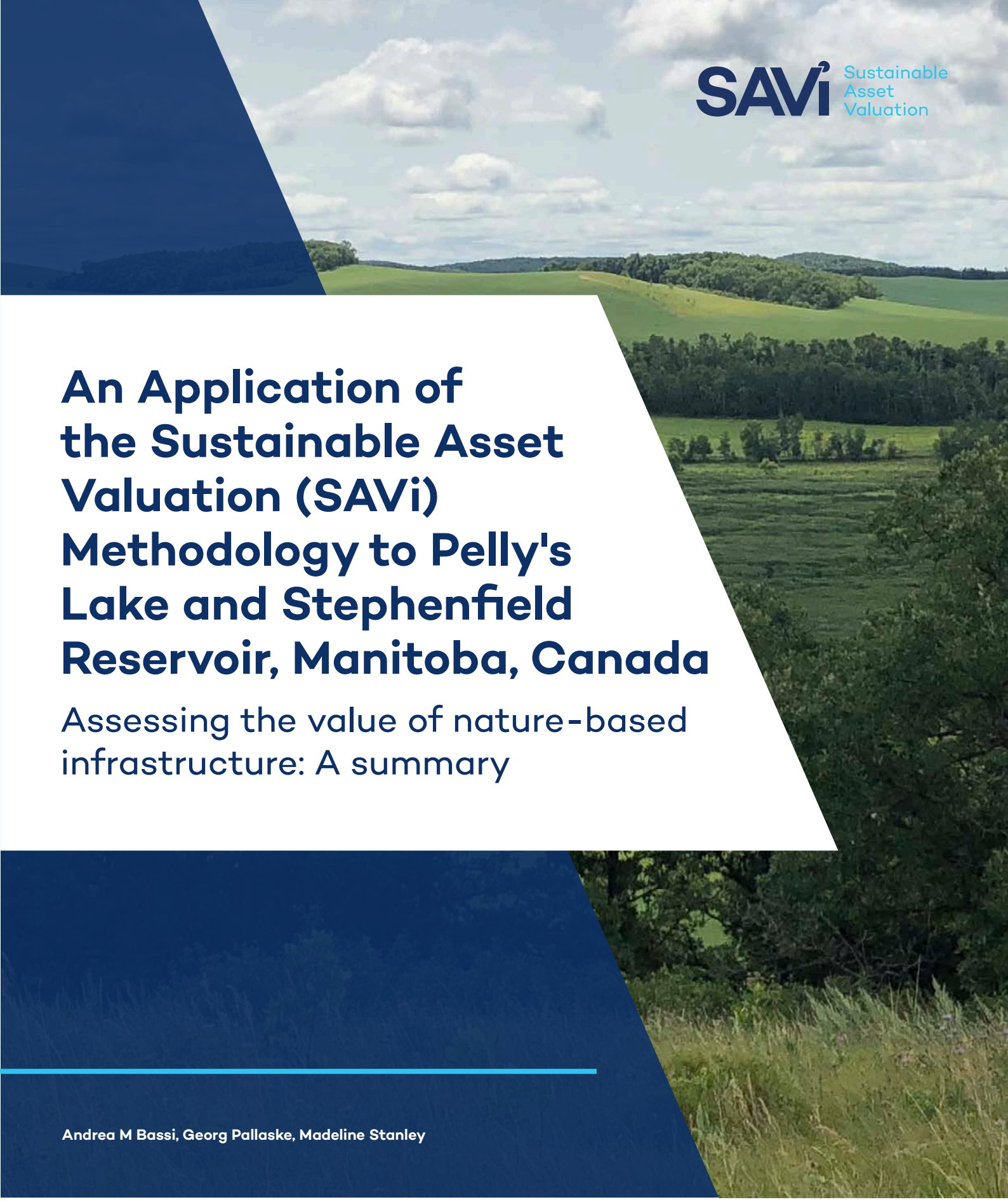

SAVi Sustainable Asset Valuation

An Application of the Sustainable Asset Valuation (SAVi) Methodology to Pelly's Lake and Stephenfield Reservoir, Manitoba, Canada

Assessing the value of nature-based infrastructure: A summary

Andrea M Bassi, Georg Pallaske, Madeline Stanley

IISD
International Institute for Sustainable Development

MAVA
FONDATION POUR LA NATURE

The Scope of This SAVi Assessment

In Manitoba, Canada, and indeed all over the world, policy-makers grapple with the costs of maintaining natural ecosystems, including wetlands, forests, protected areas, etc. As public budgets diminish, decision makers are often viewing such spending as a luxury that can be ill afforded, especially in light of other seemingly more urgent upgrades in mobility, healthcare, education, transport, social housing and the like. However, natural ecosystems provide a range of "services"—that is, ecosystem services—such as storing water, supplying water, protecting against floods, preventing erosion, reducing the impacts of heat and drought, reducing air pollution, reducing noise pollution and improving aesthetics. With the advent of climate change, natural ecosystems are also critical, as they serve as buffers against catastrophic weather and the resulting floods, droughts, landslides and forest fires. However, what is the financial value of these "services"? Also, if policy-makers, investors and citizens were better informed on these services and their values, would it support the conservation and regeneration of natural habitats? Alternatively, to put it another way, would citizens, businesses, industries, investors and governments be ready to spend on maintaining natural ecosystems if there were more predictability and certainty about the services natural ecosystems can provide?

