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Creating a Blue Dialogue Webinar Summary

From Panama to Canada: Urban Water Sustainability & Natural Asset Planning

October 23rd, 2018

This webinar explored lessons learned from communities working to better value nature and its ecosystem services by shifting to natural asset planning approaches, with speakers Vic Adamowicz (University of Alberta), Tatiana Koveshnikova (Credit Valley Conservation), and Gayle Soo Chan (Credit Valley Conservation). Vic highlighted the lessons learned on a project in the Panama Canal watershed, which analyzed the costs and benefits of ecological (green) infrastructure versus grey infrastructure as they relate to maintaining high water levels in the Panama Canal. Tatiana and Gayle then described their research with Ontario's Credit Valley Conservation Authority related to the natural assets initiatives west of Toronto.

Accessing Markets for Ecosystem Services and Green Infrastructure

Vic Adamowicz is the Vice Dean and a Professor in the Faculty of Agricultural, Life & Environmental Sciences at the University of Alberta.

There are a variety of studies happening worldwide that are looking at ecosystem services, payments for ecosystem services, and green or natural infrastructure—but the question of whether these ecological (green) infrastructure projects could be done on a large scale still remains.

Definitions	
Ecosystem Service	A service provided by nature that people desire or that they are willing to pay for
Payments for Ecosystem Services	Paying suppliers (often landowners) for the provision of ecosystem services
Ecological / Green infrastructure	Natural systems, such as wetlands and green spaces, that provide a substitute for

	engineered (grey) infrastructure, such as water treatment plants or dams
Private Goods / Services	Goods that are bought and sold between two parties, and other parties can be excluded from the benefits e.g. water quality improvements that reduce treatment costs for a municipality
Public Goods / Services	Goods that provide benefits to "everyone" and parties can't easily be excluded from benefitting from these goods/services e.g. biodiversity enhancements, greenhouse gas emission reductions

Case Study: Ecosystem Services in the Panama Canal Watershed

The Panama Canal watershed was chosen as a case study because there is a single entity (the Panama Canal Authority (ACP)) willing to pay for needed ecosystem services, who could attract the participation of local landowners and farmers. This study tested the ecological and hydrological effects of green infrastructure in the watershed, as well as the economic feasibility of a green project of this scale.

Historic Lake Levels: Motivation for the Study

The Panama Canal is a complex system of lakes and locks. Lake water levels fall during the dry season, with the lowest water levels from January to March. In the past, the low average water level did not affect the original draft restrictions, but with new draft restrictions these low water levels will become a significant problem during the dry season. The question to be solved is: How can green infrastructure maintain a higher water flow through the canal in the dry season?

Overall Goal:

To determine if a program of payments from the Panama Canal Authority (ACP) to landowners for providing an increasingly forested landscape that transmits private services to the ACP is feasible; to forecast the size of those benefits; and to forecast the costs of the program so that it could be compared to alternative investments.

1. **What are the benefits?**

A one-metre lake level rise during the dry season would bring the ACP an economic benefit of $18 million per month after new draft restrictions are met.

2. **What is the ecological production function?**

Land use changes from, for example, pastoral to a coffee plantation and timber plantation would create an Enhanced Sponge Effect (ESE) generating higher water volume in the dry season. It may increase a water level between 11.5% and 30%.

3. **What is the supply and market institution?**

The supply function was carried out by talking to approximately 20% of landowners within the watershed. The landowners were given contracts that commit them to land use changes, such as

planting coffee trees or changing to silvopastoral farming systems for a subsidized loan or a payment. These changes will generate the needed ecosystem services.

4. Green vs. grey infrastructure

Assuming an increased ESE of 11.7% and a 0.11 to 0.12 cm increase for the enrollable convertible lands, green infrastructure would result in a benefit-cost ratio of 4.0 to 5.0. In contrast, the proposed grey infrastructure project called Rio Indio Dam has the potential to add 300 cm of lake height for $303 million (engineering cost). The ACP would see a benefit-cost ratio of about 7.8 from the dam, but the political and social costs are not included in this calculation.

