transfer of ES services for payment between the beneficiary and the provider (Sattler and Matzdorf, 2013, 3).

The Pigouvian-style PES program resembles a structure where a government agency makes payments that are typically made up of "earmarked user fees or general tax funds" (Engel, 2016, 135-136; Sattler and Matzdorf, 2013, 3). In this case, the agreement is not always entirely voluntary since there can be compliance regulations on the demand and supply side (Sattler and Matsdorf, 2013, 3). The more prominent examples of a Pigouvian-style program are the agricultural-environmental payments in Europe (Engel, 2016, 135-136). In these programs, landowners receive payments for "environmentally friendly land management" (Sattler and Matsdorf, 2013, 3). These payments are derived from public funds and are not given to the direct beneficiaries but to the government on behalf of the beneficiaries (Sattler and Matsdorf, 2013, 3).

Additionally, there are examples of hybrid programs that incorporate aspects of both Coasean and Pigouvian styles. Costa Rica's federal PES program is an example of a hybrid approach that incorporates funding from private and public sectors (Engel, 2016, 135-136). For this research, I will be examining PES programs that resemble the Pigouvian style, in which governments typically use tax funds, in the form of tax subsidies to support the PES programs.

E. Prominent Debates about ES and PES programs

E1. Issues of Standardization

The challenge regarding the standardization of ES definitions and valuation has been touched on in this paper already, but it is an important debate within ES and PES literature. Currently, there is a lack of standardization and there is significant debate around ES definitions and valuation (McElwee, 2017, 112; Boyd and Banzhaf, 2007, 616; Costanza, 2017, 13; Koellner, 2011, 13). There is evidence of "competing" definitions for ES valuation (Boyd and Banzhaf, 2007, 616). Since there is a lack of standards in measuring ES they are measured in "diverse and inconsistent ways" which makes them "incommensurate with each other" (McElwee, 2017, 103). Yet another challenge is the difficulty in arranging standardized approaches for measuring ES. This is a challenge due to a lack of understanding of ecosystem functions and how to provide a proper measurement for qualitative aspects (McElwee, 2017, 103; Costanza, 2017, 12).

E2. Poverty Alleviation

A greatly debated topic in PES literature revolves around poverty alleviation, and if it should be a main goal alongside environmental conservation. There is a "high spatial correlation" between areas with high rates of poverty and areas that can supply ES (James and Sills, 2019, 4; Wunder, 2005, 1; Jack et al., 2008, 9466; Pagiola et al., 2005, 238; Sunderlin et al., 2008, 24). It is suggested that PES programs could alleviate poverty because there are likely situations where "rich beneficiaries" of ES and "relatively poor" ES providers (James and Sills, 2019, 4). For this reason, it is suggested that poverty alleviation is not only a "positive externality" of PES programs but also can be a mechanism for them (James and Sills, 2019,

4). This has led some institutions to implement PES programs that have social goals alongside environmental goals (James and Sills, 2019, 10). Although, one issue identified with including poverty alleviation as a main goal of PES programs is the possible trade-offs for the environmental goals (Wunder, 2005, 1).

Typically, this discussion of poverty alleviation is brought up regarding PES programs in the context of developing countries (Jack et al., 2008, 9466). As I am examining PES programs in Canada for this paper, this argument of poverty alleviation might not apply to the same scope. Canada has a poverty rate of 8.1% in 2020, which went down from previous levels of 14.5% in 2015 (*Disaggregated Trends in Poverty from the 2021 Census of Population*, 2022). This is much lower than in other countries around the world, with the highest poverty rate being 82.3% in South Sudan (*Poverty Headcount Ratio at National Poverty Lines (% of Population) Canada*, 2021). Although Canada's rate of poverty is much lower compared to other countries, there is a discrepancy in income between rural and urban areas, with the highest incomes being in urban areas and the lowest in rural areas (*Disaggregated Trends in Poverty from the 2021 Census of Population*, 2022). Considering that most PES programs are conducted in rural areas there is a possibility of diminishing the gap between rural and urban income inequality in Canada using PES programs.

E3. Equity Debate

Another debate along similar lines as the poverty alleviation debate, concerns implementing equity goals and considerations into PES programs. On one side of the debate, people argue that there are not enough equity considerations in PES programs, while the other side of the debate argues that there should not be equity considerations in PES programs (James and Sills, 2019, 10). The camp of people arguing that there are not enough considerations of equity argue that there is an “unfair distribution of benefits” among ES providers and ES beneficiaries (James and Sills, 2019, 10; Berbés-Blázquez et al., 2016, 134). While the other camp suggests that including equity and social considerations will have a

negative impact on the cost-effectiveness of PES programs and introduce trade-offs for environmental conservation (James and Sills, 2019, 10; Wunder, 2005, 1; Tacconi, 2012, 34).

In some literature, equity has been incorporated into PES programs as an important aspect and relevant policy outcome (Jack et al., 2008 9466). An example of the structure of a PES program including equity considerations, is shown in Figure 4 below.

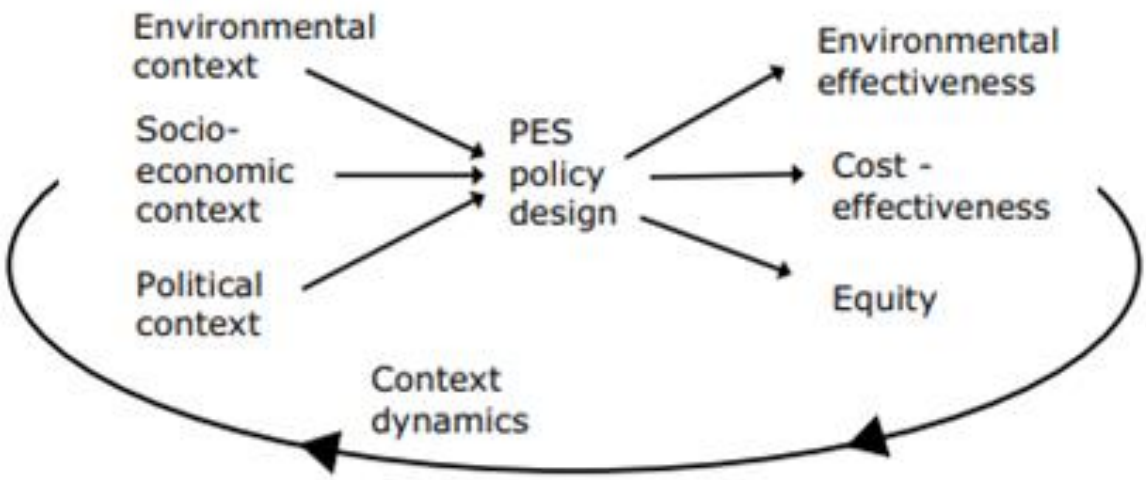

Figure 4: "Context interacts with PES policy design to determine outcomes" (sourced from Jack et al., 2008, 9466).

Some important equity considerations that have come up in discussions of PES literature concern who is receiving payments, such as ES providers receiving payments and which do not receive payments (James and Sills, 2019, 10). This relates to discussions around the distribution of participation, who can participate and who is restricted from participating (James and Sills, 2019, 10; Tacconi, 2012, 34). Another equity issue discussed is if the "provision of incentives" is suitable for the PES program (Tacconi, 2012, 34). In cases where other encouragement means are used instead of incentives being provided, there could be negative impacts on ES providers (Tacconi, 2012, 34).

On the other side of the debate, some argue that equity concerns distract from the efficiency and cost-effectiveness of PES programs (James and Sills, 2019, 10; Wunder, 2005, 1; Tacconi, 2012, 34). A PES program that is cost-effective provides "the maximum amount of ES possible given a certain amount

of funding", which has important positive environmental impacts (Tacconi, 2012, 34). Yet it is also added that this has positive equity implications as well when it is cost-effective. For instance, if ES provisioners do not receive the highest possible incentive per unit of ES, then ES other provisioners could be able to participate in the program (Tacconi, 2012, 34). Additionally, it is argued that an exceptionally cost-effective PES program that has success in environmental conservation is better for future generations (Tacconi, 2012, 34).

E4. Transaction Costs Issue

Another issue identified in PES programs, particularly for Coasean style PES programs is the issue of transaction costs. In some literature, it is identified that the Coasian perspective requires low transaction costs as it is recognized this could have impeding effects, and maximize efficiency (James and Sills, 2019, 2-3). Yet oftentimes in PES programs, there can be high transaction costs, such as negotiating contracts and valuing and monitoring processes (Tacconi, 2012, 30; James and Sills, 2019, 10-11). This can disincentivize private agencies to create PES programs. Furthermore, having substantial transaction costs impacts the "price setting", because intermediaries will set the price rather than the market setting the price (Tacconi, 2012, 30). Transaction costs also have some relationship to equity in PES programs, since high up-front transaction costs can deter ES providers from participating in ES programs (James and Sills, 2019, 11). For this reason, transaction costs create "inequitable access" to PES programs since they are a barrier for lower-income landowners and landowners with smaller properties (James and Sills, 2019, 11; Neitzel et al., 2014, 20).

E5. Spaces and Times and PES programs are not ideal

There are limitations and challenges to using PES programs in policy as a tool for environmental conservation, some of these identified in literature have been discussed throughout this paper. Due to these limitations, there are several scenarios where PES programs are not the ideal solution. It has been identified that PES programs are ideal in circumstances where the benefits to society outweigh the costs to ES providers (Engel, 2016, 134; Wunder, 2005, 2015). There are other issues that environmental

degradation might be a result of, including lack of awareness, poverty, crises of the commons, flaws in the credit market, or property rights issues (Engel, 2016, 134). In instances such as these, other solutions would fit to solve environmental degradation more than PES programs. Enhancing awareness, implementing, or improving credit policies, eliminating counteractive policies, acquiring property rights, poverty alleviation, or community-based governance could be more suitable and beneficial solutions compared to PES programs (Engel, 2016, 134).

Additionally, some other environmental policies or solutions could fit better in certain contexts as compared to incentive-based policies such as PES programs. For instance, there are command-and-control techniques, environmental taxes, or tradeable permits (Engel, 2016, 134; Fisher et al., 2011, 151-152). These cases can be more applicable because they reflect a "polluter-pays principle" approach (Engel, 2016, 134; Fisher et al., 2011, 151-152). It has been identified that one of the most appropriate cases for a PES program is when the ES beneficiaries have a relatively higher income as compared to the ES providers (Engel, 2016, 134).

E6. Spillover Issues

Another issue that has generated discussion regarding PES programs is the limitation of spillover in price and behaviour. The issue of price spillover happens when the PES program has been introduced and this alters the prices of outputs (James and Sills, 2019, 8). This is possible, mostly in isolated markets, for a shift in production, which results in a net gain that is less than what was anticipated originally in the conception of the PES program (James and Sills, 2019, 8). The following quotation illustrates this issue.

> consider a PES program for forest preservation implemented in a closed economy with Type B agents (those who apply for payments and would not conserve without payments) and Type D agents (those who do not apply and will not conserve). The Type B agents apply and some are selected to receive payments to set aside and not convert forestland to agriculture. By definition, PES has "additional" impacts on these agents. As illustrated in Figure 1 [Figure 5], this additionality could lead to a decrease in supply (assuming an isolated economy and no change in the demand schedule for agricultural products) and a resulting increase in agricultural prices. The rejected Type B agents and the Type D agents may increase their agricultural production in response to the higher prices. (James and Sills, 2019, 8).

This issue is shown by James and Sills in Figure 5 below. This issue of price spillover can have negative effects on the success of the PES programs. However, it is important to note that in a globalized economy, there are not as many closed economies or isolated markets where a situation such as this would occur.