This SAVi assessment responds to these questions. It gives a valuation of the ecosystem services provided by examples of built and natural infrastructure: (i) Stephenfield Reservoir is a civil engineered reservoir that was built for irrigation and domestic water supply; and (2) Pelly's Lake is a natural wetland that is being actively managed for flood control. Their added benefits are related to improved habitat and biodiversity, groundwater recharge, nutrient and sediment sequestration, carbon offsets and various economic uses of the biomass (plant material). From there, the assessment values the cost of the grey infrastructure that would be needed to provide the same level of service.

This assessment was conducted in close collaboration with LaSalle Redboine Conservation District, Manitoba Sustainable Development and Manitoba Infrastructure. We sourced data from public sources as well as from these organizations.

Why Use SAVi?

SAVi calculates the environmental, social and economic risks and externalities that impact the financial performance of infrastructure projects. These variables are typically ignored in traditional financial analyses.

SAVi is a simulation tool that is customized to individual infrastructure projects. It is built on project finance and systems dynamics simulation.

Visit the SAVi webpage: iisd.org/savi

Risk Scenarios

Scenario Assumptions

The SAVi assessment estimates the value of ecosystem and infrastructure services provided by Pelly's Lake and Stephenfield Reservoir, and assesses the required costs of providing these services with built or updated infrastructure. A baseline scenario and a climate change scenario were simulated for both assets. Table 1 provides a description of the baseline and climate change scenarios, and the additional sensitivity scenarios simulated for Stephenfield Reservoir and Pelly's Lake.

Table 1. Overview of assumptions by scenario

Scenario	Description
Baseline	A business-as-usual (BAU) scenario that assumes the continuation of historical trends such as water extraction and population growth. There are no climate change impacts assumed in the baseline.
Climate change (CC)	The climate change scenario assumes an increase in precipitation variability and a shift in precipitation patterns.
Sensitivity scenarios	Stephenfield Reservoir: • O&M irrigation: two assumptions on the cost of operations of irrigation infrastructure, low (CAD 24/ha/year) and high (CAD 150/ha/year). • Conventional (5 per cent/year) and low (2.5 per cent/year) discount rates for the value of asset services. A low discount rate results in a higher medium- to long-term value for the ecosystem services provided by the asset. Pelly's Lake: • Ecosystem services: high case and low case for the provision of ecosystem services (i.e., cattail production) from wetland and lake. The assumptions used are: - Cattail yield, low (15 tonnes/ha/year) and high (18 tonnes/ha/year) (based on Grosshans et al., 2011). - Nitrogen (N) removal from wetland, low (350 kg N/ha/year) and high (32,000 kg N/ha/year) (based on Berry et al., 2017; Olewiler, 2004; Wilson, 2008). - Phosphorus (P) removal from wetland, low (80 kg P/ha/year) and high (770 kg P/ha/year) (based on Berry et al., 2017; Olewiler, 2004). - P removal from cattail, low (20 kg P/ha/year) and high (60 kg P/ha/year) (based on Berry et al., 2017; Grosshans et al., 2014). • Conventional (5 per cent/year) and low (2.5 per cent/year) discount rates for the value of asset services. A low discount rate results in a higher medium- to long-term value for the ecosystem services provided by the asset.

Note: O&M = operation and management

SAVi Results: Stephenfield Reservoir

The SAVi tool analysis indicates that the real value of Stephenfield Reservoir is that it provides extremely cost-effective irrigation and water storage services. The operating and management costs of the reservoir are CAD 256,000, while the irrigation and water storage services it provides enable economic activity that adds up to a cumulative discounted value of CAD 6.07 billion by 2050 (Table 2).

The SAVi analysis also highlights that, if the Province of Manitoba were to build grey infrastructure to provide the same water storage and irrigation services that are currently being provided by Stephenfield Reservoir, the capital cost required would be CAD 5.3 million. The cost of maintaining the reservoir by way of comparison is CAD 256,000. Moreover, should grey infrastructure be built, the cost of maintaining this built asset would be approximately CAD 300,000, which is also higher than the current reservoir maintenance costs.

In light of this analysis, Manitoba would do well to maintain Stephenfield Reservoir and consider the related expenditure as one that optimizes value for money across the asset life cycle.

