



ADAPTATION FUND

Enhancing climate resilience and strengthening adaptive capacity in urban ecosystems: Experiences and lessons learned from the Adaptation Fund portfolio

JUNE 2025



Sea-level rise mapping in Solomon Islands. (Photo by UNDP)

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List of Acronyms

- CSO**Civil society organization
- MTS**.....Medium-term strategy
- NbS**Nature-based Solutions
- NGO**.....Non-governmental organization
- NIE**.....National Implementing Entity

Disclaimer

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Executive Summary

Just over half – 55 per cent – of the world’s population lives in cities, a figure expected to reach 70 per cent by 2050 (UN-Habitat, 2022). The influx of people to urban areas has major environmental implications. Cities already have high concentrations of people and infrastructure that are vulnerable to climate risks from sea-level rise, flooding, extreme heat, wildfire and water stress, ecosystem degradation, and biodiversity loss (IPCC, 2022). Moreover, 70 per cent of cities worldwide have experienced climate impacts. In 2024, flooding affected cities across East Africa, while Southeast Asia has suffered from extreme heat waves. By 2050, more than 800 million urban residents will be affected by sea-level rise and coastal flooding (C40 and McKinsey Sustainability, 2021). In addition, 1.6 billion people could be vulnerable to extreme heat, and 650 million people could face water scarcity.

Given this context, the Adaptation Fund (the Fund) has focused on building urban resilience in developing countries. Established in 2001 under the United Nations Framework Convention on Climate Change (UNFCCC), the Fund assists developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse impacts of climate change. As of April 2024, the Fund’s portfolio comprised 176 projects

reaching over USD 1.2 billion in funding (Adaptation Fund, 2024b).

This study offers an overview of the Fund’s experience and lessons learned related to strengthening long-term resilience to climate change in urban areas. As such, it seeks to advance understanding of adaptation challenges in urban areas among the wider adaptation action community. In this way, the study contributes to one of the three strategic pillars of the Fund’s Medium-Term Strategy (MTS) (2023–2027), Learning and Sharing, which aims to develop knowledge and evidence on effective and innovative adaptation action and finance.

Approaches

The Fund’s urban portfolio applies a range of approaches to build long-term resilience. Based on an analysis of the case studies in this report, the primary approaches are the following:

- Disaster risk reduction
- Nature-based Solutions
- Small-scale infrastructure and water management
- Institutional strengthening and access to finance
- Capacity-building, awareness-raising, and information-sharing



Adaptation Fund Project Monitoring Mission to Malaysia, March 17-21, 2025.
(Photo by Adaptation Fund)

This study finds that urban adaptation approaches and interventions are most effective when the process incorporates the following features: **(1) An integrated approach:** when interventions are designed to respond to meet multiple goals and are tailored to the local economic and socio-political context, and the built and natural environments; **(2) An inclusive approach:** when interventions adopt a participatory and collaborative approach, and engage local communities, including vulnerable people, women, the elderly,

and people with disabilities; **(3) A multi-institutional level approach:** when interventions work in partnership with city and district governments with support of, or in coordination with, higher-level governments. This can help create appropriate institutional incentives and actions, and support sustainability beyond the project's term; (4) An adaptive approach: as urban contexts change dramatically due to ongoing climate impacts, political changes, and other urban environmental stressors, projects need to be flexible.



Antigua's northwest coastal McKinnon's watershed become more resilient to flooding, hurricanes, and higher temperatures by increasing the ability of the watershed to handle extreme rainfall through enhanced drainage and wetlands restoration.
(Photo by Adaptation Fund)

II. Introduction

A. Background

Most people now live in cities, a trend expected to increase; by 2050, 70 per cent of the global population is expected to live in cities (UN-Habitat, 2022). Cities have high concentrations of people and infrastructure that are vulnerable to climate risks from sea-level rise, flooding, extreme heat, wildfire and water stress, ecosystem degradation, and biodiversity loss (IPCC, 2022). More than 70 per cent of cities worldwide have already experienced climate impacts. In 2024, flooding affected cities across East Africa, while Southeast Asia had extreme heat waves. By 2050, more than 800 million urban residents will be affected by sea-level rise and coastal flooding (C40 and McKinsey Sustainability, 2021). In addition, 1.6 billion people could be vulnerable to extreme heat, and 650 million people could face water scarcity. Given this context, the Fund has focused on building urban resilience.

Urban climate risks are due to climate impacts, urban development contexts, and local environmental stressors (Rosenzweig et al., 2018). Most cities have been built along coasts or bodies of water, making them physically vulnerable to rising seas and flooding (IPCC, 2022). Urban areas also have unique climate risks, such as the urban heat island effect. Cities are normally 5–9 degrees Celsius hotter because the built environment absorbs and radiates more heat than natural landscapes (C40 and McKinsey Sustainability, 2021). Urban areas

also often lack vegetation that provides a cooling effect on infrastructure, including streets and buildings. They also frequently lack sufficiently large green areas to absorb stormwater and reduce flood risks.

In many developing countries, cities are expanding rapidly, making adequate planning, urban services, and financing a growing challenge, alongside the ongoing fight against poverty and inequality. Furthermore, the increased frequency, intensity, and unpredictability of extreme weather events from a changing climate affect basic urban services such as water management, waste management, sewage systems, housing, and food security (Chu et al., 2019). The impact of climate change is straining these systems, often in the context of limited financial, human, and technical resources, and weak governance structures (Rosenzweig et al., 2018). At the same time, there can be vast inequality among segments of urban populations. The very poor, such as those living in slums and informal settlements, are disproportionately affected by climate change due to their overall high levels of physical, economic, social, and environmental vulnerabilities (IPCC, 2022).