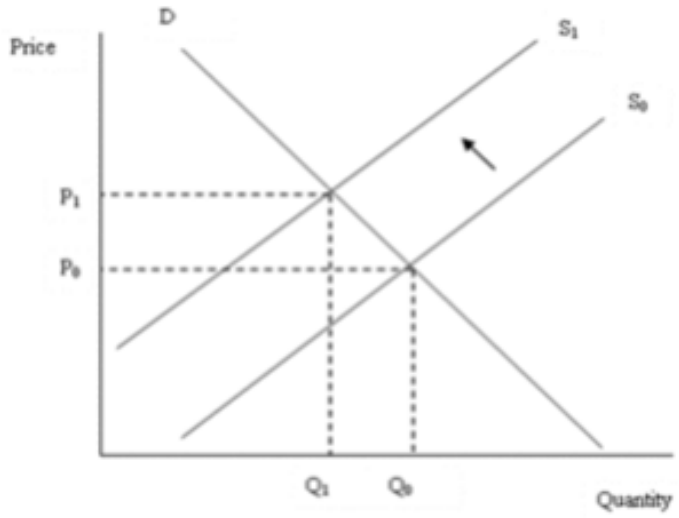

Figure 5: "Increased conservation can restrict supply thus increasing the price if the demand scheduled does not also shift down." (sourced from James and Sills, 2019, 9).

Similarly, there can also be an issue of behavioural spillover regarding PES programs. In this case, people who do not participate but would fulfill the program's needs regardless could feel slighted due to the lack of compensation (James and Sills, 2019, 9). In this instance, it could lead to reducing the motivation of individuals to implement beneficial practices (James and Sills, 2019, 9). It has been shown that when price and behavioural spillovers occur it can reduce the effectiveness of PES programs (James and Sills, 2019, 9; Alpizar et al., 2020, 26-27).

E7. Issue of Free riders

One issue regarding PES programs that has sparked some discussion is the challenge of dealing with "free riders", individuals that do not pay for the benefit yet still receive the benefit (Jack et al., 2008, 9467-9468). This type of issue is often common in incentive-based policy programs. In PES programs, free riding only becomes an issue when the ES are not bought directly through the market. For example,

some ES are linked to the market, such as clean drinking water, in which free-riding is not usually possible (Jack et al., 2008, 9468). Yet in cases where the ES are non-excludable, for example, such as climate stabilization or biodiversity, then there are possibilities and incentives for people to free ride (Jack et al., 2008, 9468).

E8. Issues in the Future

Other issues that come up for debate in PES programs, but also policy programs more generally are issues with future resilience. Political, environmental, and socioeconomic contexts can change in unpredictable ways over time, and this can affect policies and particularly incentive-based tools (Jack et al., 2008, 9468). If it is possible, "future changes should be taken into account when designing PES policies because these dynamic changes in context can alter how a policy performs, determining whether it can maintain a high degree of cost-effectiveness, environmental effectiveness, and equity over time" (Jack et al., 2008, 9468). However, not every change can be predicted and prepared for.

A future issue that decision-makers cannot typically plan for, that is particularly relevant in the Canadian context, is the issue of high political turnover. In these cases, a new leader at a municipal, provincial, or federal level can completely change a certain policy that they don't agree with. The current Premier of Ontario, Doug Ford's government, is a model example of a leader that completely reshaped the landscape of environmental policies, rendering the previous government's work arguably ineffective. For example, the Premier cancelled over 700 renewable energy projects, revised planning policies, weakened protections on endangered species, and shattered the prior provincial government's climate change strategy (Winfield, 2022). This future issue of high political turnover in Canada can create concern for the success and effectiveness of environmental policies.

E9. Transparency Issue

In some instances of PES negotiations and PES definitions, lack of transparency has been identified as an issue that ought to be given more attention (Tacconi, 2012, 33). There has been evidence of negotiations for PES contracts that demonstrate a lack of transparency (Tacconi, 2012, 33).

Additionally, there are suggestions for improved transparency in databases in efforts to grow knowledge about the prices and valuation of ES (Tacconi, 2012, 33; Landell-Mills et al., 2002, 107). Similarly, there is a discussion that rules need to be standardized and made public to support transparency (Tacconi, 2012, 33). These issues of transparency could offer valuable improvements to legitimizing PES data and programs.

E10. Ecosystem Services versus Nature's Contributions to People

There are many ways that the relationship between humans and nature has been described and experienced throughout time and space. ES is one way that this relationship has been described in Western scholarship, and of course, it is not the only way. Another concept for describing this relationship steaming from Western science was introduced in 2015, called "Nature's Benefits to People" (Kadykalo et al., 2019, 269-270; Díaz et al., 2015). This was established by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (Kadykola, et al., 2019, 269-270; Díaz et al., 2015, 2). Two years later the term was changed to "Nature's Contributions to People" (NCP) (Kadykola, et al., 2019, 269-270). This was initiated as a "supra-concept" to ES because ES was being seen as too restricted to represent a comprehensive range of pedagogies, worldviews, and stakeholders (Kadykola, et al., 2019, 269-270). The most refined definition of the NCP concept comes from Diaz, et al, where it is defined as positive and negative contributions of the living environment; the diversity of ecosystems and organisms and their evolutionary and ecological functions to the quality of life of people (2018a, 270; Kadykola, et al., 2019, 270).

NCP is argued to expand on ES for several reasons. One reason is that NCP distinguishes between negative and positive contributions, considering all nature's contributions as critical (Kadykola, et al., 2019, 271). Additionally, NCP is said to expand space for humanities and social science disciplines to be combined in assessments concerning the relationship between the environment and humans (Kadykola, et al., 2019, 270; Díaz et al., 2015, 2). Likewise, NCP is said to expand on the ES concept by being "better suited to embrace Indigenous and local knowledge which the ES approach has failed to

engage" (Kadykola, et al., 2019, 271). There is also a difference in the reporting classifications between ES and NCP. NCP goes beyond the reporting categories of ES, by including universal indicators that can be applied to more contexts than ES (Kadykola, et al., 2019, 271). ES and NCP also differ because NCP goes beyond the scope of instrumental and intrinsic value systems (Kadykola, et al., 2019, 271). Moreover, NCP goes further than the stock and flows framework that ES encompasses (Kadykola, et al., 2019, 271).

However, there is debate among these claims that NCP and ES differ for these reasons. For instance, there is evidence that ES engages with a variety of humanities and social science disciplines in a substantial amount of ES literature (Kadykola, et al., 2019, 278). Additionally, it has been shown that ES does incorporate diverse fields of study within the ES framework (Kadykola, et al., 2019, 278). Moreover, there is evidence of ES incorporating Indigenous and local knowledge through examples such as participatory modelling and mapping, ethnoecological studies, ethnomedicinal studies, and PES schemes and programs (Kadykola, et al., 2019, 278). There is minimal, yet some literature on "ecosystem dis-services" that examines the negative impacts of ecosystems and the environment (Kadykola, et al., 2019, 278). This debate between ES and NCP is ongoing and will continue to develop throughout a variety of science and social science fields.

E11. Lack of Recognition of Social Power Relations

An important debate to be acknowledged within the realm of ES literature is the lack of recognition of social power relations in ES and PES programs. ES and PES decisions are influenced and affected by the social relationships between groups of people, particularly the influencing of outcomes to benefit some groups over other groups (Berbés-Blázquez et al., 2016, 134). That is where Berbes-Blazquez et al. argue that the ES framework must guide environmental policy in demonstrating "socially fair outcomes" and not solely environmental and sustainable outcomes (2016, 134). They argue that this is done through acknowledging and responding to unequal power relations and social tradeoffs, and if this is not done, it perpetuates discrimination and marginalization (Berbes-Blazquez et al., 2016, 134).

The main argument by Berbes-Blazquez et al. is that ES is constructed by the social power relations which are entrenched within governance and institutional systems (2016, 135). Their recommendation for one way to adequately address social power relation issues in ES assessments and PES programs is through transdisciplinary research that goes further than bridging fields of study together to where "science becomes a vehicle to solve sustainability and social justice problems through the participation, empowerment and mutual learning among stakeholders, including scientists and decision-makers" (Berbes-Blazquez et al., 2016, 136). Additionally, it is necessary to identify and understand who is controlling the access to ES provisions and the possible social and ecological trade-offs (Berbes-Blazquez et al., 2016, 138). These social power relations issues are not acknowledged enough within ES and PES literature, partly because it is thought to interfere with efficiency and cost-effectiveness (Berbes-Blazquez et al., 2016, 137-138).

These issues are particularly important to understand in the Canadian and North American context when considering ES and PES programs. The history of colonial violence and oppression towards Indigenous people has plagued North America and continues to exist in institutional and governance structures. Not acknowledging this, especially within the context of environmental conservation, represents a continued perpetuation of discrimination against Indigenous peoples. Additionally, omitting Indigenous knowledge within ES and PES program construction not only removes foundational knowledge, but also continues the settler-colonial discrimination, "Ignoring traditional indigenous knowledge, relational values of different stakeholders, and the historical legacies in ES assessments of the Canadian landscape would not only be inaccurate but they would also serve to perpetuate historical injustices." (Berbes-Blazquez et al., 2016, 140).

E12. Lack of Indigenous Knowledge

Continuing the previous debate, it is also argued that there is a lack of Indigenous knowledge in ES and PES program literature and practice. ES was established and continues to be affiliated with Western scientific knowledge and its biases (Kadykalo et al., 2019, 270). These biases and sometimes

prejudices limit the acceptance of other kinds of knowledge within Western-based knowledge. Limiting the ability for ES and PES programs to incorporate and accept other types of knowledge, such as Indigenous and local knowledge (Kadykalo et al., 2019, 271).

There have been responses to this claim, pressing that there have been many contributions to ES literature by Indigenous people and local knowledge holders (Kadykalo et al., 2019, 271). Yet this claim was opposed by Diaz et al., who found that only 3% of 20,000 ES papers between the years 1972 to 2018 deliberated on Indigenous and local knowledge, and less than 0.5% of papers approached ES research from an Indigenous or local knowledge perspective (Kadykalo et al., 2019, 271). This presents a fairly limited application of Indigenous and local knowledge perspectives in the ES community.

F. Indigenous Knowledge, Environmental Conservation, and Policy

For centuries Indigenous peoples have delivered environmental conservation and climate solutions around the world. Through the practices of "multi-dimensional, interconnected, and interrelated approaches", Indigenous people have protected and conserved the environment (Reed et al., 2022, 2). And today this continues to be the case. The International Panel on Climate Change (IPCC) Working Group One Report stated the importance of having Indigenous people and Indigenous knowledge included in climate change mitigation and adaptation strategies (Intergovernmental Panel On Climate Change, 2023, 57; Reed et al., 2022, 2). Additionally, the IPBES 2019 Global Assessment verified that areas stewarded by Indigenous peoples showed that nature was declining less rapidly than land that was led by non-Indigenous people (IPBES, 2016, 14; Reed et al., 2022, 2). Furthermore, Indigenous people experience the worst of the impacts of climate change in comparison to the rest of the world (Deranger et al., 2022, 53).

Despite this Indigenous people are disproportionately affected by climate policy, particularly in the Canadian context. A study on the solutions proposed in the Pan-Canadian Framework (PCF) (*Pan-Canadian Framework on Clean Growth and Climate Change*, 2016), and the Healthy Environment and a Healthy Economy (HEHE) *(A Healthy Environment and a Healthy Economy, 2020),* found that there are

negatively disproportion effects on Indigenous people and communities that "serve to perpetuate and entrench the structural inequalities and colonial relations that are driving the climate crisis in the first place" (Deranger et al., 2022, 54). Additionally, in the PCF (*Pan-Canadian Framework on Clean Growth and Climate Change*, 2016), in sections on forestry, water, and agriculture there are zero references to Indigenous rights, participation, jurisdiction, or knowledge systems (Reed et al., 2022, 13). More broadly, there is also a lack of support for Indigenous Knowledge in climate research and policy. For instance, climate assessments are based on Western scientific models and other knowledge systems, such as Indigenous and local knowledge are not valued and incorporated (Deranger et al., 2022, 56). As a result of the lack of Indigenous and local knowledge incorporated in climate research, Indigenous People have not been able to guide decision-making in climate policy (Deranger et al., 2022, 57; Reed et al., 2022, 13).