Table 2. Summary of the SAVi analysis of Stephenfield Reservoir (cumulative from 2019 to 2050)

Category	Unit	Discounted results			Undiscounted results		
		(1) Baseline	(2) Climate change	*(2) vs (1)*	(1) Baseline	(2) Climate change	*(2) vs (1)*
Direct revenues and cost							
Revenues from water licences and tourism	CAD_{2019}	678,413	678,413	*0.00%*	1,356,793	1,356,793	*0.00%*
O&M cost of the reservoir	CAD_{2019}	256,005	256,005	*0.00%*	160,001	160,001	*0.00%*
Value of agriculture-related services							
Value of agriculture-related services which in turn are linked to irrigation and water storage	CAD_{2019}	315,419,939	306,590,138	*(5.52%)*	625,205,933	607,812,652	*(2.78%)*
Capital and O&M costs required to build new grey infrastructure to provide the same services currently delivered by Stephenfield Reservoir							
Irrigation services	CAD_{2019}	5,417,056	5,432,542	*0.28%*	5,718,888	5,734,962	*0.28%*
Water storage	CAD_{2019}	208,820	232,765	*11.47%*	208,820	232,765	*11.47%*

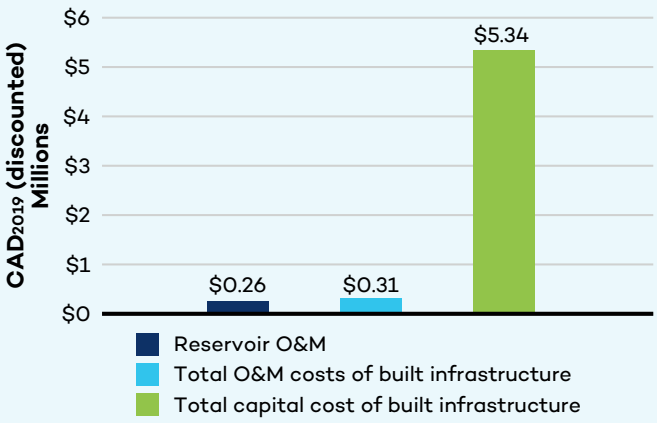

Figure 1. Comparing the cost of Stephenfield Reservoir with new grey infrastructure that would provide the same volume of services, 2019 and 2050 (all costs are cumulative)

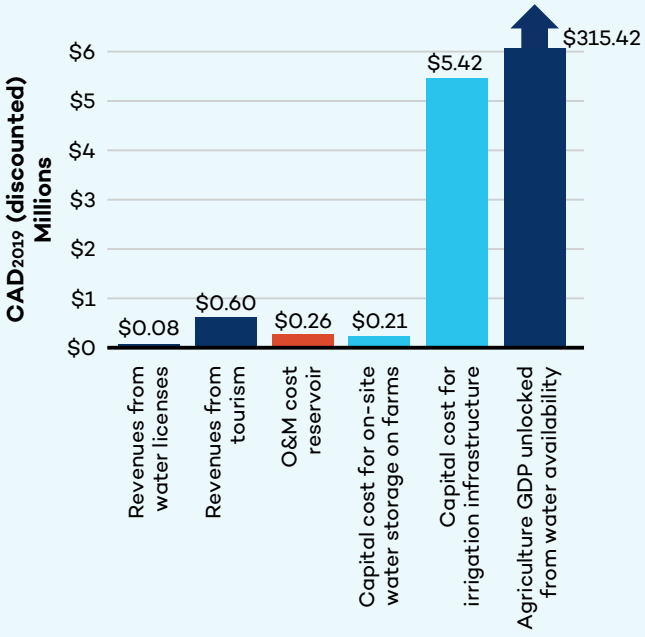

Figure 2. SAVi valuation on the costs, benefits and avoided costs of Stephenfield Reservoir, 2019 to 2050

SAVi Results: Pelly's Lake

The real benefits of Pelly's Lake are in the ecosystems and infrastructure services that it provides: representing cumulative discounted valuation of approximately CAD 60 million between 2019 and 2050. The breakdown is provided in Table 3.

When reviewing the climate change scenarios, we remind readers that the volume of rainfall has little effect on the performance of the wetland in terms of cattail harvesting, nutrient removal, carbon sequestration, etc.