Even as cities are affected by climate change, they are also adding to the problem. As major engines of economic development, cities are major contributors to climate change, accounting for 70 per cent of CO2 emissions. This makes address-

ing urban climate change, both adaptation and mitigation, a high priority.

The Sendai Framework for Disaster Risk Reduction 2015–2030, the 2030 Agenda for Sustainable Development, and the Paris Agreement all mention cities as critical areas of focus. Following these agreements, in 2016, the New Urban Agenda was adopted at the United Nations Conference on Housing and Sustainable Urban Development in Quito, Ecuador, providing a shared vision for sustainable cities. It includes working to “adopt and implement disaster risk reduction and management, reduce vulnerability, build resilience and responsiveness to natural and human-made hazards and foster mitigation of and adaptation to climate change” (UN, 2017).

New non-governmental coalitions have also emerged to support adaptation and mitigation in cities and build global collaborations. These include the Global Covenant of Mayors for Climate and Energy, the C40 Cities, Local Governments for Sustainability (ICLEI), 100 Resilient Cities, and the Global Resilient Cities Network. COP28 held the first Local Climate Adaptation Summit, providing cities with a voice at the UNFCCC (UNFCCC, 2023a). Additionally, a Coalition for High Ambition Multilevel Partnerships was started to ensure governments work closely with cities on climate plans. It aims to help countries work with their local governments to make Nationally Determined Contributions more ambitious ahead of COP30 in 2025 (UNFCCC, 2023b). This trend will continue as urban adaptation rises on the global agenda.

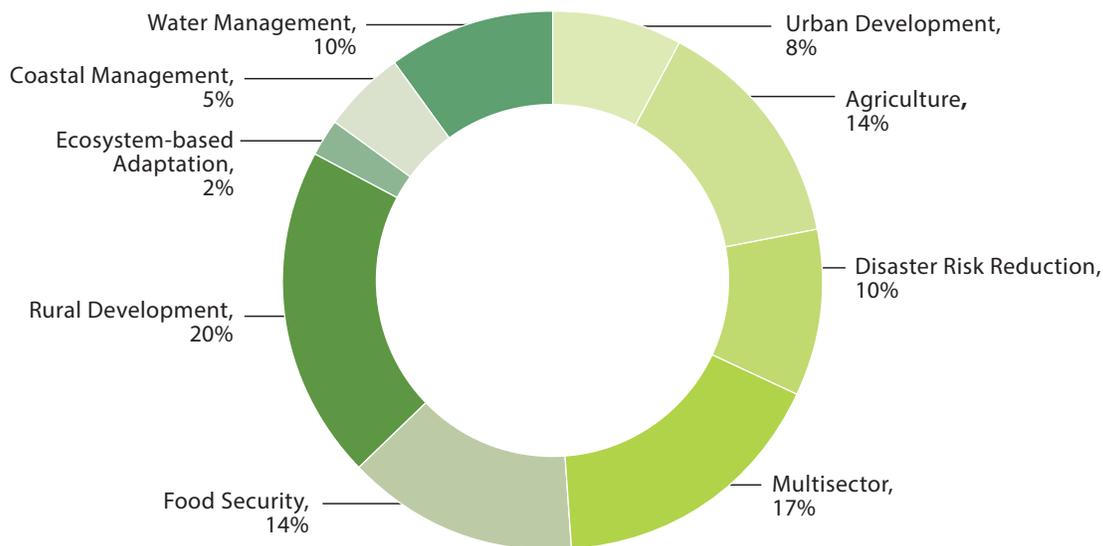
B. Background on the Adaptation Fund

Established in 2001 under the UNFCCC, the Fund is mandated to assist developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse impacts of climate change. Specifically, it helps them meet the costs of adaptation by financing concrete adaptation projects and programmes that are country driven and based on the needs, views, and priorities of eligible Parties. The Fund also pioneered Direct Access, empowering countries to access funding and develop projects directly through accredited National Implementing Entities (NIEs).

As of April 2024, the Fund’s portfolio comprises 176 projects, reaching over USD 1.2 billion (Adaptation Fund, 2024b). Almost a third of these projects are implemented by 32 accredited NIEs through the Direct Access modality (Adaptation Fund, 2024a). Projects are occurring around the globe, including in Africa, Asia-Pacific, Eastern Europe, and Latin America and the Caribbean, as well as through two global projects that cross regions. In all, the projects are expected to benefit 46 million people (Adaptation Fund, 2024c); create, protect, or rehabilitate more than 728,250 hectares (ha) of natural habitats; introduce or adjust 116 policies to address climate risks; and install 577 early warning systems (Adaptation Fund, 2024a).

While this report focuses on urban projects, projects are addressing adaptation across a range of sectors (Graph 1). Projects in the portfolio cover food security, disaster risk

Graph 1. Adaptation investments by sector (USD millions)



Source: Adaptation Fund 2024

reduction and early warning systems, water management, rural development, coastal management, urban development, and ecosystem-based adaptation.

