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Water Safe Cities Accelerator

Planned Actions to Deliver Commitments

C40 CITIES

Buenos Aires

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CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

Set an early warning system baseline based on data collection that shows the current situation in all the city's vulnerable neighbourhoods. The city has a system for receiving hydrometeorological data to trigger an early warning, and has an emergency system that contemplates this scenario, however, there is much room for further improvement in the simulation and actual implementation of this type of warning, and above all many other initiatives that are worth continuing to coordinate, such as a first response programme carried out by trained volunteers who live in flood risk neighbourhoods.

Roadmap

Roadmap developed from the City's Water Plan within the framework of the climate change adaptation plan for water. An inter-ministerial early warning committee will be proposed to monitor civil defence actions, rainfall maintenance, the climate action plan and the city's water plan. At the same time, the issue will be included in an agenda for discussion with interjurisdictional basin committees in the Buenos Aires Metropolitan Area (AMBA). The KPIS will be agreed and co-created with stakeholders once the process has started.

Financial structure necessary

It is proposed to be funded by the City's own source and the exploration of international cooperation.

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Baseline

Update the city's water management master plan to a climate change scenario, within the water climate adaptation plan framework.

Roadmap

The hydraulic modelling teams will elaborate the infrastructure plan taking into account a climate change scenario with an IPCC factor of 1.3, city-wide solutions will be proposed in teamwork with other governmental areas involved, such as public space, environment and urban development. Inter-jurisdictional solutions will also be proposed and agreed with the relevant municipalities and river basin committees. The KPIS will be defined in the development of this process.

Financial structure necessary

City's own economic resources and exploration of international funding agencies.

Restoring at least 3 of the city's water bodies (such as rivers, creeks, and wetlands) to significantly reduce flood risks and improve water quality

Baseline

- Development of the master plan for the sanitation of the city's river system, within the climate adaptation plan for water framework.
- Continue to develop natural reservoirs, wetlands and water bodies in the city as water adaptation solutions: Parque Sarmiento reservoir in the Medrano basin, restoration of the Medran's delta, restoration of the Raggio delta and the coast of the La Plata river.

Rodmap

- Setting up a working unit focused on the sanitation and restoration of the river system that also involves the environment, rainwater maintenance, government, infrastructure and the hydraulic plan.

Set a baseline for pollution in the river system.

- Consensus meetings with basin committees,

municipalities, aysa, national government, universities and companies.

- Shared access to information and joint baseline development.
- Co-creation of a sanitation action plan, including KPIs.
- Master plan for the sanitation of the city's and AMBA's storm water system.
- Implementation of 3 restorations for risk management and water enjoyment.

Financial structure necessary

City's own economic resources and exploration of international funding agencies.

Copenhagen

CORE COMMITMENT
Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

In case of a crisis or disaster, the municipality's crises-website will gather the relevant employees (specific for certain type of crisis) will be activated. Simultaneously the Greater Copenhagen Fire Department will be summoned, in order to activate the action plan (combined with step by step action cards). From there on, higher governance actors will be contacted (if not already), such as mayors, police, the defence etc. In this process a specific action group will also be summoned, consisting of representatives from various city administrations, police, fire department, neighbouring municipalities, utilities etc – depending of the nature of the crisis. This Action Group will coordinate how the different organisations can support the Fire department and the police in the current crisis.

The municipality is taking two types of actions. The first one is on the planning-level, which refers to preventing and or decreasing the events and assisting the different emergency-teams in dealing with an event. Secondly, the municipality can deploy employees, and material in terms of cars, trucks etc. and set up safety-barriers to secure the safety of the citizens. The need for this is established in collaboration with other municipalities and the emergency service.

The social services are responsible for helping citizens with temporary accommodation, rehousing, crisis assistance and other social assistance. This is done in collaboration with the Employment and Integration Administration. The municipality defines the citizens that need temporary accommodation and rehousing as people who can't secure new accommodations. This refers to citizens as well as tourists visiting Copenhagen.

The Children and Youth Administration is responsible for helping the individual institutions during the crisis situation. In addition, they must make premises available for the collection or accommodation of citizens.

The Employment and Integration Administration is responsible for temporary accommodation, rehousing, crisis assistance and other social assistance. This is done in collaboration with the Social Services Administration.

Roadmap

- The City of Copenhagen as a municipality has action plans which are politically adopted. As a few, stormsurge, heavy rainfall/stormwater, terror and pandemic can be mentioned.
- All action plans are revised based on ongoing risk assessments. These assessments are both local and national assessments.
- The emergency services have annual exercises to test the strength of the action plans. And plans are revised after exercises based on the experiences.

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Baseline

- In 2011 and 2012, Copenhagen prepared assessments of how sensitive the city is to flooding. The calculations are continuously qualified in connection with the implementation of the cloud breaking plan's projects. Calculation of sensitivity to flooding is based on detailed city data that includes height maps, location of housing, land use, traffic, etc.
- The approach to increasing infiltration and retention by watershed is strategically prioritised whereas possible to be the first option. Not only due to the ecological and the natural water cycle reasons, but primarily due to the cost-effectiveness in management of the stormwater projects. In Copenhagen it is by far the cheapest stormwater typology and solution to infiltrate stormwater and or treat it locally in local rainwater drainage systems, for example bioswales, then constructing the transport solutions, such as for example cloudburst boulevards. This approach is challenged by the clay soil structure below the city and the rising groundwater, which greatly affects the dimensioning

and the design of the conducted climate adaptation projects in Copenhagen. Thus the projects are not uniform neither in infiltration nor retention degree, but nevertheless contribute locally and on the watershed level on infiltration as much as possible. Beside that we are building a dam by the port of Copenhagen, as a measurement to prevent the rising of the groundwater (influenced by the sea level rise).

- The assessment of the sensitivity to flooding is being ongoing updated and will form the basis of future measures against flooding.