In the Canadian and North American context, it is essential to understand the centuries of discrimination and violence from the settler-colonial institution against Indigenous peoples, and the continual perpetuation of this throughout settler-colonial laws and policies. Without acknowledging the history and current colonialism, the dominant solutions can be misplaced and can be damaging to Indigenous people and communities (Deranger et al., 2022, 61). There are many suggestions to remove settler-colonial policies. For example, decolonizing policy and climate research and building space for Indigenous peoples (Deranger et al., 2022, 61). Furthermore, emphasizing the understanding that NbS cannot be treated as outside of Indigenous-settler government relations (Reed et al., 2022, 16). Also, it is important to recognize that Indigenous peoples have an inherent right to self-determination in policy (Reed et al., 2022, 16). Additionally, focusing on non-Indigenous decision-makers and researchers to "learn to listen and direct their resources, time and efforts to support the vast wealth of Indigenous-led research, policy, and best practices already happening across Mother Earth" (Deranger et al., 2022, 71). It is important to understand these issues concerning ES and PES programs that are in settler-colonial policy, so these solutions are not misplaced and cause damage to Indigenous communities. Particularly in terms of jurisdiction.

5. Examination of the Policy Programs:

In this section, I will examine the four policy programs that are being evaluated and analyzed in this research to give some background information on the programs. Additionally, the ALUS program will be examined since it has a rather significant importance as a PES program in Canada. However, I will provide context for why the program is not being included in the analysis and evaluation. See Table 3, Appendix 1 for a summary table of the PES programs.

A. Canadian Ecological Gifts Program

The CEGP is a federal-level PES policy program designed to conserve the environment by providing a tax benefit to landowners that donate their land. This program "provides a way for Canadians with ecologically sensitive land to protect nature and leave a legacy for future generations" (Government of Canada, 2021). The program functions under the terms of the *Income Tax Act of Canada (Income Tax Act (R.S.C., 1985, c. 1 (5th Supp.))*, and the *Quebec Taxation Act (Taxation Act, CQLR c I-3)* and is administered by the Ministry of Environment and Climate Change Canada (MECCC), in cooperation with several partners (Government of Canada, 2021). When landowners choose to donate their land or a partial interest in their land, to a "qualified recipient" the landowner receives "significant tax benefits" (Government of Canada, 2021).

The qualified recipient who receives the donation will then ensure that the land's environmental heritage and biodiversity are conserved "in perpetuity" (Government of Canada, 2021). A qualified recipient of the donation is classified by the Canada Revenue Agency (CRA) as either; the Government of Canada, a province or territory, a municipality in Canada or a public or municipal body that is approved by the MECCC, a registered charity that has been approved MECCC, or a designated person (Government of Canada, 2022). The important point of note is that the donation cannot be given to a private entity (Government of Canada, 2022).

Before a donation of land can be included in the CEGP, the land that is donated is required to be certified as "ecologically sensitive" in compliance with national and provincial criteria (Government of

Canada, 2021). However, some provinces include more particular definitions that would also have to be met for qualification for the program (Government of Canada, 2021). The Minister of the MECCC will authorize if the land is ecologically sensitive and establish the fair market value of the gift (Government of Canada, 2022). The national definition of "ecologically sensitive lands" constitutes lands as "areas or sites that currently or could, at some point in the future, contribute significantly to the conservation of Canada's biodiversity and environmental heritage" (Government of Canada, 2021). Once the land has been declared to be "ecologically significant" then moving forward that land must be protected and not used for other purposes (Government of Canada, 2022). When the ecologically sensitive land is a "significant part" of a greater portion of land then the entire area can be qualified to be donated (Government of Canada, 2021). It should be noted that "significant" is not defined on the website. Another important aspect to note is that when land is donated as a gift, it does not automatically mean that the affiliation between the provider and the land is broken (Government of Canada, 2021). Additionally, any future owners of the land are bound by the same restrictions, "all subsequent owners will be required to respect the terms and conditions of the servitude and contribute to the conservation of the property's natural features" (Government of Canada, 2021).

The tax benefit works in two different ways for individuals versus corporations. Individuals receive a non-refundable tax credit that is converted based on the value of the individual's ecological gift (Government of Canada, 2021). The credit is calculated by "applying a rate of 15% to the first $200 of the donor's total gifts for the year, and 29% to the balance" (Government of Canada, 2021). Corporate donors can directly deduct their ecological gift from their taxable income (Government of Canada, 2021). Additionally, for the majority of provinces, this decline in federal taxes will also reduce provincial taxes (Government of Canada, 2021). Moreover, the ecological gifts classification entails that there will be a 0% taxable portion of capital gains (Government of Canada, 2021).

B. Manitoba Riparian Tax Credit

The MRTC was a voluntary PES program started by the Manitoba Department of Finance. This program began in 2003 and was cancelled in 2017. The main aim of this program was to support farmers to enhance their management of rivers, stream banks, and lakeshores (Government of Manitoba, 2017). The program intended to improve the land along waterways and lakes by preventing erosion and improving water quality, which can have benefits for reducing extreme effects of drought and flood cycles and reducing greenhouse gas emissions (GHG) (Government of Manitoba, 2017).

This program ran in five-year commitment periods, where landowners were required to protect their agricultural land inland beside a waterway for the designated five-year period (Government of Manitoba, 2017). landowners of farming property were eligible to apply if their farm property has a lake or waterway running through the property, where the area beside it is suitable for "cropping and has been used as cropland in the past; or suitable for grazing and is adjacent to current grazing land" (Government of Manitoba, 2017). Additionally, there must be a minimum of one acre of adjoining land on the riparian strip (Government of Manitoba, 2017). The requirements for the program, are to first set up a "livestock exclusion zone 100 feet wide along each side of the lake or waterway", this entails that livestock cannot graze or water in this zone for the full five-year commitment period of the program (Government of Manitoba, 2017). Additionally, this area must have permanent fencing maintained that separates the grazing livestock from the land in the exclusion zone (Government of Manitoba, 2017). The fencing has some exceptions, it allows for supervised water crossing and does not have to follow the lake or waterway (Government of Manitoba, 2017). Additionally, the livestock exclusion zone cannot have any agricultural activity other than haying for this five-year commitment period (Government of Manitoba, 2017).

The tax reduction consisted of different parameters depending on what was done with the land. For instance, if previous cropland was not being cultivated and rather maintained with native plants, then a tax exemption of "$20 annually for five years, for a total of $100 per riparian acre" was applied (Government of Manitoba, 2017). If previous grazing land was used only for haying, then a tax

exemption of "$20 annually for five years, for a total of $100 per riparian acre." was applied (Government of Manitoba, 2017). Additionally, if previous grazing land had no agricultural activity at all, then there was a tax exemption of "$28 annually for five years, for a total of $140 per riparian acre." (Government of Manitoba, 2017). Additionally, there were rules established for how much the tax exemption could exceed the property taxes for certain years, for instance, the tax reduction for the five-year commitment period of 2017 to 2021 could not exceed 120% of 2016 property taxes on the landowner's farm property (Government of Manitoba, 2017).

This program ran from 2003 to 2017 when it was eventually cancelled by the Minister of Finance of Manitoba, Cameron Friesen. Friesen announced in 2017 that the province was eliminating multiple tax credit programs across the province because they "had little uptake or failed to meet their objectives" ("Manitoba Pulls Less-Loved Ag Tax Credits in Budget," 2017). The MRTC was cancelled "effective immediately", but that did not impact eligibility for unused tax credits on the five-year commitment that could be exchanged by a certain date ("Manitoba Pulls Less-Loved Ag Tax Credits in Budget," 2017).

C. Ontario Conservation Land Tax Incentive Program

The Ontario CLTIP is a voluntary PES program that encourages the protection of significant natural areas in Ontario. The main goal of this program is to "recognize, encourage, and support the long-term stewardship of specific categories of conservation land by offering tax exemption to those landowners who agree to maintain their land in a manner that contributes to the natural heritage and biodiversity objectives for conserving land" (Government of Ontario, 2010). In addition to the goal of the program, there are several objectives the program aims to meet, including assisting private landowners in the protection of natural heritage and biodiversity values for the benefit of the environment, the local community, and all people living in Ontario (Government of Ontario, 2010). Another objective is to protect significant conservation lands while also promoting ecosystem functions, processes, and successions (Government of Ontario, 2014). Additionally, there are objectives to restrict incompatible

uses on conservation lands and to work alongside other provincial incentive programs (Government of Ontario, 2014).

The CLTIP allows for a 100% property tax exemption to landowners that have land that qualifies for the program (Government of Ontario, 2010). It is important to recognize that this tax exemption is intended as an incentive and not compensation or to enhance net revenue (Government of Ontario, 2010). To qualify for the program, the Ministry of Natural Resource and Forestry (MNRF) must first identify the lands to be eligible land types for the program (Government of Ontario, Government of Ontario, 20102010). Individuals are mailed application packages if their land is deemed eligible by the MNRF (Government of Ontario, 2014). Every year these applications must be re-submitted to participate in the program (Government of Ontario, 2010). For the area to qualify it also must be ⅕ of a hectare or larger (Government of Ontario, 2014). Additionally, the landowners must commit to protecting the designated area, and consent to the MNRF inspecting their land (Government of Ontario, 2014). Moreover, governments and municipalities are not eligible to be landowners in this PES program (Government of Ontario, 2010). All in all, the MNRF is the primary decision-maker in CLTIP, particularly on the decision of eligible lands (Government of Ontario, 2010).

The natural heritage feature only applies to certain types of lands as identified by the MNRF. These include provincially significant lands for scientific and natural interest, habitats of endangered species, provincially significant wetlands, Niagara Escarpment Natural Areas, and Community Conservation Lands that are operated by non-profit conservation organizations and conservation authorities (Government of Ontario, 2014; Government of Ontario, 2010). Examples of lands that would not apply are areas municipally zones for conservation, floodplains, and wetlands without provincial significance. Additionally, land that has been “commercially harvested” cannot participate in the program until ten years have passed since the last harvest took place, or until the property has been re-evaluated by the MNRF (Government of Ontario, 2010).

D. Managed Forest Tax Incentive Program

The MFTIP is another Ontario provincial voluntary PES program, which focuses on protecting forest lands in Ontario. The main goal of this program is to "bring fairness to the property tax system by valuing forestland according to its current use. The program is designed to increase landowner awareness about forest stewardship" (Government of Ontario, 2012). The MFTIP program provides a 25% property tax exemption from the municipal tax rate of residential properties (Government of Ontario, 2012).

To qualify for the program several requirements must be met. The main requirements are that the property is in Ontario, the property is owned by a "Canadian citizen or permanent resident; a Canadian corporation, partnership, or trust; or a conservation authority" (Government of Ontario, 2012). In addition to these requirements, there are also forest area requirements. The forest must cover a minimum of four hectares that excludes residences and is on a property with a single municipal roll number (Government of Ontario, 2012). Additionally, the forest must have a minimum of the following: "1,000 trees of any size per hectare, or 750 trees per hectare measuring more than five centimetres in diameter, or 500 trees per hectare measuring more than 12 centimetres in diameter, or 250 trees per hectare measuring more than 20 centimetres in diameter" (Government of Ontario, 2012). The diameter measurements must be taken at 1.3 meters above the ground, and the trees must be listed in the book *Trees in Canada* by John Laird Farrar (Government of Ontario, 2012; Farrar, 1995). There are some exceptions for open areas to be entered into the program with the less than minimum number of trees (Government of Ontario, 2012). There are specific properties listed as not eligible within the program. These include areas listed under the *Aggregate Resources Act* (*Aggregate Resources Act, R.S.O. 1990, c. A.8*), or are being zoned for aggregation; if the area is owned by municipal, provincial, or federal government; residences and landscaped areas that are on eligible properties; land-uses for other purposes such as campgrounds, ski hills, and golf courses (Government of Ontario, 2012).