Table 3. Valuation of the ecosystem services provided by Pelly's Lake

Benefits and ecosystem valuation	Unit	Discounted results			Undiscounted results		
		(1) Baseline	(2) Climate change	*(2) vs (1)*	(1.1) Baseline	(2.1) Climate change	*(2.1) vs (1.1)*
Direct revenues and cost							
Cattail value added	CAD_{2019}	97,546	97,546	*0.00%*	879,534	879,534	*0.00%*
O&M cost	CAD_{2019}	176,416	176,416	*0.00%*	342,717	342,717	*0.00%*
Added benefits							
Nutrient removal	CAD_{2019}	47,497,559	47,497,559	*0.00%*	92,271,379	92,271,379	*0.00%*
Carbon sequestration	CAD_{2019}	11,925,298	11,925,298	*0.00%*	23,167,064	23,167,064	*0.00%*
Flood protection	CAD_{2019}	743,279	1,064,505	*43.22%*	1,386,960	2,157,886	*55.58%*
Captial costs of building grey infrastructure providing the same services as Pelly's Lake							
Wastewater	CAD_{2019}	13,884,979	13,807,278	*(0.56%)*	25,519,747	25,323,302	*(0.77%)*
Carbon sequestration	CAD_{2019}	23,104,923	23,104,923	*0.00%*	23,104,923	23,104,923	*0.00%*

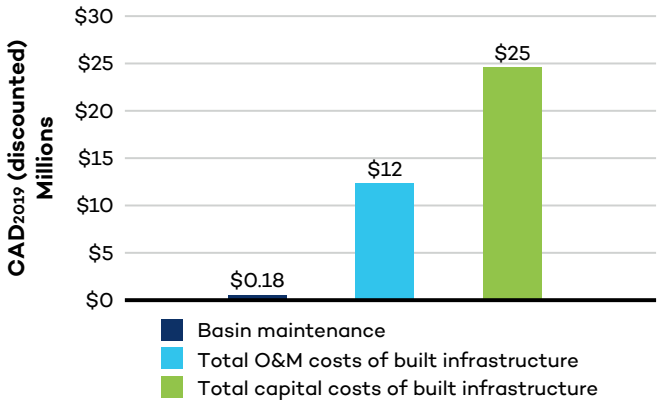

Figure 3. Comparing the capital and operating costs of built or grey infrastructure to provide the services currently provided by Pelly's Lake (cumulative values from 2019 to 2050)

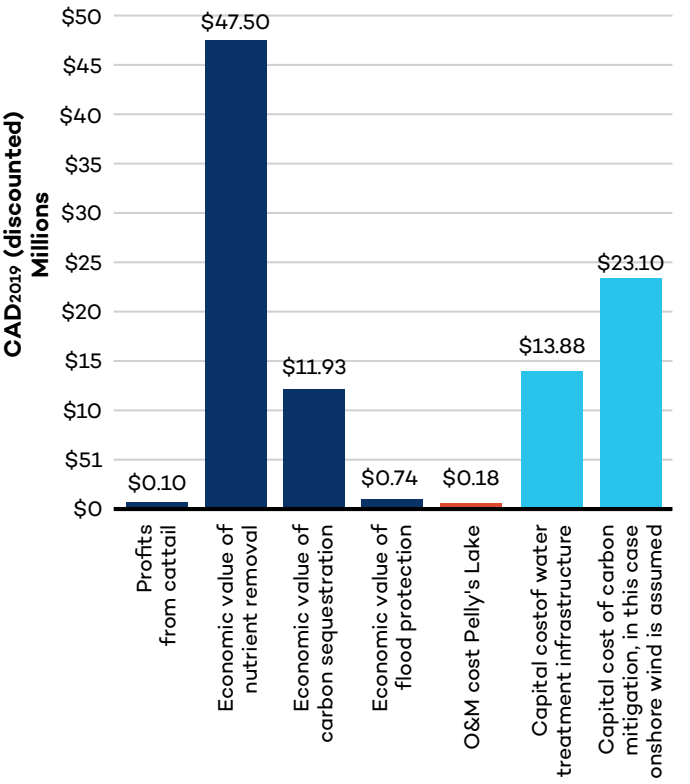

Figure 4. SAVi valuation on the current costs and benefits of Pelly's Lake (cumulative values from 2019 to 2050)

About SAVi

SAVi is an assessment methodology that helps governments and investors steer capital towards sustainable infrastructure. SAVi's features are:

Simulation

SAVi combines the outputs of systems thinking and system dynamics simulation (built using Vensim) with project financing modelling (built with Corality Smart).

Valuation

Cost of Risk: SAVi places a financial value on economic, social and environmental risks. It then shows how these risks affect the financial performance of infrastructure projects and portfolios, across their life cycles. These types of risks are often overlooked in traditional financial valuations.

Cost of Externalities: SAVi identifies and values in financial terms the externalities that arise as a direct consequence of infrastructure projects. This analysis enables policy-makers and investors to appreciate the second-order gains and trade-offs of infrastructure investments, which may otherwise not be apparent under a traditional valuation.

Costs of Emerging Risks: SAVi shows how externalities today can transform into direct project risks tomorrow. Such valuations help stakeholders make decisions in favour of sustainable infrastructure.

Customization

SAVi is customized to individual investment projects and portfolios. SAVi can therefore value the cost of risks along with a range of wider externalities that are directly material to each asset.

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