C. Adaptation Fund's urban resilience portfolio

Building long-term resilience through urban interventions is increasingly a component of the Fund's work. Indeed, it has a large portfolio of adaptation projects and long experience as a pioneer and innovator in adaptation finance. As of April 2024, urban development projects account for 4.2 per cent of the Fund's portfolio. These projects align with the Fund's MTS (2018–2022 and 2023–2037) and three strategic pillars: Action; Innovation; and Learning and Sharing (Adaptation Fund 2018, 2022). For their part, the urban projects are focused on three strategic outcomes: (1) strength-

ened awareness and ownership of adaptation and climate risk reduction processes at local level; (2) increased adaptive capacity within relevant development sector services and infrastructure assets; and (3) improved policies and regulation that promote and enforce resilience measures (Adaptation Fund, 2024a).

Urban projects have been a part of the portfolio since 2011, only one year after the Fund approved its first project. However, most urban portfolio projects began between 2017 and 2022. Since 2011, the Fund has supported 11 projects in this portfolio, two regional projects, and nine country projects. Of the urban projects, three are in Latin America and the Caribbean, six are in Asia-Pacific, one is in Africa, and one is in Eastern Europe (Adaptation Fund, 2024a). The total project costs reach USD 74,983,930. The projects range from over USD 800,000

to USD 13.9 million, with the average project reaching USD 6.8 million. Three used the Direct Access modality, while most are implemented by UN-Habitat with local government partners. This analysis is based on

projects that are coded as “urban” within the Fund’s project typology. There are, however, additional projects in the portfolio that incorporate urban or peri-urban development components not included here.

Table 1. Snapshot of the urban resilience portfolio

(as of April 2024)

Total number of projects	Projects completed	Projects under implementation	Total number of countries	Regional projects
11	1	8	15	2
Project countries	Antigua and Barbuda, Armenia, Chile, Ecuador, Fiji, Honduras, Indonesia, Lao, Madagascar, Malawi, Malaysia, Mozambique, Pakistan, Solomon Islands, Union of Comoros			

Source: Adaptation Fund, 2024a.



A fruit dryer beneficiary of the Environmental Project Implementation Unit of Armenia.
(Photo by Adaptation Fund)

III. Objective

This study offers an overview of the Fund’s experience and lessons learned on urban interventions in strengthening long-term resilience to climate change. In this way, it seeks to advance understanding among the wider adaptation community, as well as generate and share knowledge on project approaches. The study also contributes to one of three strategic pillars of the MTS (2023–2027), Learning and Sharing, which aims to develop knowledge and evidence

on effective and innovative adaptation action and finance.

Findings will be of interest to the Fund’s stakeholders, current and prospective Implementing Entities, Executing Entities, government officials, private sector, civil society groups, youth organizations, other adaptation practitioners, and the public interested in approaches to urban adaptation.



Sea-level rise mapping in Solomon Islands.
(Photo by UNDP)

IV. Methodology

The study used document analysis and semi-structured interviews. Analysis covered a review of the academic and grey literature on urban adaptation; a review of Fund policies and guidelines related to the study, including the Strategic Results Framework; Environmental and Social Policy; MTS 2023–2027; the 2020, 2021, 2022, and 2023 Annual Performance Reports; and a review of the Fund's urban portfolio. The portfolio review was used to understand the general characteristics of the projects and informed the case study selection.

The case studies were chosen based on two criteria: (1) a diversity of approaches; and (2) geographic diversity. For each case study, the authors reviewed all available documents, including Project Performance Reports, Mid-Term Reviews, Terminal Evaluations, and project completion summaries, where available, along with project websites, newsletters, and social media. Finally, semi-structured interviews were conducted with project leaders and advisers for the case study projects to understand approaches, their effectiveness, and lessons learned.



Antigua's northwest coastal McKinnon's watershed become more resilient to flooding, hurricanes, and higher temperatures by increasing the ability of the watershed to handle extreme rainfall through enhanced drainage and wetlands restoration.
(Photo by Adaptation Fund)

V. Approaches to strengthen resilience through urban adaptation interventions

The Fund's urban portfolio applies a range of approaches to build long-term resilience. Based on an analysis of the case studies presented in the next section, these are the primary approaches:

- Disaster risk reduction
- Nature-based Solutions
- Small-scale infrastructure and water management
- Institutional strengthening and access to finance
- Capacity-building, awareness-raising, and information-sharing

The section below describes these approaches and some activities implemented within them.

Disaster risk reduction

Disaster risk reduction is a preventive approach to build resilience to hazards and reduce vulnerability. Urban areas are facing risks often due to the way that water flows through the built environment. Actions to address this include infrastructure such as drainage culverts and retention ponds. It also includes emergency preparedness,

risk planning, and addressing needs such as emergency shelters and home retrofits.

Nature-based Solutions

Nature-based Solutions (NbS) protect, conserve, restore, sustainably use, and manage natural or modified ecosystems. Urban NbS can help mitigate risks, build resilience, and provide co-benefits beyond adaptation. This approach has received increased attention globally for its ability to support ecosystem health while achieving economic and social goals. Projects are using NbS such as urban forestry, green infrastructure for stormwater drainage, and creation of green spaces. In many cities, NbS can complement hard infrastructure and provide flexibility within systems as rainfall levels are reaching new extremes.

Small-scale infrastructure and water management

Climate change is affecting access to clean, safe drinking water in many cities, particularly in vulnerable informal settlements. Projects are working to support access to water during scarcity and insufficient infrastructure. Small-scale infrastructure is also important as cities need to build improved drainage systems to address increasing frequency of extreme events.