In this program, properties are entered for ten years (Government of Ontario, 2012). The application requires a "long-term horizon" guide of 20 years or more that describes the activities the

landowner will complete over the 10 years (Government of Ontario, 2012). Additionally, halfway through the agreement at the five-year mark, the landowner must complete a “Five-Year Progress Report” (Government of Ontario, 2012). In addition, to this, the landowner is required to submit a “Ten-Year Activity Summary” (Government of Ontario, 2012). Although the program is for ten years, a landowner can remove their property from the program at any time they wish (Government of Ontario, 2012).

The applications for being in MFTIP take roughly five months to complete and require a substantial commitment of time and resources. First, the landowner must review the guide and contact the MFTIP Administrator and acquire a list of Managed Forest Plan Approvers (approvers) (Government of Ontario, 2012). An initial property inspection is required, and it is suggested to get advice from the approver on how to write the plan (Government of Ontario, 2012). After the first draft of the plan is completed, there should be revisions and suggestions from the approver, and finally, it must be approved and submitted along with the application package (Government of Ontario, 2012). It is important to note that the approver is someone designated by the MNRF, and these individuals are “independent contractors” that require payment for their services (Government of Ontario, 2012). This is a classic example of transaction costs associated with PES programs. This approver visits the landowner's property and verifies its eligibility; ensures the plan, map, and activities meet the standards; and completes approval forms (Government of Ontario, 2012).

Certain activities may be required of the landowner to meet the objectives of the program. These include tree planting and maintenance of native tree species; including recreational activities such as “hiking, skiing, or hunting”; managing wildlife in the area, limiting disturbance in environmentally sensitive areas; and gaining more knowledge about their forest (Government of Ontario, 2012). There are specific activities prohibited from happening on the land in this program. For instance, high grading; pasturing livestock, inactivity that diminishes forest health, or removing soil (Government of Ontario, 2012).

E. Alternative Land-Use Services Program

The ALUS Program is a community-developed initiative that prioritizes environmental issues within local agricultural industries. ALUS provides resources and support, such as expertise and direct financial support, to private farmers and ranchers who contribute important solutions to climate change and biodiversity loss (*Alternative Land-Use Services*, 2023). The program aims to advance the production of ES from agricultural land that is privately owned (Sparling et al., 2008, 73). The essential principles of ALUS are to aid the improvement and preservation of environmental assets, and to ensure interest and use in the program for commitment to ES provision (Sparling et al., 2008, 73).

In the ALUS program, eligible landowners receive "continuous annual payments" that are meant to maintain and enhance specific land types that provide ES; wetlands, natural features on farms that hold spring season, semi-permanent or permanent water, ecologically sensitive areas, riparian areas, and natural areas (Sparling et al., 2008, 74; *Alternative Land-Use Services*, 2023). The program is implemented through a Partnership Advisory Committee that consists of other NGOs, local farmers, and community stakeholders (*Alternative Land-Use Services*, 2023). This is done so that each program addresses the local environmental challenges of each community (*Alternative Land-Use Services*, 2023). Additionally, participating communities receive "innovative technology and data infrastructure tools" from ALUS that can present detailed technical information on the advantages of ecosystem projects (*Alternative Land-Use Services*, 2023). This includes measuring nutrient capture, biodiversity benefits, and carbon sequestration (*Alternative Land-Use Services*, 2023).

As of 2023, there are 38 communities involved in ALUS, with 1,655 farmers or ranchers in the program (*Alternative Land-Use Services*, 2023). These programs are active in six provinces across Canada: Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and PEI (*Alternative Land-Use Services*, 2023). Including 37,550 acres of wetlands, 36,185 acres of pollinator habitat, and 8,861 acres of land being reforested with native trees and shrubs (*Alternative Land-Use Services*, 2023). In total, there are

46,305 acres of land in ALUS programs and over $16 million in funding being distributed (*Alternative Land-Use Services*, 2023).

Since this program is not a policy program but rather a community-led program run by an NGO, it will not be included in the analysis and evaluation of this paper. I wanted to touch on this program because it has a wide application and considerable success across Canada. Yet since it is not a policy program nor a tax subsidizing program, it will not be included in the analysis of this paper.

6. Analysis

In tandem the literature review and the personal interviews will provide qualitative data to support the analysis I provide on the evaluation of the four policy programs: CEGP, the MRTC, CLTIP, and the MFTIP. Three evaluative criteria are being used to assess these programs; (1) is there some kind of measurable indicator of success, (2) is there an impact on broader public policy or policymakers, and (3) is there a recognition of social power relations in the policy program. These criteria are taken in a broad understanding since each program is structured differently and has different approaches, aims, and goals. This section is organized by splitting up each evaluative criteria, and then further splitting up the section by each PES program. See Table 4, Appendix 1 for a summary table on the analysis.

A. Measurable Indicator of Success

For this first evaluative criterion I will examine any public empirical information about the various PES programs. Including qualitative and quantitative evidence, such as data on the amount of land being conserved, statements from the interviews that were completed for this research, and newspaper articles that express opinions on the programs.

An important point of analysis that came up during the primary data collection and the literature review, is the issue of a lack of standardization in defining PES programs and valuing ES for PES programs. This debate in ES and PES literature identifies issues of standardization of definitions of PES programs and valuation techniques. Resulting in ES valuation being measured in “diverse and inconsistent ways” (McElwee, 2017, 103). Although, the four programs I am evaluating in this paper are

all tax rebate programs, thereby following some form of standard in that they reduce taxes for a landowner. Having a standardized valuation technique for PES programs would allow for increasingly more analysis and evaluation of the successes of PES programs. Since the programs I am evaluating do not follow a complete standardized system for valuing ES, I will review the available information concerning the amount of land being conserved in the program, increases, or decreases in the hectares and the number of properties in the programs, the length of the program, and personal statements.

A1. Canadian Ecological Gifts Program

The CEGP has been around for almost 30 years, with its inception in 1995. Since the beginning of the CEGP to the date March 31, 2023, there have been 1,807 ecological gifts donated with a total value of over one billion dollars across Canada (Government of Canada, 2021). Figure 6 below, shows the location and area of completed ecological gifts between 1995 and 2014, when the total number of ecological gifts was 1,108. This has since grown with the addition of almost 700 more ecological gifts.

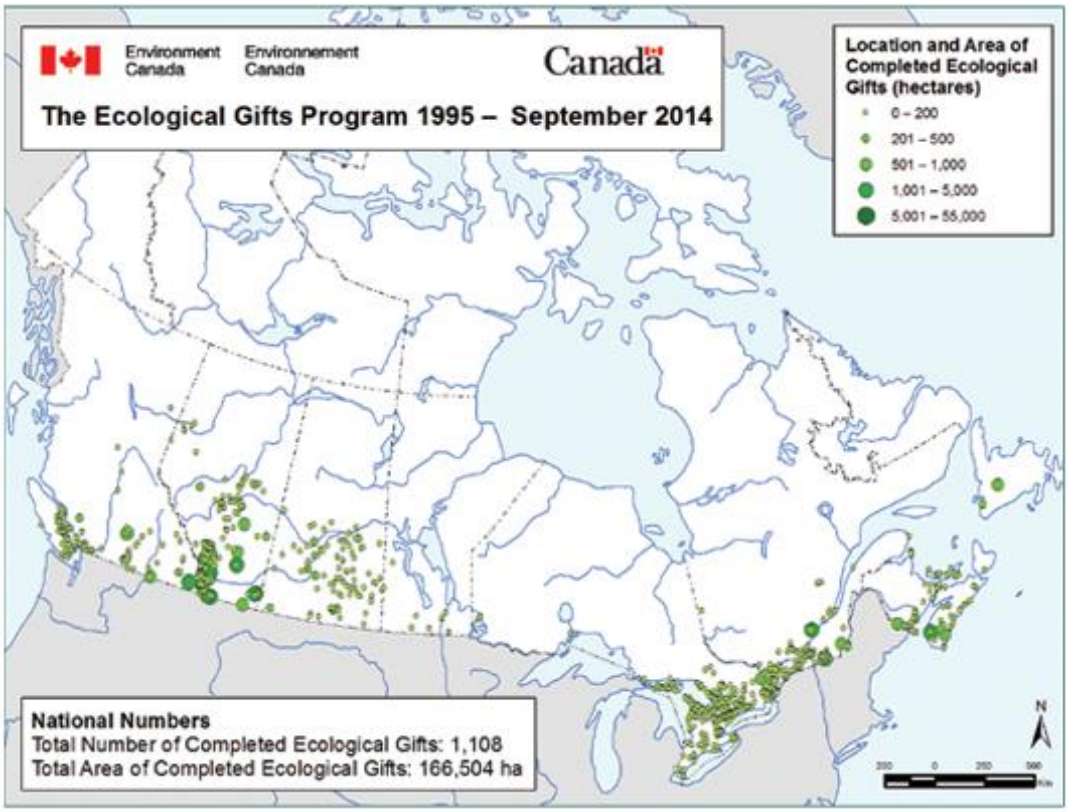

Figure 6: Ecological Gifts donated between 1995 and 2014, showing the location and area in hectares (sourced from Environment Canada, 2015)

These programs are protecting 225,000 hectares of the environment (Government of Canada, 2021). To give a picture of how much this is, the City of Toronto is 63,000 hectares, this does not include the Greater Toronto Area (*Toronto at a Glance*, 2023). Thus, the amount of area being protected by the CEGP is roughly the size of 3.57 Torontos. This might seem like a lot of area, however comparing this to the size of Canada, which is 998,467,000 hectares, it is not a significant portion of Canada (*Canada Year Book. Chapter 15.*, 2011). The program protects 225,000 hectares which equates to roughly 0.023% of Canada's area. Another way to look at this is to remove the total built-up area, cropland and grazing area since those land uses would not be eligible for the PES program. In Canada, there are roughly 1,454,600 hectares of built-up land and 62.2 million hectares of farmland (*Built-up Area by Census Metropolitan Area, 1971, 1991, 2001 and 2011*, 2016; *Overview of Canada's Agriculture and Agri-Food Sector*, 2023). Subtracting that from the total area of Canada, the program protects roughly 0.024% of Canada's land that could be eligible for the program. However, it is also important to note that most of Canada's population lives within the southern portion of the country, near the border with the United States (*Provinces and Regions*, 2008). See Figure 7. This is imperative since it significantly reduces the amount of land that individuals can own and could be eligible to donate to the CEGP. Nonetheless, the area being protected is of environmental importance, many areas being determined as national or provincial significance, and many are home to some of the species at risk in Canada (Government of Canada, 2021).