- The aim of the plans is to protect all Copenhageners – always putting lives before material assets. In case of emergency the focus is always on the most vulnerable groups (in Copenhagen's case the elderly and people who are unable to take action for themselves).

Roadmap

- Assessment of the current risk of flooding and projection of risk in relation to climate change

- Decision on flood protection level. Including assessment of the individual districts' sensitivity to flooding and identification of areas that require greater protection for reasons of human life or critical social functions. *

- Identification of business partners and funding opportunities for implementation

- Preparation of development plans for cloudburst protection for each district, extensive future urban development and the possibility of implementing projects in synergy with other projects and plans*

- Establishment of cooperation organization for the implementation of projects

*political decision

Stormwater-wise we are both executing the plan and are about to re-assess the roadmap steps one and two, due to changes in national legislation for climate adaptation.

Storm surge-wise we are in the process of making a 13 km embankment to protect Amager, the part of the city, that has been identified as the most sensitive to flooding. We are also planning to establish a canal lock in the southern part of the port to secure the city against flooding and in the northern part they are establishing a new urban arena. In 20 years, there is a plan to establish a barrier between Nordhavn and Lynetteholmen, that would protect the city during storm surge.

Stakeholders:
- Copenhagen Municipality (political level): Decisions on overall principles for climate adaptation, initiation of projects
- Copenhagen Municipality (technical and administrative level): Preparation of plans, implementation of projects, political settings, management of finances
- HOFOR (utility company): Implementation of projects in collaboration with Copenhagen municipality, construction of tunnels and pipes, hydraulic calculations, collection of waste water tariff that finances the implementation of projects and technical solutions
- Local committee: Comments on project proposals, channelling the local citizen involvement
- Citizens: participate in the development of projects in the local area at different stages
- National level: Prepares rules and legislation for climate adaptation, principle approval of projects and finances

Partnerships
- The municipality and the utility company have drawn up a formal agreement on the implementation of the cloudburst plan, including the distribution of funding and tasks
- On private areas that are threatened by flooding, the tility company can enter into an agreement on remedial projects on private land

Milestones
- in 2035, Copenhagen will achieve a service goal of being cloudburst-proof to the goals adopted by the policy for cloudburst protection of the city

KPI
- Preparation and publication of annual report on progress and status of implementation of the cloudburst protection plan

Financial structure necessary

When preparing the cloudburst plan, it was clear that there was a need for funding that could ensure continuous implementation. If the financing were to take place via municipal funds, there would be a great risk that the implementation of the cloudburst plan's projects would come into competition with the municipality's other interests during the annual budget negotiations.

To avoid this, the administration lobbied for a change in the national legislation that made it possible for the city's utility company (HOFOR) to legally finance all the necessary technical solutions for storm- and rainwater management, the cloudburst plan works with. With this change in the national legislation, it has since been possible to finance the city's rainwater technical solutions via waste water tariff.

The municipality must pay for the greening of the projects where urban space improvements are also desired.

PATHWAY 3
Capturing and utilising at least 50% of biogas from wastewater plants by 2035

Baseline

The city's wastewater is cleaned by the wastewater treatment plants of Biofos. Biofos is owned by a number of municipalities that all discharge their wastewater to the three plants run by Biofos. Biofos has the aim of becoming energy positive by 2025 – and is currently producing more energy than it is consuming.

Biofos creates biogas from two of its plants – using the sludge from wastewater to create biogas. The sludge is collected from the sediment tanks (24.000 and 30.000 m3) and the biogas is being used in the natural gas system of some of the other municipalities, and in Copenhagen the gas is being led into the gas system used for cooking.

The remaining material after biogas production is incinerated and integrated into Copenhagen's district energy system.

Roadmap

Biofos gives an annual report of their production to the city for the use of the city's carbon accounting - used in the Climate Action plan to demonstrate the progress toward a carbon neutral Copenhagen.

In 2021 Biofos produced in total more than 100,000 MwH of energy.

All actions in Biofos have to be taken in agreement with the municipalities that own Biofos. And Biofos has its own action plan to become energy positive.

Financial structure necessary

Waste water treatment is paid via the water fees that citizens pay for the consumption of water. These prices are regulated annually by consultation with a national agency. As Biofos is currently producing (and selling) more energy than they are consuming this goes into the equation in the prices.

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CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

Assessment and Mapping: Freetown City Council will do a comprehensive assessment of the current state of early warning systems across the city that will identify vulnerable communities through mapping by considering factors such as geographical location, historical incidents, and socio-economic indicators.

Technology Integration: FCC will integrate advanced monitoring systems to enhance early warning capabilities. This includes sensor networks, satellite imagery, and real-time data analytics to detect potential water-related threats promptly.

Community Engagement: There will be an active engage with residents in vulnerable areas. through workshops, outreach programs, and educational initiatives that aim to empower communities to understand, respond to, and mitigate water-related risks effectively.

Collaborative Partnership: FCC will build on the existing collaborations and forge new partnerships with governmental agencies, non-profit organizations, and technology providers that will leverage on collective expertise and resources to establish a robust early warning infrastructure.

Regulatory Simulation and Testing: Implementing a continuous improvement model and regular simulations and tests of early warning systems. This will ensure the reliability and efficiency of infrastructure and provide opportunities for refinement.

Data Transparency and Accessibility: To foster transparency and enable informed decision-making, FCC will establish a platform for real-time data sharing. This will not only keep residents informed but also aid authorities in making timely interventions during emergency situations.

Continuous Monitoring and evaluation: Establishing a dedicated team for continuous monitoring and evaluation that will track the effectiveness of early warning systems and regular feedback loops and performance assessments will guiding ongoing improvements and adaptations to changing environmental conditions.

