RESILIENCE VALUATION INITIATIVE

Australian Institute for Disaster Resilience

IISD International Institute for Sustainable Development

RESILIENCE VALUATION INITIATIVE CASE STUDY

Sustainable Asset Valuation (SAVi) for resilient urban planning

Sustainable Asset Valuation (SAVi) of Stormwater Infrastructure Solutions in Johannesburg, South Africa: Assessing climate resilience and socio-ecological benefits

Summary	· Stormwater infrastructure in Johannesburg required updating to manage the risk of flooding. · Planners developed three potential solutions, and applied the Sustainable Asset Valuation process to identify which solution would avoid future losses and achieve the best co-benefits based on economic, social and environmental factors.
Decision Type	· ESG/Sustainability
Level of analysis	· Bottom-up, locally-led approach
Outputs generated	· An integrated cost-benefit analysis taking into consideration project costs, avoided future losses and generated social, economic and environmental co-benefits. · A climate change scenario analysis to test how the three infrastructure options developed will perform in the long term based on different projected climate futures.
Outcomes	· A nature-based solution was identified as the preferred solutions to generate the best social, environmental and economic outcomes for the cost of the investment. · The outputs from this application of the SAVi tool will support making the case for future investment in nature-based infrastructure projects.
Next steps	· The lessons learned from using SAVi to analyse nature-based solutions will help to improve how the tool is applied to future urban projects.

Exposure to hazards

The Paterson Park Precinct experienced heavy flooding, largely as the result of outdated stormwater infrastructure and nearby drainage lines. To address these challenges, Johannesburg's Development Planning Department planned to undertake extensive upgrades to the area's stormwater infrastructure.

Key Stakeholders

The Paterson Park Precinct project is part of Johannesburg's Corridors of Freedom Initiative, which seeks to improve social cohesion within the urban environment while maximising environmental and economic benefits. The project is also part of the Global Environment Facility (GEF) Sustainable Cities Impact Program, which promotes holistic urban planning to maximise environmental and social benefits and avoid negative trade-offs.

Three proposed infrastructure solutions

Johannesburg City Council utilised the SAVi assessment, integrated with climate data developed by the Copernicus Climate Change Service (C3S) to help contribute to the discussion of potential stormwater infrastructure solutions. This aligns with the city's 2021 Climate Action Plan which aims to enhance climate resilience and adapt to climate change impacts in the city, including reducing vulnerability to flooding.

The SAVi assessment helped identify which of three proposed approaches to stormwater management would yield the best outcomes:

- Grey stormwater infrastructure: civil-engineered, concrete culvert
- Nature-based stormwater infrastructure: stream renaturalisation
- Hybrid stormwater infrastructure: a combination of a concrete culvert section and a renaturalised stream section.

SAVi Assessment Process

To estimate the costs and benefits for each of the SAVi is a customisable tool that uses a combination of system dynamics and project finance modelling to capture the full costs of environmental, social, economic and governance risks. It also calculates the dollar value of externalities that result from infrastructure development.

The SAVi assessment for the stormwater infrastructure proposals involved:

- Calculation of capital and operational expenditures.
- Valuation of co-benefits, avoided costs, and societal costs. This includes job creation, discretionary spending, (reduced) flood damage costs, and air quality improvements (reduced health costs).
- Simulation of climate change scenarios (varying projections of climate variables) and the impact on the performance of the three alternatives, such as impact on operational expenditures and magnitude of co-benefits, avoided costs, and societal costs.
- A financial analysis of the performance of three alternatives under the different climate change scenarios.

The causal loop diagram in Figure 1 shows the systemic analysis performed in this SAVi assessment.

Read the detailed SAVi assessment report **here**.

Results

The SAVi assessment found that over the life cycle of the infrastructure, the hybrid solution and the full renaturalisation of the stream were found to be the most cost-effective investments. Grey stormwater infrastructure required the highest upfront investment, while annual operations and maintenance costs were higher for the renaturalised stream.

The hybrid solution that incorporated the renaturalised stream provided benefits to the community that could not be delivered by grey stormwater infrastructure alone. Some of these benefits include improve flood management resulting in avoided costs of flood damages, additional employment from landscaping, and environmental benefits such as carbon sequestration and increased water supply. Crucially, when considering future climate scenarios with more volatile precipitation patterns, the grey stormwater solution with its limited capacity is less able to deal with extreme weather events. The hybrid approach that incorporates nature-based solutions will help to mitigate flood risk in the future as the climate changes and weather events become more extreme. This demonstrates the importance of using future climate scenarios to consider the full costs and benefits of different infrastructure options.

