

# Economic Evaluation of Adaptive Pathways for flood resilience strategies

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## INTRODUCTION

The escalating threats posed by rising sea levels and intensifying storm surges due to climate change necessitate the development of effective flood resilience strategies. The Dynamic Adaptive Policy Pathways (DAPP) approach integrated with the Global Flood Risk Tool (GFRT) offers a flexible framework to create and implement adaptive strategies (Haasnoot, 2013; Trommelen, 2022). This research explores the integration of economic evaluation and probabilistic assessments in the DAPP approach to select flood resilience investment strategies under uncertainty.

## FLOOD RISK ASSESSMENT

The GFRT follows a five-step framework encompassing flood hazard calculation, economic damage assessment, flood risk visualization, conceptual flood measure design, and cost-benefit analysis. It combines flood event probabilities, infrastructure exposure, vulnerability, and socio-economic impacts to address flood risks. Data layers on land use, assets, critical infrastructure, and population are integrated with inundation maps to identify vulnerable assets and communities under varying return periods and climate scenarios. To address uncertainty from sea level rise and socio-economic developments, an innovative economic evaluation framework was developed, employing Monte Carlo analysis and multiple economic metrics (Montijn, 2023).

## ECONOMIC EVALUATION

The combination of the GFRT, DAPP framework, and Monte Carlo Analysis provides comprehensive insights into risk, uncertainty, costs, and benefits of adaptation strategies. It facilitates the selection of robust and flexible strategies to safeguard Singapore's coasts against rising sea levels. The GFRT supports policy decisions regarding optimal flood safety protection levels, enabling the analysis and implementation of adaptation strategies. The Monte Carlo Analysis allows the simulation of a range of possible futures for adaptation strategies, supporting comparison and selection of the most effective strategy.

The GFRT is crucial for flood risk assessment and adaptation strategy formulation, as it assesses disaster risk reduction options effectively. Applied in Singapore's "City-Coast Climate Change Adaptation Study" for the Public Utilities Board (PUB), the GFRT evaluates the costs and benefits of adaptive pathways, aiding strategic investment decisions. Beyond technical outcomes, the GFRT features a user-friendly, visually appealing interface that enhances decision-making and stakeholder involvement.

## CONCLUSIONS

This research advances the application of the DAPP approach in creating and selecting flood resilience strategies under uncertainty. The streamlined framework harmonizes pathway creation, economic evaluation, and probabilistic assessment, with potential refinements to incorporate transfer costs and enhance flexibility. This evolving framework has the potential to become a comprehensive tool, offering probabilistic assessments for various adaptation pathways.

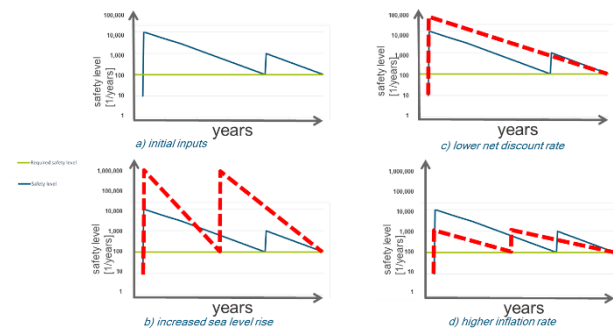


Figure 1 - Required sea flood protection level, tipping points and moment in time of implementation for different scenarios, i.e.: lower discount rate, increased sea level rise and higher inflation rate

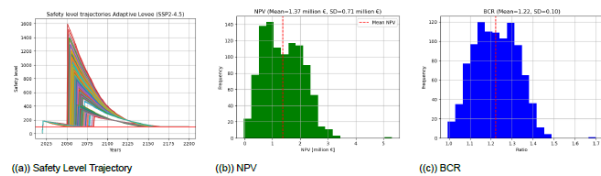


Figure 2 - Example of the results on one strategy (adaptation pathway)

## REFERENCES

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