Roadmap

Here's a description on how FCC will build a step-by-step :

- Stakeholder engagement and vision setting
- Risk Assessment and Vulnerability mapping
- Technological Infrastructure Development
- Community Empowerment and Education
- Policy and Regulatory framework Enhance
- Pilot Programs in vulnerable communities
- Technology Integration and System Testing
- Continuous Monitory and adoptive management

Stakeholders involves:

- Local government and municipality
- Community representative and residents
- Non-governmental Organizations
- Water Management and Environment Agencies
- Emergency Response and Disaster Management Team
- Urban Planning Department
- Technology and Innovation Partner
- Educational Institutions and research Centers
- Business and Industry Leaders
- Heath Care professional
- Media and communication Agencies
- International Organizations

Financial structure necessary

Here's a description of how FCC will develop the financing structure to implement the actions:

- Comprehensive needs assessment
- Public Private Partnership
- Government Grant and fundings
- Community Contributions
- Infrastructure Bonds

- Budget Reallocations and prioritization
- Grant Application to International Organizations
- Risk Management Strategies
- Innovative Financing Models
- Regulatory Financing Audit and Reporting

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

Below is a description of how a city might build and demonstrate a baseline of emergency responses:

- FCC will conduct thorough risk assessment to identify potential hazard and vulnerabilities
- Prioritize risks based on their likelihood and potential impact on the population.
- FCC will develop a comprehensive emergency response plan that cover a range of scenarios, including natural disasters and public health crises.
- Collaborate with relevant agencies, including police, fire departments, healthcare providers, and non -profit organization to ensure a coordinated response.
- FCC will invest in resilient infrastructure that can withstand or minimize the impact of disasters. This includes reinforcing buildings, creating evacuation routes, and ensuring the availability service.
- FCC to maintain an inventory emergency resources, such as medical supplies food, water temporary shelters
- FCC to implement advance communication systems to facilitate swift and accurate information dissemination during emergencies. Also utilize technology such as emergency alert system mobile apps, and social media to keep residents inform and provide real-time update.
- Conduct regular training session for emergency responders to ensure they are well-prepared to handle various situation and organize drills and simulation involving multiple agencies to test the effectiveness of the emergency response plan.
- FCC will educate the public on emergency preparedness through outreach programs, workshops, and educational campaigns and also establish community-based organization and networks that can assist in disseminating information and providing support during emergencies.
- FCC to foster strong collaboration among various government agencies, on-profits, private sector entities and community organization and establish clear line of communication and protocols for collaboration to ensure a seamless response during emergencies.
- FCC to implement system for continuous monitoring and evaluation of emergency response activities.
- Will raise awareness among the public about the importance of individual preparedness, including creating personal emergency plans and assembling emergency kits
- Regularly update emergency response plans based on lesson learned from real incidents and exercises and stay informed about emerging risk and technologies, adapting strategies according.

Roadmap

Below is the roadmap with clear governance structure, committed stakeholders, milestone and Key Perform Indicators:

- Established Governance structure: FCC already have a climate Action Committee responsible for overseeing and guiding the implementation of Freetown Climate Action Plan.
- Define clear goals and target: FCC ensures the goals and targets from the Freetown Climate Action Plan align with current recommendations and international standards.
- Engage Stakeholder: (a) Implement stakeholder mapping to identify and categorize key stakeholders, including government agencies, businesses, community groups and residents.
- (b)Stakeholder engagement Plan involves stakeholders at various stage of the Freetown Climate Action implementation, seeking input, feedback and collaboration.
- Develop Action Plans: Sector-specific Action Plans with relevant departments to develop detailed action plans for sectors outlined in the Freetown Climate Action plan.
- Allocate Resources: Secure necessary funding and allocate resources for the implementation of the Freetown Climate Action Plan and explore partnerships, grants and funding opportunities from governmental, private and non-profit sectors.
- Implement key initiatives: (a)Initiate pilot programs for select projects to test feasibility and date gathering. (b)Implementation of infrastructure projects outlined in the Freetown Climate Action Plan.
- Monitor and Evaluate: (a) Define KPIs for each action item, ensuring they are measurable and aligned with overall Freetown climate goals(b) Implement systems for real-time monitoring of progress and impact.
- Review and adapt: Conduct regular review of the implementation progress against milestone and KPIs and develop strategies to address challenges and incorporate lessons learned into the ongoing action plan.
- Lunching a city-wide campaign to raise awareness about Freetown Climate Action Plan. And provide regular updates to the public through various channels, including social media, press releases and community events.
- Compile an annual report summarizing

achievements, challenges and future plans and ensure transparency in reporting to build trust among stakeholders.
- Acknowledge and celebrate achievements and milestones through public events and awards.
- Establish feedback mechanism for continuous improvement, incorporating input from stakeholders and residents.
- Review and update existing policies to ensure alignment with Freetown climate goals and explore new legislation or regulations to support climate initiative.
- Explore opportunities for collaboration with other cities, international organization and networks focused on climate action.

Financial structure neccesary

Below is the financial structure necessary to implement actions of the road map to move the target in two years:

- Financial needs assessment
- Prioritize Initiative
- Establish Public Private Partnership
- Grant funding and subsidies
- Community Investment and Crowdfunding
- Green Bonds and financial instruments
- Budget Reallocations and prioritization
- Climate Funds and Trusts
- Tax incentives and rebates
- Carbon Pricing and Trading
- Grant Application to International Organizations
- Insurance and Risk Management
- International Funding and cooperation
- Transparent Reporting

PATHWAY 1
Reducing at least 20% of water demand

Baseline

Below describe how city build a baseline of water demand:

Define the scope
Gather existing data
Engage stakeholders
Establish metrics
Use established baselines
Assess current water policies
Benchmark against accelerator standards
Identify key challenges and opportunities
Data validation and quality assurance
Set Realistic Targets
Create an Implementation Plan
Establish Monitoring and Reporting Mechanism
Community Engagement
Lunch Awareness Campaign
Review and Adapt

Roadmap

Below is comprehensive guide with a clear governance structure, committed stakeholders, milestones and Key Performance Indictors for a one-year period.