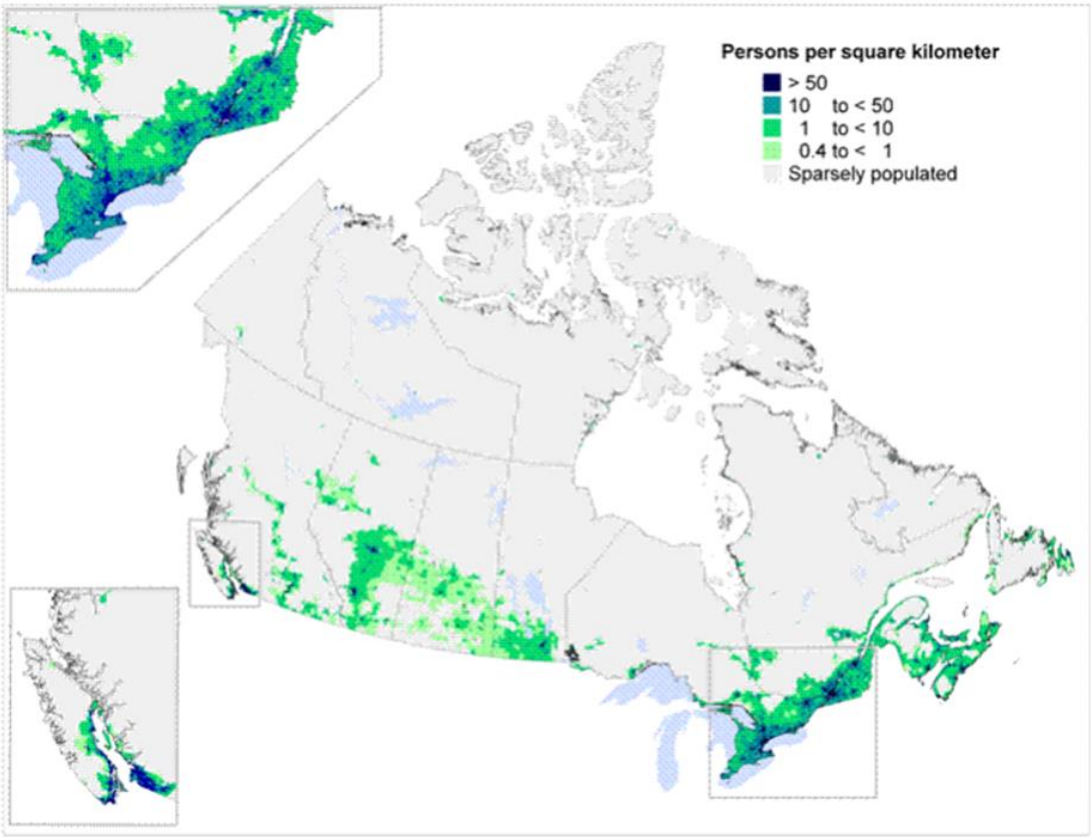

Figure 7: Persons per square kilometre in Canada (sourced from *Provinces and Regions*, 2008)

The province of Prince Edward Island (P.E.I) has been notably positively impacted by the CEGP. This program is described as "an important tool in preserving Prince Edward Island's most sensitive ecosystems" (Yarr, 2018). P.E.I has received more ecological gifts than any other province, particularly in the last few years (Yarr, 2018). In total there are 27 land donations in P.E.I., see Figure 8. One suggestion for why the program is such a success in P.E.I is because of the tax reduction on capital gains, which can often be significant for large family properties (Yarr, 2018). Another suggestion is that it is because the CEGP is "community-driven" (Yarr, 2018).

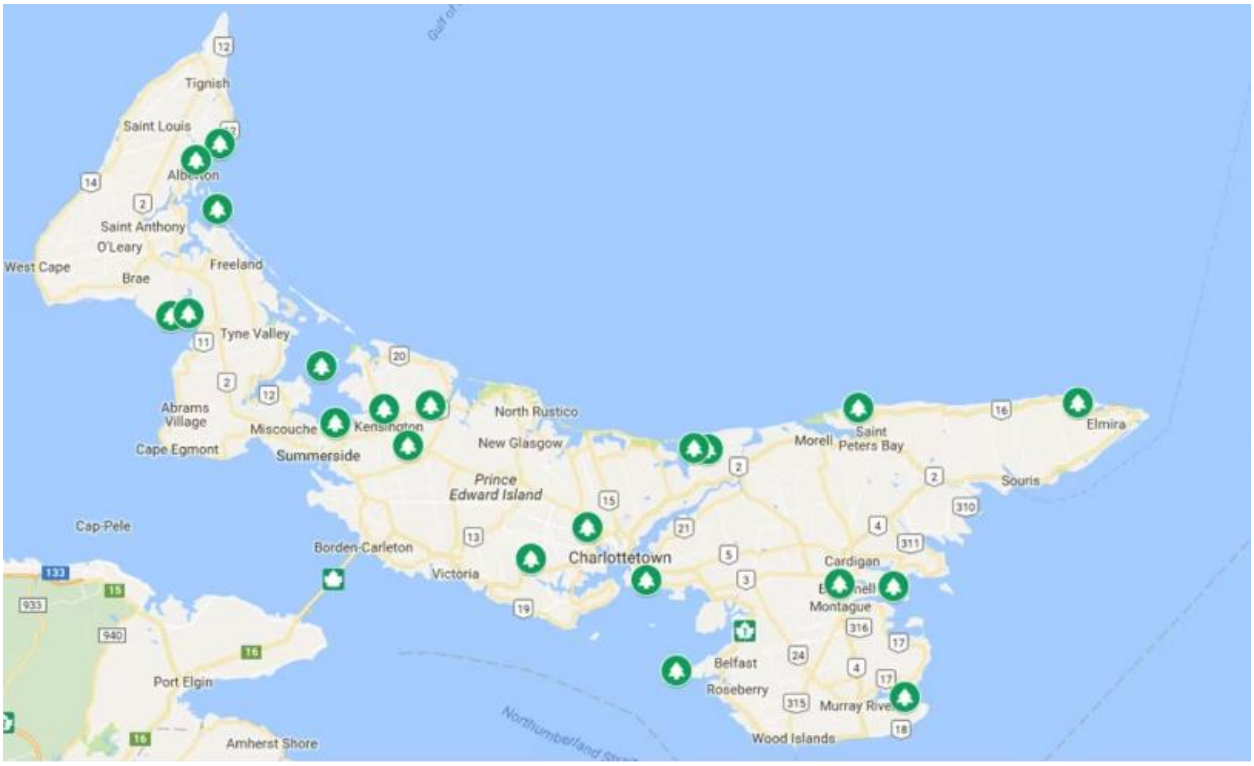

Figure 8: Protected lands spread across the island from one end to the other (sourced from Yarr, 2018).

Although it is not a significant portion of land protected under the CEGP in terms of the entirety of Canada's land, it is a much more significant portion considering where people live in Canada. The areas being protected under CEGP are critical pieces of land since they have the possibility of being developed. Additionally, CEGP arguably has had the most success in P.E.I. where there are the most ecological gifts and are valuable by locals. Overall, the CEGP does have empirical evidence of a measurable indicator of success and shows a benefit to Canadian land considering the length of the program, the amount of land in the program, and quotes from locals.

A2. Manitoba Riparian Tax Credit

The MRTC program was cancelled in 2017 after running for 15 years. It was cancelled along with other provincial tax credit programs for having minimal use or failing to meet the program objectives (AGCanada, 2017). The program was cancelled immediately and has not been re-implemented since then. Besides this newspaper article, I was unable to find any other information on the successes or failures of

the program. There was no data on the amount of land ever registered into the program or personal statements regarding the program. An interesting point concerning the political context during the time this program ran, is that the MRTC was established in 2002 during Gary Albert Doer's term as Premier in the New Democratic Party (NDP) (*Premiers of Manitoba: Celebrating 150 Years as a Province 1870-2020*, 2020). It continued during the terms of Gregory Francis Selinger, again an NDP government (*Premiers of Manitoba: Celebrating 150 Years as a Province 1870-2020*, 2020). Then in 2016, Brian William Pallister, leader of the Progressive Conservative party in Manitoba, was elected as Premier (*Premiers of Manitoba: Celebrating 150 Years as a Province 1870-2020*, 2020). Less than a year after Pallister's successful election, the MRTC was cancelled. The MRTC program ran through multiple terms of a left-of-center party yet was cancelled after a right-of-center party gained power. This highlights an issue of future resilience, particularly the issue of political turnover that was discussed in the theoretical literature, section E8, of this paper. Although the program lasted multiple terms of two different Premiers, it did not last a change in government party. Considering how long the program lasted, it shows some level of success. Yet the cancellation of the program presents that the program ran into the issue of political turnover.

A3. Conservation Land Tax Incentive Program

The CLTIP has been around for 25 years, beginning in 1998 when it replaced the Conservation Land Tax Reduction Program. One interviewee identified that CLTIP can be "incredibly valuable" (Interview 3, 2023) for smaller land trusts and individual landowners as the tax benefit can be quite substantial. Another interviewee identified that there is significant political support for CLTIP in Ontario and it is something landowners appreciate having as a program (Interview 6, 2023).

Between 2002 and 2020 the area was conserved and the number of participants in the CLTIP increased. The area listed under the program increased from 201,980 hectares to 289,200 hectares, overall increasing by 43% (Ontario Biodiversity Council., 2021). While the number of participating properties

increased from 13,800 to 24,900 showing a significant 80% increase (Ontario Biodiversity Council., 2021). See Figure 9 below.

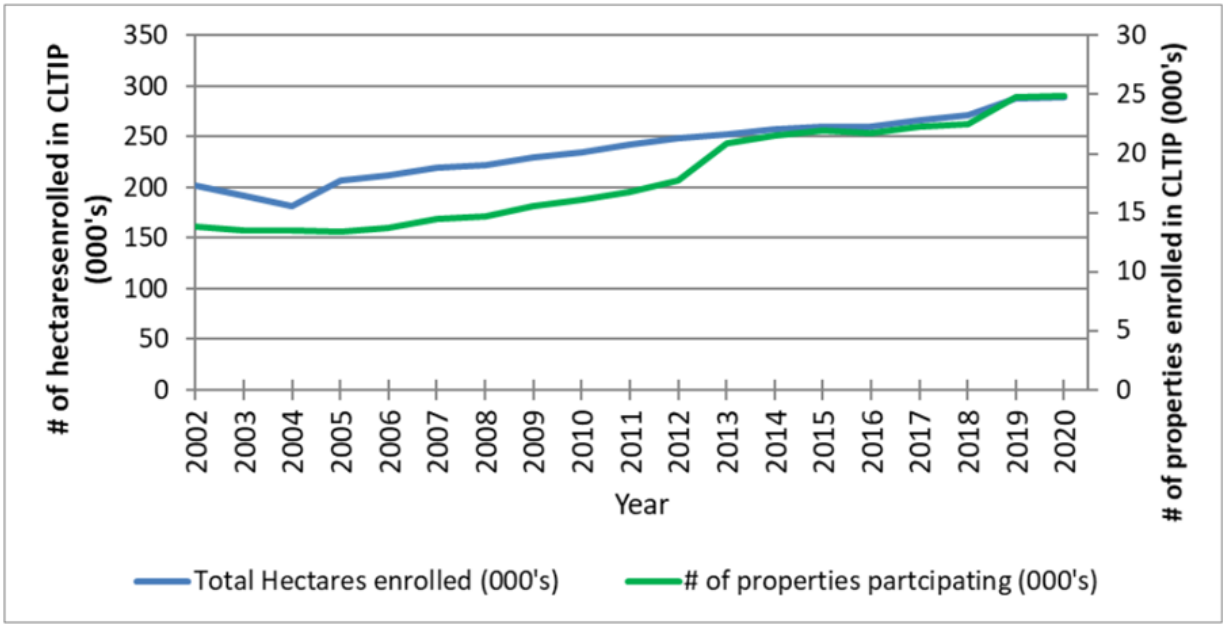

Figure 9: Land area and participation in the Conservation Land Tax Incentive Program 2002-2020 (sourced from Ontario Biodiversity Council., 2021).

To illustrate the amount of area being conserved in this program using the numbers from 2020 of 289,200 hectares. The City of Toronto is 63,000 hectares, this does not include the Greater Toronto Area (*Toronto at a Glance*, 2023). Roughly CLTIP conserves about 4.59 Toronto's worth of land. Considering this in terms of the size of Ontario, which is 107,639,500 hectares (*About Ontario*, 2023). CLTIP conserves 0.269% of land in Ontario. Another way to look at this is to consider the total built-up land, cropland, and grazing land that would be ineligible for this PES program. In total, Ontario has 1,036,106 hectares of built-up land, 3,647,439 hectares of cropland, and 1,758,048 hectares of grazing land (Miller et al., 2021, 25). Subtracting the total area of built-up land, cropland, and grazing land from Ontario, the CLTIP covers approximately 0.286% of what could be considered eligible lands for the program. Although, it is essential to understand that most of Ontario's population lives within the southern portion of Ontario, near the United States border (*Provinces and Regions*, 2008). Similarly, to the example with the CEGP, this significantly reduces the amount of land that would be eligible for the CLTIP. Overall,

this program demonstrates several measurable indicators of success considering the length of the program, the amount of land and properties in the program, and interview statements about the program.

