

Municipal capital investment planning for resilience to climate change

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Capital investment plans, generated by cities during each budget cycle, determine how funds are appropriated for capital assets. Municipal managers use capital investment plans (CIPs, a.k.a. capital improvement programs) to extend the service life of assets, implement urban and economic development plans, and maintain creditworthiness. The purpose of the paper is to convey the utility and ease with which cities can adopt a method for climate-resilient decision-making that speaks to budgetary and financial officers as well as directors of planning and engineering departments. Regardless of their financial capacity, cities can use their capital investment plans to avert crises, prevent disruptions from escalating into disasters, and continue to provide public infrastructure services despite disruptions.

Though possible, most cities do not employ CIPs to ensure the resilience of their investments, or reduce greenhouse gas emissions (Whittington and Lynch, 2015). There is more than one way to build a building, generate electricity, and pave a roadway. Each fiscal year, cities miss opportunities to reduce the cost and extend the life of facilities by making those facilities climate-smart. Infrastructure investments are climate-smart when they serve the social, economic, and environmental purposes for which they were intended, while also reducing greenhouse gas emissions and increasing resiliency to any number of disturbances a city may face. Many cities of the world already possess the necessary data, and a methodology CIP has been developed through the World Bank. This methodology was recently applied by the municipal authorities in Kampala, Uganda, generating the capital city's first capital

investment plan, complete with the selection of low carbon, resilient alternatives for investment.

This paper focuses on resilient capital investment planning using the methodological framework developed for the World Bank, as applied by the Kampala Capital City Authority. The framework combines estimates of costs and losses to capital assets, with scenario planning and robust decision-making, to provide a financial indicator of the savings that accrue to the selection of a resilient alternative site, site design, or facility design for any and all proposed capital investments (Whittington and Young, 2013). The method makes use of citywide data, oftentimes in GIS, along with analyses of the business-as-usual effects of climate change, to identify and map locations at risk of climate-related events, such as flood, drought, urban heat island, sea level rise, landslide, wildfire, and storm surge. Proposed capital investments are analyzed for the purpose of identifying sites or site designs that reduce the losses forecasted from climate-related hazards. Future losses, such as damage to the capital asset and neighboring development, can be estimated and used as the basis for selecting alternative sites or site designs, and for setting aside capital reserves to use when extreme events occur.

Decision-makers in local government need to know that there are choices available for capital investment that are resilient, and that these choices are fiscally beneficial. The cost of adaptation to a world that is 2 degrees Celsius warmer is estimated to be between \$75 and \$100 billion per year, and this range will shift upward as the world depletes the global carbon budget (World Bank, 2011). Collectively, the decisions that cities make regarding project resiliency will have a significant financial impact. For city governments, the prerequisites to resilience include understanding the hazards faced by the community, managing growth and development while systematically addressing disaster risks, and adapting to the local impacts of climate change (Shah and Ranghieri, 2012, 17). Climate-smart CIP allow decision-makers the chance to see the financial and climate-specific effects of their choices, and to prioritize with this knowledge.

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