Establish Government Structure
Climate Action Task Force
Define Clear Goal Targets
Review and define targets
Stakeholder engagement
Stakeholder mapping
Develop Action Plan
Sector-specific Action Plan
Allocate Resources
Budget Allocation
Implement Key Initiative
Pilot Programs
Monitor and Evaluate
KPI Development
Review and Adapt
Periodic Review
Communication and Public Awareness
Public Awareness Campaign
Reporting
Regular updates
Capacity Building
Training Programs
Legal and Regulatory measures
Policy Alignment
International Collaboration
Collaboration Agreement
Celebrate Success
Recognition
Continuous Improvement
Feedback Mechanism
Legal Compliance
Environment Compliance

Below is a list of stakeholders that will be involved to develop and implement the actions of the road map and how the Freetown will build partnerships.

Government Structure
-Mayor
-Ministry of Water Resource
-Climate Action and water Committee Chairperson
-Climate Action Task Force

Stakeholder Engagement
-Government Departments (Guma Valley Water Company)
-Non-Profit and NGOs
-Community Groups

Milestone KPIs
-Milestone 1(Quarter 1): Completion of detailed sector-specific action plans.
KPI: Number of action plans completed.
-Milestone 2(Quarter 2): Lunch of pilot programs for key initiatives.

KPI: Number of pilot programs initiated.
-Milestone 3(Quarter 3): Achieve a 20% reduction flooding and carbon emissions compared to baseline.
KPI: Percentage reduction of flooding and carbon emission.
-Milestone 4(Quarter 4): Completion of one year action plan with 80% implement.
KPI: Percentage completion of action plan.

Financial structure neccesary

Below describe how Freetown will develop finance structure necessary to implement the action in two years:

Cost estimation
Detailed budgeting
Identify Funding Source
Government Grant and Subsidies
Private Sector Collaboration
International Funding
Public -Private Partnership (PPPs)
Establish collaboration agreement
Green Bonds and financing Instruments
Explore Green Financing

Budget Allocation
Allocate Resources

-ommunity Engagement and Crowdfunding
Community Investment Programs
Carbon Pricing and Trading
Explore Carbon Market
Insurance and Risk Management
Collaborate with Insurer
Legal and regulatory Measures
Policy Alignment
Continuous Monitoring and Adaptation
Monitoring system
Adaptation Strategies
Transparent Reporting
Financial Reporting
International Collaboration
Global Funding Opportunities
Government Budget Reallocation
Advocate for Climate Budget Allocation

Public -Private Investment Forums
Organize Investment Forums
Regular Financial Audits
Conduct Audit
Contingency Planning
Develop Contingency Plans

Increasing at least 15% of water supply

Baseline

Below describe how city build a baseline of water supply:

Data Collection and Inventory
Gather existing Data
Water Sources Assessment
Identify water sources
Water Quality Testing
Conduct Water Quality Test
Infrastructure Mapping
GIS Mapping
Demand Assessment
Population Growth and Water Demand
Water Treatment Capacity
Assess Treatment Plans
Infrastructure Conduction Assessment
Evaluate Infrastructure Condition
Water Conservation Initiatives
Review Conservation initiatives
Policy and Regulation Review
Assess Policies and Regulations
Community Outreach
Engage with the community
Drought Response Plans
Develop Drought Response Plans
Benchmark Against Standards
Compare with Standards
Data Management System
Implement a data Management System
Risk Assessment
Conduct Risk Assessment
Regular Reporting and Monitoring
Establish Reporting Mechanisms
Compliance with Water Laws
Ensure Regulatory Compliance
Collaboration with Experts
Engage water Expert

Roadmap

Below is a description on how Freetown will build a step-by-step roap:

Define Objective and Goals
Stakeholder Consultation
Conduct Needs Assessment
Gather Data
Prioritize Initiative
Rank and Priorities
Establish a Governance Structure
Task Force Creation
Develop Action Plan
Sector-Specific Plans
Resource Allocation
Budgeting
Timeline and Milestones
Create a Timeline
Stakeholder Engagement
Community Involvement
Legislation and Policies
Review and Updates Policies
Technology Integration
Leverage Technology
Risk Management

Identify and Mitigate Risks
Communication Plan
Establish Communication Channels
Monitoring and Evaluation
KPIs and Metrics
Adaptability and Flexibility
Review and Adapt
Collaboration with External Entities
Partnerships
Capacity Building
Training Programs
Continuous Improvement
Feedback Mechanisms
Regular Reporting
Transparency
Celebration of Achievements
Recognize Milestones

Below is a list of potential stakeholders and a description of how Freetown can build partnership:

Freetown City Council
MDAs
Local Businesses
Community Organizations
Educational Institutions
Residents and Neighbourhood Association
Utilities and Service Providers
Chamber of Commerce
Non-Government Organization
Health Institutions
Financial Institutions

Financial structure necessary

Below is a description on how the city develop the finance structure necessary to implement the action:

Conduct a Comprehensive Cost Estimate
Identify Funding Sources
Public-Private Partner
Green Bonds and Financing Instruments
Budget Allocation
Community Engagement and Crowdfunding
Carbon Pricing and Trading
Insurance and Risk Management
Continuous Monitoring and Adaptation
Legal and Regulatory Measures
Transparent Reporting
International Collaboration
Government Budget Reallocation
Public-Private Investment Forums
Regular Financial Audit
Contingency Planning
Engage Financial Institutions
Explore Innovative Financing Models
Educate and Involve the Communities

Fuzhou

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To implement the Water Safe Cities Initiative of the C40 Cities Climate Leadership Group ("C40") and build a modern international city of water security, this action plan is formulated as follows based on the actual situation of Fuzhou.

Guiding Principles
Guided by the water control policy "prioritizing water conservation, seeking spatial equilibrium, implementing systematic governance, and achieving government-market synergy", Fuzhou will establish a comprehensive water security system that includes drought and flood management, balanced water distribution, and a complementary multi-source water supply. The action plan aims to build Fuzhou into a modern international city of water security with harmonious coexistence of people and water and provide a solid water security guarantee for high-quality economic and social development and the well-being of its citizens.