A4. Managed Forest Tax Incentive Program

The MFTIP began 26 years ago after it replaced the Managed Forest Tax Redemption Program in 1997. Similar to CLTIP, MFTIP was identified by interviewees to be extremely beneficial for smaller land trusts, conservation organizations, and individual landowners. Additionally, there is considerable political support for the program and is something valued by those participating in the program.

Altogether, there has been an increase in the number of properties that participate in MFTIP from 2002 to 2020 (Ontario Biodiversity Council., 2021). MFTIP had some fluctuation but an overall increase of 6% of the area conserved under MFTIP, from 708,000 to 751,000 hectares (Ontario Biodiversity Council., 2021). There has been some fluctuation in the changing of participating landowners, with large land holdings (Ontario Biodiversity Council., 2021). However, there is still an upward trend in the number of properties participating in the program, with a 91% increase between 2002-2020 from 9,899 to 18,950 properties (Ontario Biodiversity Council., 2021). See Figure 10.

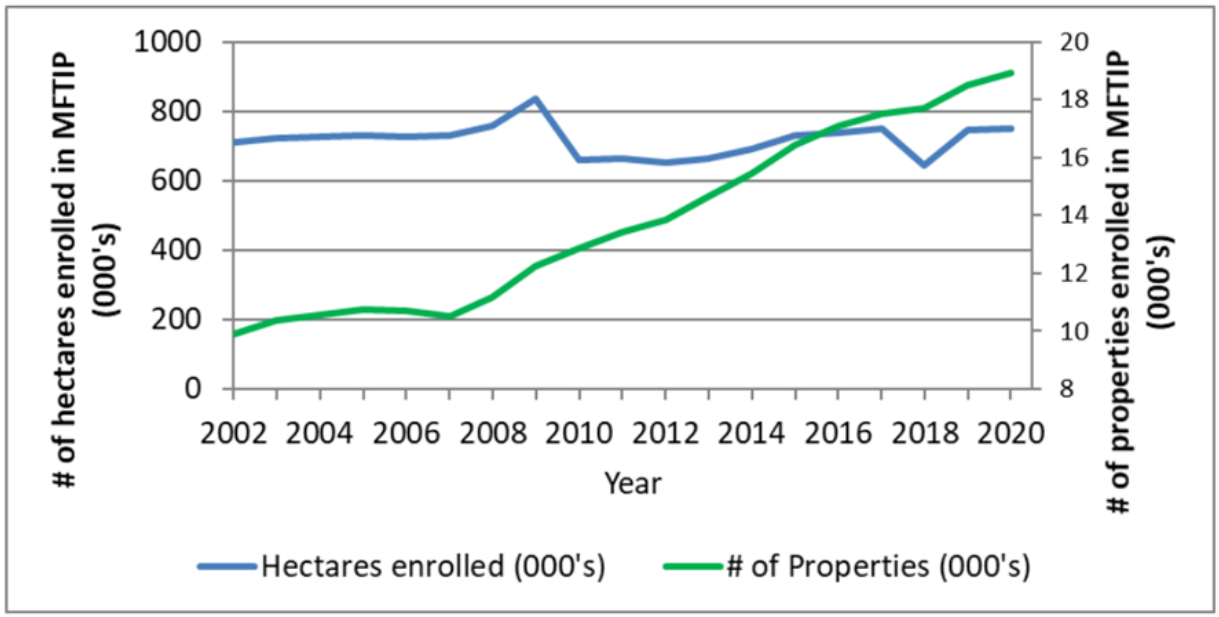

Figure 10: Land area and participation in the Managed Forest Tax Incentive Program 2002-2020 (sourced from Ontario Biodiversity Council., 2021).

To illustrate the amount of area being conserved in this program using the numbers from 2020 of 751,000 hectares. The City of Toronto is 63,000 hectares, this does not include the Greater Toronto Area (*Toronto at a Glance*, 2023). MFTIP roughly conserves about 11.92 Toronto's worth of land. Considering this in terms of the size of Ontario, which is 107,639,500 hectares (Miller et al., 2021, 15). MFTIP conserves 0.698% of land in Ontario. Since the only land eligible for this PES program is forestland, it is important to consider the percentage of land the program protects in the total area of forest in Ontario. There are 47,536,733 hectares of forestland in Ontario (Miller et al., 2021, 15). MFTIP conserves 1.58% of forestland in Ontario. Similar to the CEGP and the CLTIP cases, it needs to be mentioned that the majority of individuals in Ontario live close to the border with the United States (*Provinces and Regions*, 2008), which significantly reduces the amount of land eligible for the MFTIP. Overall, this program presents several aspects of measurable indicators of success, including the length of the program, the amount of land and properties in the program and continual increases in those, and the interview statements about the program.

B. Impact on Policy

For this evaluative criterion I will examine available documentation and the primary data for information on the effects these PES programs have had on Canadian public policy and the political context. Available documentation can include documents such as newspaper articles, government websites, or academic articles.

B1. Canadian Ecological Gifts Program

The most obvious effects the CEGP has had on public policy and the policy context of Canada is regarding the *Income Tax Act (Income Tax Act (R.S.C., 1985, c. 1 (5th Supp.)),* and the *Taxation Act of Quebec (Taxation Act, CQLR c I-3).* CEGP is empowered through these two significant legislations. This tax exemption also potentially reduces provincial taxes for the landowner in addition to national taxes. Overall, this affects the revenue the federal and provincial governments receive from income taxes.

Another effect that the CEGP has on public policy and the policy context in Canada is benefiting the goals of the *Species at Risk Act* (*Species at Risk Act (S.C. 2002, c. 29)*). The main goal of this program is to "prevent endangered or threatened wildlife from being extinct or lost from the wild" (*Species at Risk Act: Frequently Asked Questions*, 2003). This impacts the CEGP because there are instances where lands having habitat of species at risk can qualify for CEGP. For instance, in Ontario, significant portions of land can qualify if there are "portions of the habitat of federally or provincially listed species at risk, including endangered or threatened species, or species of special concern" (*Tax Relief: Incentive Programs. Ecological Gifts Program*, 2023). Other similar criteria apply to other provinces around Canada too. Overall, the CEGP has had some effect on public policy in Canada, albeit quite minimal with regards to only the *Tax Act of Canada* and the *Taxation Act of Quebec* that the program is operated by, and the *Species at Risk Act* in an indirect way.

B2. Manitoba Riparian Tax Credit

Although the MRTC was cancelled in 2017 after operating for 15 years, there are some effects the program had on the policy context and government response in Manitoba. One effect is the reduction in property taxes that municipalities receive as revenue to pay for their city services (*Manitoba Property Tax Calculator 2022*, 2022). These city services include aspects such as the fire department, education systems, and public transit (*Manitoba Property Tax Calculator 2022*, 2022). A reduction in the revenue a municipality receives could have a significant effect, particularly if there is a large property and a small municipality. Moreover, there is limited information concerning the possibility of municipalities being reimbursed for the loss of property taxes, thus exhibiting a lack of transparency.

Other effects that could potentially be linked to the MRTC are the creation of new policy initiatives and programs relating to Ecological Goods and Services. Although there is not a direct correlation, the creation of these additional programs was established shortly after the MRTC began. One was the creation of the Manitoba Ecological Goods and Services (EG&S) Initiative Working Group in 2009, six years following the start of the MRTC. The purpose of the Manitoba EG&S Initiative Working

Group is to "develop an innovative, made-in-Manitoba EG&S approach for agro-Manitoba by integrating existing and new policies to provide multiple environmental and socio-economic benefits" (Government of Manitoba, 2009). This working group is developed mainly by Manitoba Agriculture & Resource Development. The working group is structured to have two main elements: an external stakeholder working group and a government policy working group (Government of Manitoba, 2009). The second element of the working group shows a direct impact on the political context of Manitoba. Additionally, this working group describes that there is strong support for EG&S programs in Manitoba (Government of Manitoba, 2009).

Moreover, following the establishment of the MRTC was the creation of the "Ecological Goods and Services: Estimating Program Uptake and the Nature of Costs/Benefits in Agro-Manitoba" final report produced for the Manitoba Agriculture, Food and Rural Initiatives Agri-Environment Knowledge Centre (Sparling et al., 2008). This report was finished in 2008, five years after the creation of the MRTC. This report was initially started to acknowledge the "growing recognition" that EG&S are critical to "Canada's economic and social well-being" by governments, producers, and other stakeholders (Sparling et al., 2008, i). The main objectives of this report were to; establish the EG&S qualifying lands in Manitoba, explain the environmental benefits of ES&G programs, determine program expenses, estimate the value of benefits of EG&S, develop an analytical framework for cost comparisons, and provide a recommendation for future EG&S in Manitoba (Sparling et al., 2008, i). All in all, the MRTC has had an impact on public policy and the political context in Manitoba, with the delay of revenue for municipalities; potential influence in the establishment of the Manitoba Ecological Goods and Services Initiative Working Group; and the creation of the "Ecological Goods and Services Estimating Program Uptake and the Nature of Costs/Benefits in Agro-Manitoba".

B3. Conservation Land Tax Incentive Program and Managed Forest Tax Incentive Program

There is evidence that the CLTIP and the MFTIP have had effects on public policy and the political systems in Ontario. One important effect is the issue at the municipal tax base level created by

the reduction in property taxes, similar to the issue in the MRTC. Since both programs can reduce the property taxes for landowners, it causes a delay in the property taxes that the local municipality receives since the municipality can be reimbursed by the province. The majority of the money that municipal governments raise to pay for public services is raised through property taxes (*How Local Government Works*, 2023). One interviewee indicated that if there is a smaller municipality and one landowner has a significant portion of land that fully goes into CLTIP, then the tax base for that smaller municipality becomes quite affected (Interview 3, 2023). Additionally, non-profit conservation organizations can qualify and participate in CLTIP and MFTIP, and it can often be the case that the conservation organization focuses their objectives on certain areas that are environmentally significant. If this happens, it can have an impact on the municipality in terms of having a delay in their revenue from property taxes. It was indicated in the interviews that the reimbursement program for municipalities to receive their lost property taxes is "not super transparent" (Interview 3, 2023). The CLTIP program policy only identifies that the "Municipal Property Assessment Corporation (MPAC) will direct the Municipality to recover those taxes, up to a maximum of four previous years" (Government of Ontario, 2014). Besides this, there is no other public information about how or when a municipality will be reimbursed. This can be seen as a challenge in the CLTIP and MFTIP that affects the political system for local municipalities. One interviewee disclosed that local communities view this as a tax loss for their community (Interview 3, 2023). Basic social services such as schools, roads, garbage and waste disposal, fire, and police services, etc. were identified as services being "eroded" because of CLTIP (Interview 3, 2023).

This issue also creates tension between provincial and municipal levels of government in Ontario. CLTIP and MFTIP have major support from the provincial level of government where they operate, yet there are issues identified that cause the municipal levels of government to be adversely affected. One interviewee identified that it creates "a bit of a push and pull between the two levels of government" (Interview 6, 2023).

Another area that the CLTIP and MFTIP programs affect is property value assessments by the MPAC. If a property is approved for conservation land or managed forests by the MNRF with regards to

CLTIP and MFTIP, MPAC will reassess the property's value ("Managed Forest or Conservation Land," 2023). And a specific approach of value assessment if applied for lands classified under MFTIP and CLTIP ("Managed Forest or Conservation Land," 2023). Lands qualifying under CLTIP are assessed using a current value assessment of the conservation land property, using comparisons of similar sale prices of other conservation land properties ("Managed Forest or Conservation Land," 2023). Lands qualifying under MFTIP are assessed using values of woodlots on properties in comparable neighbourhoods ("Managed Forest or Conservation Land," 2023).