Conclusions

- Ecological infrastructure projects are usually contracting for specific changes to land use or for maintaining the current land uses (not for services): we need to do the economics (and science) with that in mind.
- The extent of the market is often more important than the precision of the estimate of marginal values.
- Lags from payment for services to benefit may also be more important than equilibrium service levels or marginal values.
- In the Panama Canal Program, any program focused on private benefits is likely to be small.
- Even if the ACP wanted to provide "public" ecosystem services, they can enroll up to about 3,540 ha before benefit-cost ratio goes below 1.
- Targeting is important
- Scalability is important
- Interdisciplinary research is critical; social science research adds key components

Building Case for Natural Assets in the Region of Peel

Tatiana Koveshnikova is a Senior Project Coordinator with Credit Valley Conservation Authority focused on ecological economics with experience in valuing ecosystem services and the modelling of human-environment interactions.

Gayle Soo Chan is the Director of the Watershed Knowledge Department at the Credit Valley Conservation. Gayle is a hydrogeologist with over 30 years of experiences in the areas environmental research, assessment, and monitoring, and experience also in the development of environmental policies and regulation.

Natural assets such as wetlands, forests, and other green spaces provide critical services to municipalities and local communities, comparable to the services provided by grey infrastructure. Natural assets are, however, not explicitly recognized, assessed, managed, or accounted for within the existing municipal frameworks which ultimately can lead to their neglect and degradation. This presentation focused on two recent and/or ongoing initiatives in Ontario's Credit River watershed that assess and assign an economic value to services provided by natural assets to municipalities:

1. A pilot study for the Municipal Natural Assets Initiative (MNAI)
2. A business case for natural assets in the Region of Peel

1. Municipal Natural Asset Initiative (MNAI): Pilot Project in the Region of Peel

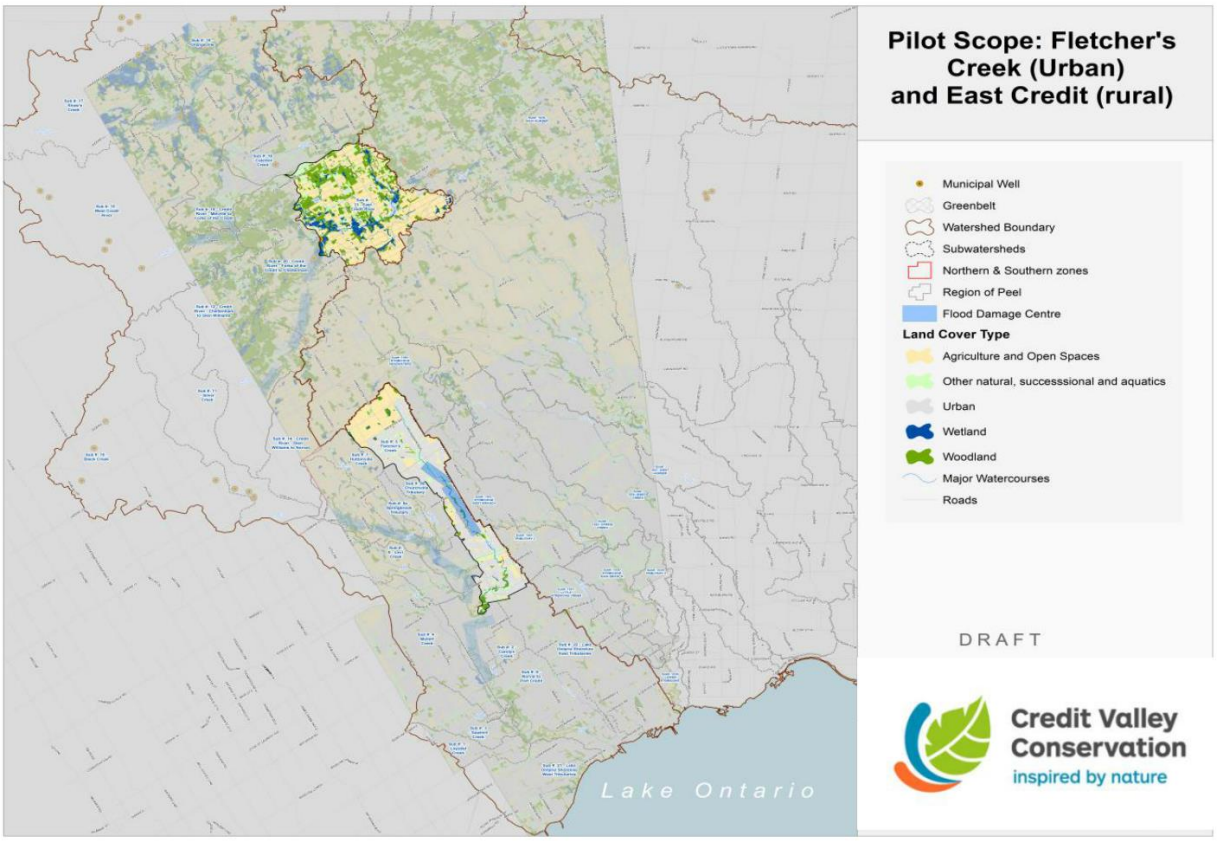
The 2017 MNAI Peel pilot project was aimed at developing an approach to:

- Assess level of Natural Asset services (NAs), in particular flood mitigation and stormwater quality control
- Provide monetary values for these services under existing and future climate conditions
- Provide input into incorporating results in a municipal asset management framework and processes**.**

This pilot project was set up to help municipalities to:

- Understand in financial terms the value of services provided by natural assets
- Understand the implications of losing NAs
- Understand the importance of natural assets in increasing infrastructure resilience to climate change
- Help maintain the desired level of stormwater service provided by natural assets

Size of the Pilot Area:	Scope of Natural Assets:	Scope of the Services:
Subregion 5: Fletcher's Creek: 45 Km2 **Subregion 13:** East Credit: 51Km2	Wetlands Woodlands Open Green Space	Flood Mitigation Storm Water Quality Control



Approach:

- Model existing NAs and determine peak flow reduction and water quality control (total suspended solids and total phosphorous reduction)
- Remove NAs from the model and determine the size of stormwater infrastructure required to match flow/water quality services provided by NAs
- Determine the capital cost of the matching constructed assets to evaluate existing NAs under the existing climate and future climate (2065)

Results:

Stormwater Quantity Performance

Natural Asset Type	Asset and Drainage Area			Design Storm (100-year return period)		
	Feature Area (Ha)	Drainage Area (Ha)	Imperviousness of Drainage Area	Volume in/out (m^3)	Volume Reduction	Peak Flow Reduction
Wetland 1: Palustrine	1.58	1.98	5%	3,192/2,010	37%	69%
Wetland 2: Isolated	1.11	13.9	5%	2,650/0	100%	100%
Wetland 3: Riverine	12.08	2,643	34%	2,005,050/ 1,980,330	1%	20%
Woodland	28.74	46.8	5%	57,776/34,602	40%	84%
Open Green Space	1.80	30.2	3%	15,361/13,950	9%	26%

Stormwater Quality Performance

Natural Asset Type	Stormwater Quality Results			
	TSS Load In/Out	TSS Load Reduction	TP Load In/Out	TP Load Reduction
Wetland 1: Palustrine	77.5/ 1.8	98%	0.31/ 0.01	96%
Wetland 2: Isolated	1,111/ 0	100%	1.68/ 0	100%
Wetland 3: Riverine	634,060/ 413,470	35%	1,673/ 1,088	35%
Woodland	2,659/ 28.6	99%	5.97/ 0.11	98%
Open Green Space	775/ 116.3	85%	2.08/ 0.59	72%

Total value of stormwater services provided by natural assets

Values of natural assets ($)	Sub-catchment 13	Sub-catchment 5
Total value under existing conditions	$514,898,155	$189,088,810
Total value under climate change	$560,338,745	$204,025,380
Difference in value	$45,440,590	$14,936,570

2. Business Case for Natural Assets in the Region of Peel 2018-2019

Credit Valley Conservation is working to apply the approach and the model developed in the pilot to take an inventory and map all NAs in the Region of Peel. There are no final results for this project yet, but it seeks to:

- Assess the level and value of stormwater management (SWM) services provided by NAs under existing conditions and under the climate change scenario
- Produce a map that will identify the most valuable natural assets in the Region of Peel to prioritize restoration projects to protect such assets