Current Condition and Baseline
The year 2020 marked the conclusion of the previous Five-Year Plan, with prior objectives having been achieved as scheduled and future development goals gradually being planned. Serving as a transition point, 2020 marks a milestone year. The socio-economic development indicators for 2020 are accessible, reliable, and comparable, making it an ideal base year for assessment. The city of Fuzhou comprises the districts of Gulou, Taijiang, Cangshan, Jin'an, Mawei, and Changle. 2020 will serve as the baseline year for assessing the objectives in these six districts of Fuzhou.

Work Objectives
By 2030, Fuzhou will become a water-secure city capable of withstanding drought and flood disasters. Specifically:

By 2027, a monitoring and early warning system should be established in high-risk areas of Fuzhou to protect the urban communities most vulnerable to drought and flood threats. A comprehensive emergency response plan and operational mechanism for drought and flood disasters should be developed to mitigate the impact on citizens during such events. By 2030, to effectively achieve equitable and universal access to clean water, measures should be implemented to reduce water demand (daily per capita domestic water consumption) by at least 20% and to increase water supply capacity (available water supply) by at least 15%.

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Optimize Meteorological Disaster Monitoring and Early Warning
The comprehensive smart meteorological service platform should undergo upgrades. It should provide signal-led early warning services for meteorological disasters combined with meteorological monitoring and disaster risk assessments. Supported by this platform, the "meteorological +" digital application should be developed for scenarios such as urban waterlogging risk and urban traffic and integrated into the relevant departments' command systems. The capacity to forecast the impacts of extreme weather by disaster type, region, and industry, as well as the risk warning capabilities, will thus be improved. This will provide accurate meteorological risk warnings to guarantee the safety of Fuzhou. Moreover, a comprehensive warning network should be set for prompt meteorological disaster monitoring and early warning, with increasing channels for meteorological forecasts and warning information release.

Strengthen Drought Monitoring and Analysis
During critical periods such as the Spring Festival, spring planting, and the autumn-winter dry season, comprehensive analysis and judgment of drought trends should be conducted. Departments including meteorology, water resources, agriculture, urban construction, industry and information technology, and development and reform should strengthen monitoring of meteorological drought, hydrological drought, urban and rural water supply, and water usage for industrial and agricultural production. This monitoring will support decision-making for drought prevention and early response.

Enhance Risk Point Monitoring and Early Warning for Water Accumulation

In 2020, the monitoring and early warning module of the Fuzhou Urban Water Dispatching System integrated the monitoring of rain, water, and work conditions. Water level sensors were deployed at risk points of water accumulation, low-lying areas, and key areas. Automatic monitoring and early warning systems for road water accumulation were roughly realized. By 2027, the water accumulation monitoring module of the original dispatching system should be comprehensively upgraded. The module will adopt ultrasound and video fusion sensing technology to develop an intelligent monitoring and early warning module for water accumulation of risk points in urban areas. This equipment-powered warning system will be supported with AI surveillance and video review. As the water accumulation risk points change with the urban development, the intelligent monitoring and perception equipment distributed at low-lying points throughout the city should be accordingly coordinated. This will enable visual automatic monitoring and early warning of water accumulation risk areas, providing decision support for urban drainage, flood control, and emergency command.

Deepen the Construction of Smart Water Systems
Smart water plants, real-time online models of water supply networks and secondary water supply management platforms should be established. The monitoring sensors for pre-warning should be appropriately deployed to build an IoT-powered urban water supply. This system will facilitate real-time monitoring and prompt alerts throughout the entire water supply production and dispatching network. Additionally, it will integrate with work order and customer service systems to provide decision support for water supply scheduling and emergency incident handling, significantly improving water supply security and refined management.

Leading Agency: Fuzhou Municipal Flood Control and Drought Relief Headquarters. Responsible Agencies: Fuzhou Municipal Emergency Management Bureau, Fuzhou Municipal Water Resources Bureau, Fuzhou Municipal Meteorological Bureau, Fuzhou Municipal Bureau of Housing and Urban-rural Development (including the Municipal Unified Dispatch Center), Fuzhou Municipal Bureau of Agriculture and Rural Affairs, Fuzhou Municipal Bureau of Industry and Information Technology, Fuzhou Municipal Development and Reform Commission, and relevant district governments according to their respective duties.

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Improve the Emergency Planning System
The emergency planning system should comprehensively address extreme weather events such as heavy rainfall, over-standard floods, super typhoons, flooding and waterlogging, extreme droughts, and rapid transitions between droughts and floods. This system should include mechanisms for early warning and coordinated response, improving the timeliness and effectiveness of emergency actions. Additionally, it should refine disaster prevention and response mechanisms, detailing key responsibilities such as organization and command, risk prevention, rescue operations, support measures, and safety control to improve the plan's specificity and operability.

Enhance Disaster Resilience
Key flood control projects, such as the Mountain Flood Prevention and Ecological Water Replenishment Project in the Northern Urban Area, the Reconstruction of the Aofeng Water Gate, and the Flood Control Improvement Project for the Mainstream of the Minjiang River, should be promptly implemented. The multi-source water supply system should be optimized, and the interconnection of the entire network should be enhanced to improve the urban flood control and drought resistance system. This will ensure that critical urban infrastructure, such as water supply, remains functional during extreme weather conditions, thus protecting the city and its residents.

Enhance Emergency Water Supply Capacity
Fuzhou will establish a mechanism for emergency water supply and resource reserves for residential and public buildings, gradually increasing its mobile water supply equipment and enhancing emergency response capacities. During droughts, floods, or changes in water quality, response measures such as targeted water resource allocation, emergency water supply (from water trucks, small-scale water treatment equipment, and interconnection of water networks), emergency testing, mutual aid for emergency supplies, and facility repair and maintenance should be implemented to ensure stable and safe water supply.