Institutional strengthening and access to finance

City governments need new policies and plans to address climate impacts alongside urban challenges occurring in rapidly growing cities. They also need support to implement existing policies as their mandates are broadening to address more frequent and intense climate impacts. Projects are working to analyse urban climate vulnerability and integrate climate change into city land-use plans. Others are focused on building improved management structures within informal and formal settlements to address climate risks. Additionally, access to low-interest loans is key to fund infrastructure improvements for homes and businesses

so they can better withstand storms and to reduce urban flooding.

Capacity-building, awareness-raising, and information-sharing

Capacity-building for city government and the wider public is a key component to build sustainability of urban interventions. Projects are working directly with city governments to provide training and collaborating with a wide range of stakeholders to raise awareness of climate impacts. Projects are also sharing their efforts more widely with the public, other development project teams, and external partners to build broader understanding of adaptation and climate risks.



A raspberry orchard beneficiary of the Environmental Project Implementation Unit of Armenia.
(Photo by Adaptation Fund)

VI. Experiences from the Adaptation Fund portfolio



Beneficiaries of the hurricane-proof storm shelter being built at St. Francis of Assisi Church, Antigua and Barbuda.
(Photo by Adaptation Fund)

Antigua and Barbuda: An integrated approach to physical adaptation and community resilience in the northwest McKinnon's watershed

Project amount: US\$ 9,970,000

Implementing Entity: Department of Environment, Ministry of Health and Environment

Implementation period: August 2017 – under implementation

Background

Antigua and Barbuda, a Caribbean small island developing state, is among the most vulnerable countries to climate impacts. Threats include drought and flooding, vector-borne diseases, hurricanes and tropical storms, and sea-level

rise. Historically, Antigua and Barbuda has only been hit by tropical storms. Consequently, residents and their homes are not prepared to withstand the increasing intensity of storms occurring with climate change.

The project is working in McKinnon's watershed, a densely populated area on the northwest coast, close to the capital. The area is primarily low income and residential. It has been identified as a "settlement expansion zone" in the national land use and zoning plan, leading to more residents moving to the area. The project has targeted this area due to increasing floods, population growth, and the influx of low-income residents who are more vulnerable to the impacts of climate change. To address these risks, the project is applying an integrated process to reduce urban vulnerability to extreme rainfall, while increasing the resilience of the built environment to cope with multiple climate stressors.

Achievements

- 1,831 metres of climate-resilient drainage were installed to reduce flooding.
- Revolving community loans worth more than USD 1.1 million helped 78 beneficiaries to retrofit their homes, enabling them to stay at home during storms.
- Five churches were retrofitted as emergency shelters to provide safe spaces for the community during hurricanes.

Approaches

Disaster risk reduction

In the past, schools were used as emergency shelters in this area. Through

consultations during the project cycle, the project team from the Fund's national implementing partner, the Department of Environment, learned that people wanted to either stay in their homes or to be in a smaller space with fewer people during hurricanes. This information guided the project's work towards two approaches: (1) improving churches as shelters; and (2) providing financing for people to improve their homes. Five churches were renovated to meet local standards as emergency shelters. The roofs were repaired, and the kitchens were upgraded. In this way, the buildings could withstand a strong storm, allowing people to live there for multiple days. Solar panels were also added to the roofs. However, due to the high costs of importing equipment, the total cost of panels is yet to be paid off and the project team is considering other ways to finance solar on the island.

Access to finance

The country's current infrastructure is only designed to withstand the impacts of category 3 hurricanes. The project is providing low-interest revolving loans to community members to upgrade their homes to handle higher wind speeds and storms that have become more frequent. During the project period alone, the island was hit by two category 5 storms. The project launched a communication strategy, including in-person discussions in the community, and television and radio programmes, to encourage households to apply for the loans.

Due to COVID-19, community members faced economic hardship and job losses. There were also increasing material costs due to supply chain constraints. This increased the costs of home renovations as applicants had less available income, and therefore, required them to take out larger loans to make the same home improvements. To address this challenge, the project extended loan repayment periods, resulting in lower monthly premiums. It also encouraged applicants, where possible, to have a secondary applicant on their loan application. This approach increased the number of applicants under the programme by over 50 per cent. With this lesson learned, the project team is working to purchase materials in bulk to save costs in the future. The response also demonstrates how the project adapted successfully to unexpected changes.

Small-scale infrastructure

The project worked to reduce urban flood risks primarily through infrastructure development. Prior to the project, there were no barriers to stop the river from flowing into the city, leading to frequent floods. The water would also often get polluted from the abandoned mine land, degraded hillsides, and the garbage that had filled the river channels. To address these challenges, the project reinforced 300 square metres of the riverbanks; reinforced 1,000 square metres of degraded hillside gabions using geotextiles and geonets; and constructed a 135 square metre concrete, low pressure dam. These actions combined with tree planting reduced the impacts of flooding. The project worked to reduce waste entering the river by improving the city sanitation system. This included expanding waste collection vehicles, installing trash bins, and developing a more regular collection system, demonstrating an integrated approach to understanding the dynamics affecting flood risks.