In summation, both the CLTIP and MFTIP have had effects on public policy and the political context in Ontario. Although these programs have ample support from the provincial level of government, there is evidence that the delay in revenue for municipalities can create tensions between provincial and municipal levels of government. This delay in revenue for municipalities potentially has effects on the public services that municipalities can provide. Moreover, both programs both have effects on property values and induce property value reassessments.

C. Recognition of Social Power Relations

As with the other two evaluative criteria, I will be using available documentation and the primary data from the personal interviews to provide analysis and an evaluation of the PES programs. Available documentation can include newspaper articles, government websites, or academic articles.

C1. Canadian Ecological Gifts Program

An issue concerning the CEGP regarding social power relations, is an issue of Indigenous jurisdiction. This issue is particularly important in the Canadian context, as there are Indigenous peoples across the country that have experienced colonial violence, and discrimination, and are being forcibly removed from land. The CEGP ought to acknowledge the ongoing inequalities and discrimination between settler-colonialists and Indigenous persons taking place at the individual, institutional, and systemic levels. Especially regarding land and conservation practices. The overview of the CEGP fails to acknowledge any relationship that the CEGP has with Indigenous peoples in Canada. This presents a lack

of recognition of social power relationships that exist between Canadian landowners and Indigenous persons. It is important to note that there are other instances where the relationship between Indigenous communities and PES programs has been acknowledged. The report, *Completing and Using Ecosystem Service Assessment for Decision-Making: An Interdisciplinary Toolkit for Managers and Analysts* (Toolkit) recognizes the relationship between ES valuation and PES programs, and Indigenous peoples (Preston, 2017). This report was produced in combination with the federal, provincial, and territorial governments aiming to be used by managers and analysts (Preston, 2017). One section of this report "Ecosystem Service Assessment Involving Indigenous Communities" acknowledges that individuals valuing ES "should consider the role and need for approval and involvement by Indigenous communities. This is particularly so for traditional Indigenous knowledge and the unique perspective held by Indigenous communities concerning nature and ecosystem services" (Preston, 2017, 96). This section goes on to describe checklists and considerations that managers and analysts ought to address in ES valuation and PES program creation to consider the social dynamics and relationships with Indigenous peoples and communities (Preston, 2017, 97-99). This report presents the possibilities for acknowledging and recognizing the relationships between PES programs and Indigenous communities, which CEGP does not do.

To further highlight this issue, there is an example of the CEGP being used as a performative act of reconciliation by a white settler individual. In 2019 a Quebec developer offered to give up 60 hectares of land through the CEGP in an area of forest known as "The Pines" that was central to the Oka Crisis (Deer, 2019). The developer, Grégoire Gollin, stated to be doing this "in the spirit of reconciliation" (Deer, 2019). Gollin had owned this land for several years, and at one point attempted to develop a large-scale housing project but was met with strong resistance and protests by Indigenous people living near "The Pines" forest (Deer, 2019). Since Gollin has offered to donate this land to the CEGP, there has been significant skepticism regarding this agreement since "little information on its [the agreement] contents have been given to the community by the Mohawk Council" (Deer, 2019). The agreement made by Gollin has not been made public nor has it ever been shown to the Mohawk council for any kind of consultation,

"Nobody has seen it" (Deer, 2019). Not only has there been a lack of transparency in this land donation claiming to be an act of reconciliation, but there has never been an instance where the CEGP has been used to "return the land to a First Nation" (Deer, 2019). This example of a white settler-colonial landowner using the CEGP to promote a claim of reconciliation highlights a lack of recognition and awareness of social power relations between Indigenous and non-Indigenous individuals in designing PES programs.

Altogether, the CEGP does not acknowledge any level of social power relations regarding the issues of Indigenous rights and the reconciliation of land. The program does not acknowledge any relationship with Indigenous persons or communities, even though there is evidence of other federal reports acknowledging and discussing this issue.

C2. Manitoba Riparian Tax Credit

The MRTC program had an important social power relations issue, concerning the local municipalities having a delay in potentially a significant portion of their tax base due to the property tax rebate in the MRTC program. In Manitoba, property taxes are collected for municipalities to use as revenue for their public services as outlined in the *Municipal Board Act of Manitoba* (*The Municipal Board Act*, 1988). These property taxes pay for services, such as fire and police departments, school services, and waste collection (*The Municipal Board Act*, 1988). This can particularly affect more vulnerable residents in the community that rely on public services, such as public transit.

This issue has the potential to be remedied if the municipality can be reimbursed for the loss of tax revenue. However, there is no information concerning if this is possible for municipalities. This also presents a lack of transparency issue since municipal residents will be unaware of the potential disruption of their city's ability to pay for public services.

Overall, the MRTC does not acknowledge the issue of potentially affecting the local tax base of municipalities, nor does it mention possibilities or reimbursement for these municipalities. Moreover, this

creates a lack of transparency regarding what municipal residents know about what could be affecting their community and public service availability.

C3. Conservation Land Tax Incentive Program

The CLTIP has a similar issue to the MRTC program, regarding municipalities' local tax base. Property taxes are used by municipalities in Ontario as a significant portion of their revenue to pay for public services, such as schools, public transportation, and waste collection and disposal. These are outlined in the *Municipal Act of Ontario (Municipal Act of Ontario, 2001)*. CLTIP does outline possibilities for municipalities to be reimbursed for the loss in revenue for their tax base, yet the process is unclear. If smaller rural municipalities are having a delay in their tax base it can have an impact on their ability to provide public services to their community, potentially causing negative effects to residents of the community. Additionally, this could have a worse impact on lower-income and racialized residents in the community that access public services more often than other higher-income and non-racialized residents of the community. Furthermore, non-profit conservation organizations are eligible to apply for their land to be in CLTIP, which entails that these organizations would be removing tax bases from communities thereby potentially negatively impacting communities' public services.

Although the CLTIP program policy page does acknowledge that the municipality can recover those taxes for up to four years (Government of Ontario, 2010). There is a lack of transparency in the processes of recovering those taxes and how long those processes can take for municipalities. This is also a particularly important issue to be acknowledged since conservation organizations are partially the landowners removing the tax bases of rural communities.

All in all, in public documents, CLTIP does not fully acknowledge that the program has potential impacts on the local tax base of communities and how this can affect public services. Although there is public information that municipalities can be reimbursed for a loss in property taxes, there could be more details included about the process and length of time that reimbursement will take.

C4. Managed Forest Tax Incentive Program

The MFTIP, similar to the CLTIP and MRTC programs, has a similar issue regarding municipalities' tax base. However, the MFTIP does not reimburse landowners 100% of their property taxes, so the municipalities won't experience the same delay as in the CLTIP. Yet a delay in the tax base for a municipality still can affect residents that use public services, particularly low-income and racialized residents. Additionally, this program also allows for non-profit conservation organizations to enter the program, again allowing for these non-resident organizations to adversely impact the tax base of a rural community. Similar to CLTIP, MFTIP acknowledges that municipalities can be reimbursed but does not outline the processes of recovering those taxes, and how long it can take for municipalities. In general, the MFTIP has a similar conclusion as CLTIP in that MFTIP does acknowledge that municipalities can be reimbursed, yet it does not outline the process of reimbursement.

7. Discussion

There are relevant discussion points relating to the four PES programs that concern the interviews and literature review but are outside the scope of analysis for the evaluation of this research paper. I will briefly touch on these as they add importance to the discussion, however, they are not necessarily relevant to the primary analysis and evaluation.

A. Structural problems

A particularly important issue that was discussed in one of the interviews done for the primary data collection of this research, was the issue of PES programs reproducing the current biased and colonial system. The interviewee stated that PES programs, and other forms of payment programs, don't provide a "systems transformation way of thinking" (Interview 4, 2023). Rather, the same economic, colonial, and capitalist systems are being reproduced. The reliance on the same system that has created the problems of over-extraction and over-consumption is being used as the economic model to reproduce these payment programs. These programs have the potential to reproduce the "colonization and the kind of structural exclusion of indigenous peoples from their lands, waters, and territories" (Interview 4, 2023).

Additionally, there is an obvious lack of jurisdictional recognition of First Nations in how PES, and other payment programs, are designed (Interview 4, 2023).

This interviewee proposed the possibility of having a space for "thoughtfully criticizing" these issues while also acknowledging that they exist (Interview 4, 2023). The space for PES programs does not often present places for critical reflection and rather they become a distraction from the underlying systemic issues that need to be addressed.

B. Lack of connection between rural and urban

One issue identified by an interviewee in this research is a lack of connection between rural residents and urban residents, specifically in the context of Ontario. They described an absence of appreciation and understanding between "the interconnections and interdependencies" that exist between rural and urban communities (Interview 6, 2023). Specifically, urban residents need to start understanding the connection between the urban communities benefiting from the stewardship practices done by rural communities, comparing this to the under-appreciation that some urban residents have for the value of food and agriculture. This interviewee believes that if there was a better understanding of the importance of natural systems in rural areas and the benefits that they have for residents in urban areas, there would be greater mitigation of policy issues and constraints for PES programs and conservation initiatives (Interview 6, 2023). Addressing this issue through educational awareness could provide knowledge to individuals to recognize and appreciate the foundational connections between rural and urban communities.

C. Interdisciplinary issue

Another issue that was recognized by some of the interviewees in the primary data collection, is the interdisciplinary nature of PES programs. There are several differing areas of expertise required to create successful PES programs (Interview 3, 2023). For instance, biologists and climate scientists are necessary to give expertise on the areas being considered for PES programs, and economists and policy officials are required to provide information on how PES programs can be constructed for economic and

monetary policies in a certain political system. Without including all the required expertise there can be potentially harmful gaps in the creation and implementation of PES programs. One interview described it as having gaps between what is happening on the ground and at the top of decision-making (Interview 4, 2023). This was also identified to be particularly important when considering PES program efforts being directed toward carbon offsets and biodiversity conservation (Interview 4, 2023). Ensuring that carbon sequestration efforts are not hindering the quality of biodiversity in an area is essential to PES program design.

D. PES as a climate solution

The issue of PES programs being a climate solution was addressed during the interviews for this research, particularly I asked if the interviewees considered PES programs to be a climate solution and if they considered PES programs to be a necessary climate issue. To clarify, this question was not insisting that PES programs are the only climate solution, rather one climate solution among many. This matter had different reflections from the interviewees. A few interviewees considered PES programs to be an important climate solution if they are created in a thoughtful manner that prevents and protects the loss of ES (Interview 1, 2023; Interview 2, 2023; Interview 5, 2023). In this sense, it was suggested that PES programs are only necessary so far as they are successful in having an impact on mitigating climate change. Another interviewee identified that PES programs as climate solutions can be a solution for reducing emissions, but PES programs are particularly a necessary climate solution for offsetting emissions (Interview 5, 2023). This is an important aspect to consider when thinking about climate solutions in terms of reducing emissions and offsetting emissions.

Another interviewee had an opposing perspective of PES programs as climate solutions, particularly that PES programs are not a beneficial climate solution. They indicated that PES programs do not address the foundational problems that need to change to sufficiently mitigate and adapt to climate change issues (Interview 4, 2023). They stated that to address climate change is not just to offset and reduce GHG emissions, but to also identify and address the foundational problems such as the

"underlying systems that continue to uphold a system of extraction" (Interview 4, 2023). This is an important consideration when implementing PES programs, and it must be acknowledged that PES programs continue to perpetrate and enable the economic, political, and social systems that cause climate change.

E. Research Limitations and Potential Future Research

This research contributes to the completion of the Master of Environmental Studies at York University. Meaning there was only a certain level of time and resources that could be given to this research study. An important limitation of this research was that none of the interview participants worked in the government departments of the PES programs that were examined. Although some interview participants were eligible and had participated in the PES programs before, none were authorities of the PES programs. This was not a choice I made in the scope of my research, rather when I reached out to the PES program departments, I was always denied an interview.