Upgrade Natural Disaster Shelters
Fuzhou will pay attention to the management and maintenance of natural disaster shelters. Before each flood season, a comprehensive safety inspection and rectification of disaster shelters within the jurisdiction should be conducted to ensure their safety and usability. The upgrade of natural disaster shelters should be continuously promoted, following standards for scientific site selection, complete facilities, clear signage, and comprehensive systems. From 2021 to 2025, 16 natural disaster shelters in Fuzhou's urban area should be upgraded annually to improve disaster resistance.

Leading Agency: Fuzhou Municipal Flood Control and Drought Relief Headquarters. Responsible Agencies: Fuzhou Municipal Emergency Management Bureau, Fuzhou Municipal Bureau of Housing and Urban-

rural Development (including the Municipal Unified Dispatch Center), Fuzhou Municipal Water Resources Bureau, and relevant district governments according to their respective duties.

PATHWAY 1
Reducing at least 20% of water demand

In 2020, the per capita daily domestic water consumption of tap water in six urban districts of Fuzhou amounted to 224.16 liters. Fuzhou will take the following measures to reduce the per capita daily domestic water consumption of tap water in the six urban districts by at least 20% (no more than 179.32 liters/day per capita) by 2030.

Stress on Water Conservation Awareness and Education
Water conservation activities should be held on special occasions such as "World Water Day" and "National Urban Water-Saving Week" to educate the public on water resource conditions and water-saving tips, fostering water-saving habits and raising awareness about the importance of these practices.

Promote Water-Saving Appliances
Regular inspections of the domestic water appliances market should be carried out and the sale of non-compliant products should be prohibited. Low-water-consumption and water-recycling technologies or facilities should be encouraged in municipal and commercial services, while high-water-consuming equipment should be phased out gradually.

Improve Water Conservation Management Systems
Fuzhou will establish a comprehensive water conservation management system covering water extraction, supply, use, and discharge to ensure the implementation of water-saving actions. The system should enforce water conservation statistics, strictly implement tiered water pricing for residents, and progressive surcharge for non-residential overuse, guiding residents and enterprises to manage water consumption responsibly.

Upgrade Industrial Water Conservation Technology
Water usage in high-water-consuming industries should be limited to encourage the adoption of water-saving processes, technologies, and equipment. Model enterprises for industrial wastewater recycling should be recognized, while the industrial consumption of fresh water should be gradually reduced. Facilities for advanced wastewater treatment and reuse should be developed to increase the reuse rate of industrial water. Additionally, limiting the discharge of indirect cooling water and condensate can further promote wastewater recycling and reuse.

Continuously Develop Water-Saving Enterprises (Units)
The exemplary role of water-saving enterprises (units) should be strengthened to promote water management measures and water-saving technologies. Enterprises, units, and residential communities are encouraged to establish and refine water management systems, including water metering, water balance testing, water-saving technology upgrades, and water-saving education. These initiatives will significantly enhance water use efficiency and management, creating more water-efficient enterprises, institutions, and residential communities.

Leading Agency: Fuzhou Municipal Bureau of Housing and Urban-rural Development. Responsible Agencies: Fuzhou Municipal Water Resources Bureau, Fuzhou Municipal Development and Reform Commission, Fuzhou Municipal Bureau of Industry and Information Technology, Fuzhou Municipal Administration for Market Regulation, and relevant district governments according to their respective duties.

Increasing at least 15% of water supply

Fuzhou will take the following measures to ensure that the water supply capacity of its six urban districts will increase by at least 15% by 2030.

Optimize Water Resource Allocation
Key water diversion and storage projects, such as the Water Allocation Scheme of Pingtan and Minjiang River Estuary in Fujian Province, and Tangban Water Diversion Project Stage II, should be advanced to secure multi-source water supply, enhance regional capacity, and improve reliability under extreme climate conditions.

Upgrade Water Treatment Plants
The planning and expansion of new water treatment plants in urban areas, such as the Southeast Water Plant, Feifengshan Water Plant, and Changle Yuanhang Water Plant, should be guided by scientific principles. Promoting the upgrading of advanced treatment processes is also essential. Additionally, interconnected regional pipelines and booster pump stations should be constructed to enhance urban water supply capacity.

Strengthen Leakage Control
Fuzhou will continuously build intelligent and refined control systems to renovate water supply networks, upgrade secondary water supply facilities, and implement district metering management and pipeline network pressure control. These efforts aim to significantly reduce water leakage and increase the effective water supply capacity. By 2030, Fuzhou's water supply network leakage rate will be kept within 6%.

Enhance the Capacity for Non-Conventional Water

Supply
Non-conventional water resources, such as reclaimed water and rainwater, should be developed appropriately according to local conditions. The utilization rate of these resources should be increased, with expanded applications in urban areas. Reclaimed water can be used for ecological replenishment, landscaping irrigation, and vehicle washing. Industries capable of using reclaimed water in their production processes are encouraged to do so.

Leading Agency: Fuzhou Municipal Bureau of Housing and Urban-rural Development. Responsible Agencies: Fuzhou Municipal Water Resources Bureau and relevant district governments according to their respective duties.

SECURITY MEASURES

Clear Respective Responsibilities
The Fuzhou Municipal Urban and Rural Construction Bureau is responsible for coordinating and tracking the development of the water-safe city and liaising with C40. Each responsible unit should develop detailed implementation plans, create specific to-do lists for each task, and ensure their execution. To this end, a comprehensive mechanism should be established, with strengthened communication, information sharing, and efficient coordination among departments to advance related work collaboratively.