Improving resilience by strengthening of slopes with geonets
(Photo by EPIU)

Republic of Armenia: Artik city closed stone pit waste and flood management pilot project

Project amount: US\$ 1,435,100

Implementing Entity: Environmental Project Implementation Unit

Implementation period: July 2019 – under implementation

Background

Artik, a city in Armenia with a population of 20,260 (2017), is located at 1,800 metres above sea level in the mountainous area in the western part of the country. It is surrounded by smaller rural communities. During the Soviet era, the area was the primary stone mining region and is now covered with abandoned mines. These mines have led to pollution and land degradation, which have been exacerbated by climate change. The area is suffering from more severe floods from the cascading

impacts of warming winters and rapid snowmelt. The two streams that flow through the city overflow during flood events, leading to flooded buildings and streets each year. The floods also carry debris from the abandoned mines, filling storm drainage channels and reducing their capacity to hold the increasing water flows. While these impacts begin outside the city, ultimately, they heighten risks to the health, livelihoods, and properties of urban residents. The project applies

an integrated approach to address the sources of urban climate risk and support populations within and outside the urban core. Uniquely, the project addresses the linkages between abandoned mines, flood risks, agriculture, and urban quality of life through three objectives: (1) land restoration; (2) reduction of flood hazards and (3) awareness-raising.

Achievements

- Forty 40 ha, including 10 ha of recreational area, were restored to reduce flood risk and improve the urban environment.
- The project reinforced 300 square metres of the riverbanks, reinforced 1,000 square metres of degraded hillsides gabions using geotextiles and geonets, and constructed a 135 square metre concrete, low pressure dam to reduce urban flooding.
- Direct capacity-building efforts reached 1,500 individuals in the Artik community to enhance awareness and knowledge on adaptation, sustainability, and rehabilitation methods.

Approaches

Nature-based Solutions

The project used ecosystem restoration and reforestation as a primary approach to reclaim the abandoned mine sites, recover agricultural lands, and support farmers that supply food to urban

residents. Drawing on local experts and an analysis of climate impacts, the project planted trees and seeds that were appropriate for the local ecology. Forty hectares of trees and grasses were planted on the abandoned mining sites, including a 10-ha park to reduce the high levels of dust coming from the sites and to improve urban life. The project invested in park infrastructure such as pavilions to make it a welcoming space for the community. The trees are growing slowly and therefore are not yet as effective as they will be in a few years, but the community sees this as a long-term investment. There is a visitor centre to share information on the agroforestry project. The project also allocated 300 ha for agricultural lands along with meadows and pastures combined with efforts to increase crop yields with organic fertilizers. In response, the arable lands and pastures have shown growth rates between five and 30 per cent. This high variation is due to irrigation levels in the fields and the use of fertilizer on both degraded and non-degraded lands. These efforts have increased the adaptive capacity of the natural landscapes, while also reducing the mining dust.

Small-scale infrastructure

The project worked to reduce urban flood risks primarily through infrastructure development. Prior to the project, there were no barriers to stop river water from flowing into the city, which led to regular flooding. The water would often get polluted from the abandoned mine land, degraded hillsides, and the garbage that had filled the river channels. To

address this, the project reinforced 300 square metres of riverbanks and 1,000 square metres of degraded hillside gabions using geotextiles and geonets; and constructed a 135 square metre concrete, low pressure dam. The combination of these actions along with tree planting and the NbS described above reduced the impacts of flooding. The project worked to reduce waste entering the river by improving the city sanitation system. This included expanding waste collection vehicles, installing trash bins, and developing a more regular collection system, demonstrating an integrated approach to understanding the dynamics affecting flood risks.

**Capacity-building
and awareness-raising**

The project's primary success was due to its capacity-building and awareness-raising

work in the communities, which reached 1,500 beneficiaries according to the final, independent evaluation. According to project implementers, this success has helped make the project sustainable. One focus was an eco-club in local schools to teach students about climate change and adaptation, building knowledge and bringing youth into the climate movement. In partnership with the eco-clubs and local non-governmental organizations (NGOs), community members took part in tree planting, allowing them to be part of the project. The project also produced two documentaries and broadcast them on public television and placed posters around the city to build public awareness. The local municipal government worked actively to raise awareness of the community and engage with local partners.



The results from new planting techniques in Solomon Islands.
(Photo by UNDP)

Solomon Islands: Enhancing urban resilience to climate change impacts and natural disasters – Honiara

Project amount: US\$ 4,395,877

Implementing Entity: UN-Habitat

Implementation period: June 2018 – under implementation

Background

The Solomon Islands is one of the world's fastest urbanizing countries with an urbanization rate of four per cent and a population expected to double by 2050. The capital of Honiara, with a population of over 110,000, is growing rapidly as people migrate from other islands for access to employment, education, and health care. As the population grows, informal settlements are expanding without the urban infrastructure to support them. Combined with these urban challenges are

increasing climate impacts such as sea-level rise, extreme rainfall, landslides, storm surges, and cyclones that are heightening the vulnerability of its citizens.

Using a multi-scale, participatory approach at the community, ward, and city scale, this project aims to enhance the resilience of the city and its inhabitants to current and future climate impacts and natural disasters. The project applies pro-poor

adaptation actions that involve and benefit the most vulnerable communities in the city with a focus on youth, women, girls, the elderly, and people with disabilities. In particular, the project is working in five informal settlements, Kukum Fishing Village (Vura), Ontong Java (Mataniko), Aekafo Planning Area (Kola'a), Gilbert Camp/Jabros (Panatina), and Wind Valley/White River (Nggosi).