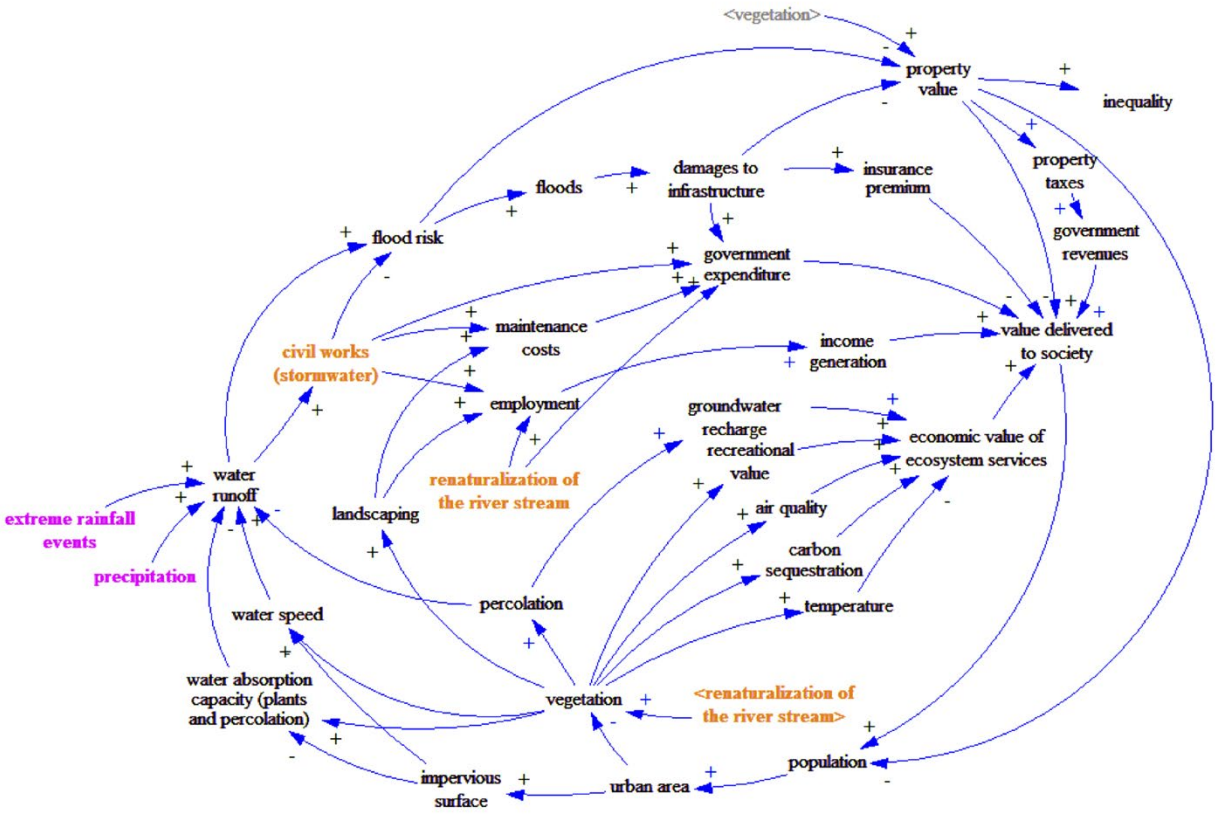

Figure 1: The systemic analysis performed in this SAVi assessment

How results can be utilised in the future

The SAVi tool provides information on the full costs of environmental, social, economic and governance risks from a project. The results of the analysis can be used to:

- Demonstrate whether interventions reduce costs for the region and increase climate resilience.
- Showcase the value of nature-based solutions for reducing costs for the city and enhancing overall environmental regeneration and resilience.
- Inform and design future urban projects.
- Raise awareness about how climate data can be integrated into urban planning and the design of stormwater infrastructure.
- Provide quantitative evidence whether infrastructure interventions aligned with objectives to promote environmental sustainability and climate change adaptation.
- Define funding priorities for resilient investments.

More information

For more information about the Resilience Valuation Initiative: **www.resiliencevaluation.com.au**
RVI@climate-kic.org.au