Increase Financial Support
Fuzhou will develop innovative financing mechanisms to strengthen financing entities and encourage private investment. Efforts should be made to apply for local government special bonds and to seek central and provincial grants for water conservation, drainage, flood control, and leakage management. Government authorities at all levels should optimize fund distribution and increase investment in urban water safety projects. Additionally, water prices should be adjusted as needed to cover the costs incurred by water supply enterprises. C40 will assist Fuzhou in connecting with domestic and international investment banks, multilateral development banks, and BRICS banks to introduce financing for international and domestic public infrastructure water safety projects.

Strengthen Public Awareness by Guidance
All responsible units should use communication platforms to educate the public on essential knowledge about flood and drought prevention, disaster mitigation, and water conservation in an engaging and understandable way. This education should be conducted through various channels and forms, aiming to increase public awareness and proactive participation in these areas, fostering a shared commitment to water conservation and safety.

COLLABORATION AND EXCHANGE

Annual Exchange of Work Information
Each year, Fuzhou will provide updates on water safety progress, including planned and completed work, outcomes, and exemplary cases, to the C40 Beijing Office.

Enhancement of Technology and Adaptive Capacity
In collaboration with C40, Fuzhou will research water supply network leakage control systems to achieve standardization, modularization, and systematization. With specialized technical assistance from C40, the city aims to meet the initiative's goal of reducing water demand by 20% by 2030.

Seeking Climate Adaptation Project Financing
Fuzhou and C40 will explore the feasibility of social financing for water safety and climate projects, engaging with relevant domestic and international investment institutions, such as multilateral development banks. They aim to develop financing models for these projects to reduce government fiscal pressure and accelerate climate adaptation actions.

Strengthening Domestic and International Exchange
Through the water safety initiative and the C40 international city network, Fuzhou will strengthen exchange and cooperation with domestic and international cities. This will be achieved through various means, such as online and offline meetings, field research, and sharing experiences and cases in disaster warning, water conservation, drought resistance, and government capacity building. These insights will help explore the feasibility of local implementation in Fuzhou.

Promoting Fuzhou and Facilitating International Cooperation
Fuzhou will share its successful experiences and technical solutions in water conservation, flood control, and comprehensive urban river system management through C40 and other international platforms. These Fuzhou-pioneered plans will be shared with countries and cities facing similar climate challenges, supporting the international growth of Fuzhou's related industries and technologies.

Jakarta

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

An early warning system to deal with flood disasters in the DKI Jakarta area was designed to provide information and advice to the public regarding predictions of flood disasters within a few hours before the disaster occurs. Also, it will use as a decision support system for local government of Jakarta city. In 2023, an early warning system is underway for the Ciliwung River as one of the main rivers in the DKI Jakarta area. This system is targeted to be finish on September in 2024 for whole 13 rivers flow to Jakarta City. In term of flood risk, this system is part of improving capacity index to decrease flood risk level.

To perform the flood early warning system, mapping of areas potentially affected by flooding was carried out using a hydrological application model and spatial model using ArcGIS, including low-income areas where generally these areas are densely populated areas. Area mapping is one of the considerations in providing flood warnings to people living in that area because nowadays there is not yet available for these people to get information about flood warning. For the implementation, further benefit will be utilized by municipal agencies such as sub-districts to provide early warning to the community, especially low-income communities who live in areas potentially affected by flooding.

Roadmap

First of all, as an initial step in controlling flooding in the DKI Jakarta area, a master plan roadmap for flood control and drainage development was prepared. The aim of preparing the roadmap is so that in the future a unified and comprehensive flood control system can be developed in the DKI Jakarta area. The roadmap contains flood early warning system, which the process of preparing an early warning system is carried out in the following stages:

- Setup of the existing Ciliwung River model in the DKI Jakarta area
- Setup model of the existing Ciliwung River upstream of DKI Jakarta
- Compile existing data and conduct field surveys to calibrate the model
- Calibration of flood modeling
- Running models and developing flood scenarios
- Create an Artificial Neural Network Model data base (including the polder area)
- Development of the EWS support model with the HECRAS + ANN combination concept
- Creation of an Early Warning System
- Model integration and output visualization (Hydro-informatic)
- Training and Socialization
- Launching the EWS program and updating the system

To realize the flood control master plan, coordination is required with various parties, both internal to the DKI Jakarta Provincial Government and external to the DKI Jakarta Provincial Government.

Financial structure necessary

Financing for flood early Warning System development activities uses the City Revenue and Expenditure Budget scheme.

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

One of the critical event that happened in DKI Jakarta is flood disaster. When the disaster happened, The emergency response carried out included establishing emergency posts in higher areas and deploying equipment and personnel to evacuate residents affected by the flood disaster, including the fulfilment of basic needs such as food and water for the residents.

The equipment used by the emergency team such as stationer and mobile pump, rubber boat, and

evacuation tent.

Roadmap

The strategies implemented to deal with critical conditions in Jakarta, especially flood disasters, include the establish a special disaster management team lead by National Disaster Agency that is ready to standby during the rainy season. Mobilization of teams and equipment also carried out immediately so there will no casualties.

Coordination and collaboration are required with various parties, both internal to the DKI Jakarta Provincial Government and external to the DKI Jakarta Provincial Government such as National Disaster Agency, Water Resource Agency, Development and Planning Agency, and Municipalities

Financial structure necessary

Financing for the emergency plan activities uses the City Revenue and Expenditure Budget scheme.

PATHWAY 1
Reducing at least 20% of water demand

Baseline

- Domestic regular house Water demand in Jakarta is stipulated as 150 l/person/day (Per Governor Regulation 122/2015), while the minimum service standard is 60 l/person/day.
- Nased on water supply masterplan, total water demand in Jakarta will be increased from 20.725 lps (2022) to 32.685 lps (2030) to achieve equitable universal access to clean water efficiently by 2030.
- Some strategies to be implemented are improving water supply capacity (WWTP and distribution pipe water), increasing number of new connection, reducing non revenue water and enhancing quantity, quality and continuity of pipe water services.