Achievements

- Ten training sessions with a 73 per cent participation rate of women were delivered to increase city government capacity.
- Fifteen water tanks were installed in all five informal settlements to increase access to clean water.
- Two ward plans have integrated climate change risks through risk mapping and identifying nature-based approaches to support more resilient communities.

Approaches

Strengthening government and community institutions

By aligning project priorities with government plans, the project can contribute to policy implementation and motivate local government to prioritize the work during and after the project. Through its integrated approach to adaptation and gender-responsive disaster planning, the project aligns strongly with international,

national, and local policies, goals, and priorities, including the Paris Agreement, the Sustainable Development Goals, and the Sendai Framework. At the national and local level, the project has worked to support implementation of the National Adaptation Plan and the Honiara Urban Resilience and Climate Action Plan. It also complements the informal settlements legislation priorities of the Ministry of Lands, Housing and Survey.

The project has developed a task force to support project implementation and share information, while also engaging directly with local communities. In particular, it has worked to build community organizational capacity to begin developing the first formal governance structure within the settlements – an important step in building community ownership and sustainability. To that end, community committees will guide project implementation in a transparent and inclusive way. Climate Resilience Officers have also linked communities with the municipal and national governments to address local issues such as trash collection and water pollution to improve local lives. In addition, the project has cooperated with many organizations and other projects on the island, including Local Governments for Sustainability, the Pacific Regional Environment Programme, World Bank, UN-Women and United Nations Office for Disaster Risk Reduction. This has been one of the successes of the project and has helped address the lack of staff at the Ministry of Lands, Housing and Survey and the Honiara City Council.

Small-scale infrastructure

Thus far, the project has installed water tanks in all the informal settlements targeted by the project. This has expanded access to clean water. More water tanks will be added by 2025 along with gutter guards on the water tanks. To support longevity of the water tanks, community members will be trained on their construction and maintenance. The project has also begun drainage upgrading work in four settlements. By 2025, these efforts will be combined with water quality testing to ensure that water is potable.

Capacity-building and awareness-raising

At a local level, the project has focused on improving Honiara City Council's knowledge and awareness about climate impacts to enable it to develop appropriate solutions. This has been important as

technical knowledge was low at the start of the project. Additionally, the City Clerk, councillors, and heads of divisions have taken part in government capacity-building workshops on climate change and disaster management. These encouraged ward councillors to engage with their communities on disaster risk reduction strategies and determine key vulnerabilities that City Council could address. Overall, the project has delivered 10 trainings with a 73 per cent participation rate for women. Community workshops and consultations were held to develop climate actions; develop transect walks to identify vulnerable areas; and promote engagement with local leadership. Additional training was organized on best practices for urban organic gardening, urban greening, and landscape design. Four young artists were supported to develop climate comics to build community awareness and engage youth.



Adaptation Fund Project Monitoring Mission to Malaysia, March 17-21, 2025.
(Photo by Adaptation Fund)

Malaysia: Nature-based climate adaptation programme for the urban areas of Penang Island

Project amount: US\$ 10,000,000

Implementing Entity: UN-Habitat

Implementation period: September 2022 – under implementation

Background

Penang Island, in northwestern Malaysia, has an urbanized east coast. The project is focused on two urban subdistricts, Georgetown and Bayan Lepas. Georgetown, the capital, has a population of almost 200,000 (2010) with a total area of 2,501 ha. It is physically vulnerable to floods and has a high concentration of elderly people. The population is ethnically diverse and mixed income. Bayan Lepas' total population is 122,654 and covers 2,898 ha. It has urbanized over the last decade and

is now a manufacturing zone with a high proportion of migrant workers and school-age children. Overall, the main climate impacts are rising temperatures, increasingly frequent and severe extreme weather events, and sea-level rise. This makes addressing extreme heat and flooding important components for adaptation planning. With climate impacts, a more flexible approach to stormwater management is needed to address the challenges associated with changes in rainfall patterns.

This has produced calls for a more resilient approach that combines green and grey infrastructure.

The adaptation programme for the urban areas of Penang Island aims to use NbS to 1) reduce climate change impacts (increased temperature and stormwater), including threats to human life, infrastructure, and property associated with extreme weather events; and 2) strengthen social resilience and institutional capacity. The programme includes a multi-scale approach with activities at the community, ward, city, and national levels. It is also adopting a comprehensive approach that implements a diversified set of components (i.e. urban greening, urban agriculture, public health) in one location, reflecting the complexity of the multiple coexisting environmental and social dimensions.

Achievements

- An urban greening pilot has tested new practices to reduce stormwater and urban heat.
- Forty grants for green facades and 22 grants for green rooftops will be provided to local landlords to incentivize NbS .
- A Youth Climate Summit Southeast Asia brought together a range of stakeholders to support youth climate engagement.
- The Malaysia Adaptation Sharing Hub, a communications and knowledge platform, was developed to support science-driven decision-making.

Approaches

Nature-based Solutions

This project is testing NbS for Malaysia to provide a demonstration site for Penang and other parts of the country to address urban heat islands and stormwater retention. The project analysed the most heat-stressed areas to reduce rising temperatures. It focused on planting street trees, and developing rooftop gardens, pocket parks, and blue-green corridors. The project team found the green roof reduced temperatures by 9.9 degrees Celsius compared to the adjacent building without any greening. In total, the project will green 14 kilometres on four waterways, as well as 32 streets and road corridors, which covers around 42 kilometres. Thus far, a pilot project has transformed one area in historic Georgetown, demonstrating the need to educate local officials to understand the purpose and impact of NbS . The project is working with a local civil society organization (CSO), ThinkCity, to develop an application-based programme to provide 40 grants for green facades and 22 grants for green rooftops. Thus far, they have held three workshops to share grant opportunities with residents and landlords. As part of addressing flood management, the project will build upstream retention ponds, and add bio-swales and infiltration wells, which all support infiltration of rainwater into the groundwater table.