Several potential avenues for future research could be considered regarding this topic and area of study. For this paper, I only focused on Canadian policies, however expanding to PES program policies around the world could offer valuable insight. Additionally, I mainly examined tax subsidy PES programs in policies, this could be expanded to other styles of programs in Canada and globally. Another avenue of potential research in the future would be to focus data collection in a survey format, to allow for a greater collection of data. Although I was able to interview some people who participated in the PES programs, it could offer valuable insight to interview more individuals that participate in these PES programs. Similarly, it would be beneficial to understand what local nearby municipalities think of these PES programs.

8. Recommendations

Based on the successes and challenges that have been found in the analysis of these four PES policy programs I am providing some recommendations for future tax subsidy PES programs in Canada. First of all, there seems to be success and benefits in the tax subsidy-based approach for PES programs in

public policy in Canada. These programs seem to be valued by the ES providers. Additionally, the length that the programs have been operating presents a success. Moreover, the amount of land being protected, specifically under the CEGP, CLTIP, and the MFTIP again shows the successfulness of the programs. However, I have some suggestions that could provide improvements for these programs based on the analysis and evaluation in this paper.

A. Standardizing Measurements

First, these programs would value having a continual standardized measurement that provides the public with information on the impact these programs are having. For example, continually providing updated information on how much area is being protected, what types of area, what species live in those areas, etc. These points would allow for continual tracking and evaluation of the programs, and making the information public would provide transparency to Canadians.

B. Increasing Transparency

Another improvement I suggest for the programs, specifically CLTIP and MFTIP, is to make information regarding the delay in tax revenue more transparent for the public. Providing more detailed information, such as the length of time reimbursement can take, or the steps that municipalities must go through. This would allow municipal residents to have a better understanding of the process and any delays the municipality might be experiencing.

C. Including Indigenous People in developing PES policy

PES programs are inherently a place-based initiative aiming to conserve the environment by changing the land use of a certain area. Considering that current Canadian settler-colonial policies are rooted in a history of colonization and displacement of Indigenous peoples, it is important for Indigenous perspectives and knowledge to be included in the policy-making process. Incorporating Indigenous consultation into the policy-making process from Indigenous representatives would be one example of a way to provide Indigenous perspectives and knowledge into these policy programs. Although these policy programs have already been created, modifications could be made to include Indigenous consultation.

D. Education and Knowledge Sharing

The final recommendation I have for these programs is to provide avenues to increase awareness and knowledge sharing about ES and PES programs. This could be done in different ways such as informational signs at city information centers and on city websites or generating public reports on the programs. Providing the public with more information could improve the public's understanding of the ES and PES program's purpose and benefits. Additionally, this increased awareness could benefit the knowledge gap of the connections between rural and urban landscapes in Canada.

9. Conclusion

In this research study, I examined some successes and challenges of four public policy PES programs in Canada: The CEGP, the MRTC, the CLTIP, and the MFTIP. To analyze these programs, I applied three evaluative criteria; if there is some measurable indicator of success, some kind of impact on broader public policy or the policy context, and if there is a recognition of social power relations. I used primary data from personal interviews and secondary data from two literature reviews to conduct this analysis and evaluation. Overall, I found that the Pigouvian-style PES programs that use tax subsidies as incentives have been successful in Canada. The CEGP was found to be valued by landowners, especially in Prince Edward Island for the reduction of capital-gains taxes. Additionally, CEGP has run for almost 30 years and protects land with environmental importance. This program could be improved by acknowledging Indigenous jurisdiction and the relationship between Indigenous peoples and settler-colonial landowners, as is done in the "Ecosystem Services Toolkit" (Preston, 2017). The MRTC was the least successful of the four programs, primarily because it did not withstand political turnover in the province and was cancelled after 15 years. Although, this program did have some effects in enhancing recognition and knowledge of ES and PES programs in the province as ES reports and working groups were established several years after the MRTC. This program could have been improved by recognizing that municipalities would lose some revenue due to the property tax reduction and by providing information on how and if they would be reimbursed. The CLTIP and MFTIP both are valued not only by

individual landowners but also by non-profit conservation organizations that qualify to register land into the program. Additionally, both programs have favourable support from the provincial government, evident by the fact that the 70 programs have been running for over 25 years. These programs also have significant amounts of land registered into the programs, which continually show upward trends of land and properties being registered into the programs. Both CLTIP and MFTIP have effects on the political context since they reduce property taxes for individuals, which causes delays in municipalities receiving property tax revenue in the reimbursement process. This was reported to cause tensions between municipal and provincial levels of government. Although both programs recognize that there is a reimbursement process for municipalities, there is no other information provided to the public. These programs could be improved by providing more transparency in outlining the details of the reimbursement process for the public to understand how potentially cumbersome it is for municipalities to be reimbursed. Since it is unclear how long and potentially resource-intensive the reimbursement process might be for municipalities, the programs could potentially be improved by putting the onus of the reimbursement process on the province rather than on the municipalities. However, due to the lack of details provided publicly about the reimbursement process, it is unclear how to improve the reimbursement process for municipalities. Considering these successes and challenges of all four programs analyzed in this study, I have made four recommendations for future PES programs in Canada. First, having a standardized measurement to track the progress of the programs over time would assist in being able to provide analytical comparisons. Second, increasing transparency in the program's policies will provide more context for the public in any issues or delays that could be affecting other levels of government. Third, including Indigenous consultation in the creation of the PES program policy would contribute to increasing Indigenous knowledge in the policy-making process, which would hopefully provide increased awareness of Indigenous jurisdiction. Finally, improving education and knowledge sharing of ES and PES programs could help to fill knowledge gaps, such as the disconnection between rural and urban living. Examining these PES programs presents a picture of continued environmental conservation in Canada through public policy. The majority of the programs have shown continued

success in protecting and conserving environmentally significant pieces of land and reducing environmental externalities.

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Appendix 1

Table 1: Interview Questions for the collection of primary data

Interview Questions:
(1) Would you like to introduce yourself with your name and a brief introduction of your professional history and interests?
(2) How were you introduced to the concept of ecosystem services and ecosystem service payment programs?
(3) What ecosystem service payment programs are you aware of, and how did you become familiar with them?
(4) Are there any ecosystem service payment programs that you find particularly successful? What is it about the program and political setting that makes it successful?
(5) Are there any ecosystem service payment programs that you find particularly unsuccessful? What is it about the program and political setting that makes it unsuccessful?
(6) Do you think ecosystem service payment programs can or cannot act as a climate solution? [with reasons for why or why not].
(7) Do you think ecosystem service payment programs are a necessary climate solution?
(8) Do you have any additional comments about ecosystem service payment programs being used as a public policy you want to make?

Table 2: Different Ecosystem Service Valuation Techniques.

Evaluation Category	Specific evaluation approach	Definition
Exchange Value Techniques		Only used for ES traded in economic markets. This method does not commodify the ES, rather the goods that are produced using ES.
Primary Method Techniques	Avoided costs method	Valuation of services that release society of other costs

		hat would be induced if the ES was absent.
	Replacement Cost Method	Valuing the ES that could be replaced (often with an artificial system).
	Factor-Income	Valuation is determined by valuing improvements that would enhance incomes, such as improving water quality to enhance the income of fishers.
	Travel Cost	Valuation is based on the costs necessary to travel to and recreational use the ES.
	Hedonic Pricing	ES value is determined by the price that individuals are willing to pay for the ES.
	Contingent Valuation	Hypothetical schemes are created to assess what people would be willing to pay.
	Production Function Methods	This method looks at changes in the supply of a factor input, then that is where the additional value is settled. The logic is that the changes in functions of ES could affect the production in the economy that will be conveyed to people through the price system.
Secondary Method Techniques	Benefit Transfer Method / Value Transfer Method	The valuation of ES from one area are used to derive the value of ES in another area.

	Unit Value Method	This method is based on the average values per unit of area that are then aggregated over a comprehensive list of valuation studies for a specific ecosystem.
	Expert Modified Value Transfer	This approach applies the same logic as above, but there are adjustments made for the economic and ecological contexts of the policy site.
	Statistical Value Transfer / Spatially Explicit Functional Modelling	Statistical models are developed to assist in transferring data and altering dependencies
Ecosystem Accounting		An integrated approach to measure and monitor ecosystems and the flows of services from ecosystems into economic and other human activity. Specifically, this is done in a way that aligns with the System of National Accounts.

Table 3: Comparing the five policy programs, four that are being analyzed for this study

	Canadian Ecological Gifts Program (CEGP)	Manitoba Riparian Tax Credit (MRTC)	Conservation Land Tax Incentive Program (CLTIP)	Managed Forest Tax Incentive Program (MFTIP)	Alternative Land-Use Services (ALUS)
Sector	Public - Federal	Public - Provincial	Public - Provincial	Public - Provincial	Non-Profit
Duration of Program	1995-present (28 years)	2002-2017 (15 years)	1998-present (25 years)	1997-present (26 years)	2000-present (23 years)
Form of payment program, and payment	Pigou, Income tax subsidy	Pigou, Property tax subsidy	Pigou, Property tax subsidy	Pigou, Property tax subsidy	Pigou, Continuous annual payments

Who can qualify for the program?	Individual landowners and corporations	landowners of agricultural land	Individual landowners and non-profit conservation organizations	Individual landowners (Canadian citizen or PR, Canadian corporation, partnership, or trust, or a conservation authority.	Private landowners that farm or ranch
Value of payment	Individuals: credit is calculated by applying a rate of 15% to the first $200 of the donor's total gifts for the year Corporate: directly deduct gift from their taxable income 0% taxable portion of capital gains	Different parameters depending on land-use, these are the main options: (1) $20 deducted annually for 5 years, total of $100 per riparian acre (2) $28 deducted annually for 5 years for a total of $140 per riparian acre	Up to 100% property tax exemption	25% property tax exemption from the municipal tax rate of residential properties	Continuous per-acre annual payments
Program administrator	Minister of Environment and Climate Change	Manitoba Department of Finance	Ministry of Natural Resources and Forestry	Ministry of Natural Resources and Forestry	Partnership Advisory Committee: NGOs, local farmers, community stakeholders

Table 4: Summary of final analysis and evaluation of the four policy programs

	Canadian Ecological Gifts Program (CEGP)	Manitoba Riparian Tax Credit (MRTC)	Conservation Land Tax Incentive Program (CLTIP)	Managed Forest Tax Incentive Program (MFTIP)
Measurable Indicator of Success	**Yes** Program has been running for 28	**Somewhat** Canceled after running for 15	**Yes,** The Program has been running for	**Yes** Program has been running for 26

	years. 225,000 hectares of land protected. Locals from P.E.I note the program as an important tool for preserving P.E.I's ecosystems.	years because of minimal uptake or not meeting objectives.	25 years. Valued and appreciated program. 289,200 hectares of land protected and 24,900 properties in the program.	years. Extremely beneficial. Political support for the program. 751,000 hectares of land protected 18,950 properties.
Impact on Broader Public Policy	**Yes** Directly; Tax Act of Canada and the Taxation Act of Quebec Indirectly; Species at Risk Act	**Yes** Reduction in the local tax base. Establishment of the Manitoba Ecological Goods and Services Initiative Working Group and the "Ecological Goods and Services: Estimating Program Uptake and the Nature of Costs/Benefits in Agro-Manitoba".	**Yes,** Delay in revenue for municipalities. Tension between provincial and municipal governments. Causing property value reassessments.	**Yes,** Delay in revenue for municipalities. Tension between provincial and municipal governments. Causing property value reassessments.
Recognition of Social Power Relations	**No** Does not acknowledge social power relational issues, e.g. reconciliation of Indigenous land and social power relations between Indigenous peoples and settler landowners.	**No** Does not acknowledge the issue of removing the local tax base, nor possibilities of reimbursement. Lack of transparency, regarding knowledge of the community and members being affected.	**Somewhat** Does not acknowledge the issue of removing the local tax base. Conservation organizations removing the local tax base. Acknowledges possibilities for reimbursement, but does not mention details of this process.	**Somewhat** Does not acknowledge the issue of removing the local tax base. Conservation organizations removing some local tax bases. Acknowledges possibilities for reimbursement, but does not mention details of this process.