Looking Ahead: Business Case for Natural Assets 2019

Future work will include:

- Identifying critical NAs in two neighbourhoods (urban and rural)
- Identifying risks and impacts of the Natural Asset failure (degradation) on SWM services
- Identifying impacts and cost of replacing selected NAs with engineered alternatives
- Identifying restoration, enhancement, and/or maintenance needs for NAs
- Identifying and evaluating additional services and benefits from restoring NAs
- Developing an interactive interface to conduct several natural asset management scenarios (e.g. business as usual, operation and maintenance plan, restoration, replacement with an engineered alternative)

Lessons and Methodology Limitations

- NAs provide valued services.
- The concept of “protection” versus “use” of natural assets should be promoted
- Methodology limited by data availability, project scope, resources, and timelines
- Opportunities for the natural asset valuation to inform existing plans, policies, and strategies (e.g. climate change strategies, urban forest and parks asset management)
- Need to reach out to the municipal staff with diverse backgrounds: planning, public works, asset management, parks and forestry, environmental and sustainability programs
- Need for a business case to demonstrate the value of natural assets to municipalities (beyond the pilot)

Questions & Discussion

Regarding the natural assets concept of “protection” versus "use" being promoted in B.C., how do municipalities prepare for a 10,000-year repetitive fire cycle without applying some form of partial timber harvesting to reduce fire impacts and mitigate snow melts and runoff? Has this discussion been included in your protection of natural assets and options?

Gayle: A complementary approach of “protection” and “use” of natural resources is needed because there are times where harvesting is the right option, but not in isolation because other aspects of the natural assets must be considered, such as habitat. As we further study and understand the benefits of the ecosystem services provided by natural assets we will come up with an appropriate answer to this question.

Vic: It is not as easy as looking at what part of the landscape we are going to protect or what we are going to change. It is important to look at the problem at hand and what action will produce the desired outcomes in a cost-effective way. To solve a problem we must first assess what the baseline approach is (what is business as usual). In the case of the Panama Canal watershed, this would mean maintaining the current land uses. Second, we must evaluate the proposed benefit of a set of changes on those natural resources. In the case of the Panama Canal watershed, we explore the benefits associated with land use change to increase the sponge effect. Lastly, we must contrast the baseline with the set of changes and do the cost-benefit analysis to understand what decision is better suited for the desired outcome.

Regarding the building of green infrastructure in the Panama Canal watershed, how do you deal with local resistance about alternative infrastructure? How do you convince people who are worried about basic public services, like sanitation and clean water, to invest in something new that may not present the results they were expecting?

Vic: The challenge with green infrastructure projects is that there is not full certainty about whether the results are directly related to the green infrastructure itself. The cost-benefit analysis must try to capture who is affected positively and negatively in order to better convince people about the project.

How does natural asset management apply to urban areas?

Vic: Urban areas benefit from ecosystem services provided by natural assets, such as clean water and air. In principle, the same process must apply to evaluate whether investment in natural capital is a good alternative over grey infrastructure. There are many interesting projects taking place all around the world in this field. An example is how Australia has been using wetland areas as water reservoirs to prevent water scarcity. The result is that these natural assets may work better than the flow infrastructure designed to date to deal with this issue.

Gayle: Everything is connected at a watershed level: What happens in the headwaters affects everyone and everything downstream. It is important to capture the value provided by these assets to properly manage them and sustain them.

Tatiana: Taking a watershed perspective, upstream natural assets affect population downstream. With respect to natural assets in highly urbanized areas, there are especially valuable due to their scarcity and increased demand for their services.

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About Creating a Blue Dialogue

Hosted since 2010 by the POLIS Water Sustainability Project at the Centre for Global Studies, University of Victoria, the Creating a Blue Dialogue webinar series brings together expert water practitioners and thinkers, as well as emerging water leaders, to engage with innovative ideas on water policy and governance in Canada. By creating an online community of interest, the series strengthens the national capacity to engage with and solve problems, and raises awareness about emerging Canadian water issues, best practices, and policies. The 2018/019 season is co-hosted by POLIS and the Water Economics, Policy and Governance Network (WEPGN) with a focus on research developed by WEPGN researchers and partners.