Institutional capacity and knowledge transfer platform

The capacity-building component is focused on 1) areas with high exposure to flood and high rates of elderly people; 2) low-income communities; and 3) women

and girls. The activities aimed to enable different groups to engage in adaptation and mitigation strategies and plans. The 2024 Youth Climate Summit Southeast Asia in Georgetown, for example, was held in partnership with 14 organizations from government, NGOs, private sector, and communities. The Summit included visits to local parks to build an understanding of NbS. In the future, the project will bring together women-run NGOs, climate experts, and women and girls to co-produce adaptation materials on topics such

as extreme heat and urban agriculture. It will also establish peer educators to serve as a social support network. In total, these activities aim to reach 16,000 women and girls, increasing their awareness of climate-related risks and providing tools to address gender-specific challenges. The project has also developed a Malaysia Adaptation Sharing Hub, a communications and knowledge platform to support science-driven decision-making. It aims for the city to adopt at least two climate change adaptation policies annually.



Adaptation Fund Project Monitoring Mission to Malaysia, March 17-21, 2025
(Photo by Adaptation Fund)

Pakistan: Enhance community, local, and national-level urban climate change resilience to water scarcity, caused by floods and droughts in Rawalpindi and Nowshera

Project amount: US\$ 6,094,000

Implementing Entity: UN-Habitat

Implementation period: December 2020 – under implementation

Background

Pakistan is managing more floods and droughts, while addressing high poverty rates and rapid urbanization challenges. Floods have led to loss of lives and property, as well as less access to clean water. During floods, tube wells – the source of water for most residents – get submerged, which affects water access. Additionally, waste in drainage channels contaminates groundwater, leading to

waterborne diseases such as diarrhea, especially in young children. The water then becomes undrinkable, leading to water scarcity even during the rainy season. These events heavily affect the urban poor as they lack social safety nets or the funds to buy water. Often, the urban poor also live in informal or unsafe areas close to rivers or drainage channels, increasing flood risks.

The project is working with poor communities in two large cities in northeast Pakistan: Rawalpindi in Punjab Province and Nowshera in Khyber Pakhtunkhwa Province. Rawalpindi is divided by a former freshwater stream that is the primary channel for sewage and stormwater for Islamabad. The banks of the river are one of the city's most populated residential and commercial areas, with more than 400,000 affected by yearly floods and without municipal water supply. Nowshera, is situated on the River Kabul, with unregulated development along the river. Flash floods are common, and most groundwater is unsafe for drinking, leading to water scarcity and illnesses. The project is addressing urban adaptation through building water harvesting facilities and supporting climate planning at three scales: community, district/city, and national levels.

Achievements

- Rainwater harvesting units were installed in 1,300 households at the two sites, providing reliable, clean water.
- Ten rainwater harvesting units were installed on public buildings to expand access to water.
- Twenty community workshops and 10 national government workshops were delivered.
- More than 100 people from different government agencies were trained in disaster risk reduction, rainwater harvesting, and spatial planning.

Approaches

Water management

Using a participatory and partnership-based approach, the project installed 1,300 rainwater harvesting units in different communities to provide secure water resources. The units can hold two weeks of water for washing clothes and watering rooftop gardens. The installations have been welcomed by the community and are working well. In larger buildings, such as schools, the project is building concrete water tanks that can store larger amounts of water underground. Drains blocked by trash, especially plastic bags, are another cause of flooding. To address this issue, the project has installed concrete slips and removed plastic from streams and sewer drains. These combined efforts have helped reduce urban flooding.

Institutional strengthening

The project is working at different levels to support development of improved policies and planning. At the national level, the project works with the government on developing urban development strategies that can address climate change. At the provincial level, the project works with district agencies for water and flood management. This also included multi-hazard and vulnerability assessments. The city can use this information to better understand where to build future infrastructure and where hazards are most likely.

At the community level, the project has worked with NGO partners to develop water user groups to better manage local

water resources. Joint groups of men and women are also preparing community plans to ensure equitable access to facilities, and fair distribution of water. Community plans and city-level spatial planning strategies will help reduce climate change

risks and impacts beyond city boundaries across multiple sectors. Across scales, the project has completed workshops to increase awareness on urban flooding and rainwater harvesting.



Through an innovative and integrated approach, the project in Antigua restored natural drainage canals and climate-proofing vulnerable homes and storm shelters to reduce flooding and disaster risks. (Photo by Adaptation Fund)

VII. Findings and lessons learned

While projects are applying various approaches, several factors influence their success. Urban adaptation interventions are most effective when the design and implementation incorporate the following characteristics:

(1) Integrated: interventions respond to local impacts and needs and are tailored to local social, political-economic context, as well as the built and natural environment. At the urban scale, issues are interlinked, providing an opportunity to address adaptation challenges while improving urban development, public health, and quality of life. anticipate possible political and institutional instability.

(2) Inclusive: participatory and collaborative methods engage local communities, including vulnerable people, women, the elderly, and people with disabilities. This recognizes that urban residents play a key role in adaptation decision-making, such as how actions are defined, designed, and implemented.

(3) Institutionalized across government levels: partnerships with city and district governments with support of, or in coordination with, higher-level governments can help create the appropriate institutional incentives and actions, and support sustainability beyond the project's term.

(4) Adaptive: staying flexible to changing contexts and needs allows projects to respond to ongoing climate impacts, political changes, and other urban environmental stressors.

A. Lessons learned

Increasing focus on Nature-based Solutions could lead to multiple benefits

When implemented well, NbS can be a flexible, comprehensive, and cost-effective

way to achieve multiple benefits for climate, urban sustainability, and public health. They are a proven method to address urban adaptation challenges such as stormwater management and heat. However, NbS need to be adapted to local ecologies, imple-

mented in strategic locations, and consider land rights issues. In Malaysia, the project is demonstrating the effectiveness of climate-resilient plants and trees to reduce urban heat and public health impacts, with green facades and green rooftops.

A combination of enabling conditions is needed for successful urban adaptation

These conditions include proper identification of community needs, assessment of local climate impacts, and strong government support to implement the needed changes. Projects must be aware of local conditions that may provide opportunities for successful implementation. In several cases in this study, sustainable city initiatives provided a policy framework for the project. This alignment was useful to bring government support and demonstrate that the project's mission was connected with existing priorities. In Pakistan, for example, the combination of intense floods in 2010, efforts to address community access to water, and the support of both local and national governments contributed to the project's effective design and overall success to build urban resilience.

There is high potential to integrate adaptation and mitigation efforts

The high energy intensity of cities provides an opportunity for urban adaptation projects to align adaptation and mitigation goals. As adaptation interventions get integrated into urban plans, they can be explicitly linked with mitigation actions. For example, greening public spaces can contribute to mitigation goals by reducing the need for energy for cooling. In Antigua

and Barbuda, the project supported shelters to become more climate-resilient by shifting to solar panels. The panels can provide access to electricity in case of grid failures during hurricanes, while reducing emissions by transitioning to clean energy.

Working with local communities and civil society organizations produces better outcomes for projects

Community organizations often have a better understanding of the local context and needs. By directly involving CSOs and members, projects were able to successfully empower local communities and build resilience. In Armenia, the project worked with school organizations to design an adaptation contest to bring awareness about the project and motivate youth to continue climate and environmental work in the community. Other efforts engaged local NGOs to maintain the agroforestry work beyond the project.

Capacity-building of city officials is essential for improved implementation and sustainability

The success of several projects was closely linked to local officials' understanding of climate change impacts and ways to address them. While training and outreach can be time-consuming, a stronger knowledge base within the city government pays dividends. In Malaysia, because project costs have increased, officials have included project activities in their budgets. This ensures the project's success and provides sustainability. This approach is the result of a strong knowledge and awareness campaign.

B. Challenges

Rising costs

The costs of urban adaptation, especially infrastructure development, can be high and are affected by supply chain costs that can change over the life of a project. In small island developing states, costs can be even higher given the need to ship in all the materials. Several projects were hampered by increasing costs beyond the initial project budget or budgets being used up earlier than planned. Consequently, they had to change the scope of their delivery.

Institutional and capacity challenges

Cities do not have the same institutional authority as provincial and national governments. Therefore, projects need to understand the role of various parts of the city government, while working with higher-level governments to achieve project goals. In some cases, jurisdictional lines between the city and county or district government are unclear, further blurring the boundaries of authority. Cities also often have less staff and therefore may lack capacity to support projects. In several cases, the resources and capacity of the implementing partners were limited and procedures to recruit staff took longer than the project had allocated. This challenge requires more work with other implement-

ing partners to ensure that cities have sufficient budgets and skilled staff to work on climate adaptation programmes.

Complicated bureaucratic procedures

In several cases, the lengthy and complicated procedures within the government and the Implementing Entity slowed down project activities. Often, many levels of approvals are needed to implement each part of a project. This process can take a long time, reducing project effectiveness and community trust with the project implementors who often get local input years before communities see any tangible benefits.

COVID-19

The COVID-19 pandemic affected delivery of all the projects in this study. In several cases, projects lost years that they have been unable to recuperate. In multiple places, states of emergency prevented travel or public meetings. This was particularly difficult where staff were based in a different location than the project sites. The impact of the pandemic demonstrated the importance of strong local project teams and the need for resources to support local capacity-building. This would provide project teams with the appropriate skills to support implementation in case of shocks.



Adaptation Fund Project Monitoring Mission to Malaysia, March 17-21, 2025.
(Photo by Adaptation Fund)

VIII. Conclusion

Urban areas face increasing climate risks. As more people move to urban areas, it is important to address these risks in a comprehensive and localized manner. This calls for local assessments of urban risks and projects to address these risks in the context of changing social, political, and environmental conditions. While adaptation has traditionally focused on rural communities, more attention is now needed on urban areas.

The Fund is applying a range of approaches in cities around the globe: (1) disaster risk

reduction; (2) NbS; (3) small-scale infrastructure and water management; (4) institutional strengthening and access to finance; and (5) capacity-building, awareness-raising and information-sharing. These approaches are most effective when designed and implemented in a process that is integrated, inclusive, institutionalized across government levels, and adaptive. As the world becomes more urbanized, more efforts are needed to address the most vulnerable urban residents and build their resilience.

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