Roadmap

Currently with the domestic household water use, there's possibility to reduce it, through efforts being made at household level or high rise building. The road map will try to map out the existing conditions including the current infrastructure conditions and will try to set steps and targets on how to approach reduction of water demand.

Stakeholders will be on National and Provincial Level, involving Ministries such as Public Works, Industrial Ministry, Jakarta Government and Private Sectors (producers of water infrastructures).

Financial structure necessary

The finance structure will be through different scheme such as National Budget, Provincial Budget, PAM Jaya budget and Financial Loan through a B to B scheme.

Increasing at least 15% of water supply

Baseline

Jakarta's current piped supply coverage is currently at around 65%, with NRW rate at around 45%. The gap is supply is due to lack of raw water supply and piping network. Jakarta aims to achieve a 100% coverage and NRW rate of 30% by 2030 (2022: 46%, : 40%, 2030: 30%)

To increase the supply and coverage, several major projects will be undertaken such as increasing supply through Regional Water Supply Initiatives through SPAM Jatiluhur 1 and SPAM Karian-Serpong project, while also considering SPAM Djuanda.

Internally, Jakarta will also increase its water supply resilience through SPAM Buaran 3, SPAM Pesanggrahan and SPAM Ciliwung Projects, while addressing the NRW issues through maintenance and replacement of existing pipes, and through other initiatives.

Roadmap

The road map for increasing water supply is laid out in the Water Supply Masterplan for Jakarta. This Master Plan will outline the steps/projects to be carried out for the next 20 years.

Major stakeholders for the road map are the central government through Ministry of Public Works and Housing, The National Planning Agency; the government of Jakarta through Department of Water Resources and The Board of Monitoring for Local Owned Enterprise, PAM Jaya (Local Owned Water Supply Company).

Partnerships will be carried out through financial collaboration with private entities and also creating work agreement to implement the projects.

Financial structure necessary

The finance structure will be through different scheme such as National Budget, Provincial Budget, PAM Jaya budget and Financial Loan through a B to B scheme.

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Baseline

To increase 20% retention and infiltration of rainwater, a solution was implemented in the form of a Natural Base Solution (NBS) by building storage ponds around river border areas. Storage ponds in the southern area of DKI Jakarta can be used as water parking and as absorption areas to anticipate flood disasters downstream. Apart from that, the pond in the northern area of DKI Jakarta functions as a polder. One of the largest polder in Jakarta is the Pluit Polder which is integrated with the Ciliwung River basin. The polder has total capacity of 111 m3/second which functions to pump flood storage into the Java Sea. The storage catchment area is 3048.651429 Hectares.

Roadmap

The step taken by DKI Jakarta in realizing the construction of storage ponds around the river border area is to analyse the availability of land around the river border area which can be used as an absorption pond. After collecting data regarding the location of areas that allow the construction of absorption ponds, a masterplan for the construction of these absorption ponds will be the guideline. The roadmap defines into three part including drainage, polder, and river. This roadmap will be done in 2026.

Financial structure necessary

Financing for Natural Base Solution development activities uses the local Revenue and Expenditure Budget scheme.

Restoring at least 3 of the city's water bodies (such as rivers, creeks, and wetlands) to significantly reduce flood risks and improve water quality.

Baseline

Several storage ponds have been built which function as absorption ponds around the river area, including:

• Brigif Reservoir (total area 10 hectares / flood reduction around 300,000 m3) in the Krukut River basin
• Lebak Bulus Reservoir (total area 3.5 Hectares / flood reduction around 175,000 m3) in the Grogol River basin
• Pondok Ranggon Reservoir (total area 17 Hectares / flood reduction around 1,000,000 m3) in the Sunter River basin
Apart from being a water catchment area, this storage pond can also be used as an ecosystem restorer, recreational, and reservoir.
For the next target, there will be more reservoirs build in Jakarta area such as Pesanggrahan River Basin, Krukut River Basin, and Sunter River Basin.

Roadmap

Construction of storage ponds in the DKI Jakarta area using Nature Based Solutions (NBS). In the future, the construction of storage pools will refer to the master plan for the development of storage pools which is still in the drafting stage. The master plan also lists blue and green locations in the DKI Jakarta area as retention areas. In preparing the master plan, coordination was carried out with various parties such as BBWS Ciliwung Cisadane.

Financial structure necessary

Financing for storage pond construction activities uses the City Revenue and Expenditure Budget scheme.

CORE REQUIEREMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

Lisbon (approx. population 550 000) is located on the right bank of the Tagus River Estuary, having a significant riverfront. In addition to this location, Lisbon is built on a structure of hills and valleys, with a very rich network of water courses. These have been artificialized into the city's (unitary) drainage network, increasing the flooding risk (14% of the city is classified as a flooding area, which affects 192 000 residents (35% of the total) and 21 000 buildings (40% of the total).

Bearing in mind these specific characteristics:

- A flood monitoring, warning and alert system already exists in the city of Lisbon.
- This system is being run in cooperation with the regional monitoring, warning and alert system, managed by the Portuguese Institute for Sea and Atmosphere (IPMA), in articulation with the National Authority for Emergency and Civil Protection (ANEPC) and Nacional Environmental Agency (APA).
- At city level, in Lisbon, the system is run by the Civil Protection Services of the Municipality of Lisbon, and relies on a network of monitoring and communication tools, as well as operational services.
- The Sensor Network for Monitoring and Early Warning of Floods in Lisbon (with 80 stations) feeds data to PGIL (Lisbon's Smart Management Platform), which, through a set of data analytics, sends alerts to different municipal services, such as Environment, Sanitation, Civil Protection, Police and Firefighters, among other.
- This strategy began to be outlined in 2012, with the approval of the Municipal Master Plan of Lisbon, followed by the Municipal Strategy for Adaptation to Climate Change.

This system targets critical flooding areas, regardless of the income of its inhabitants. Having an universal reach, comprises all the territory of Lisbon, including the most vulnerable communities at high-risk of flooding.

Roadmap

Based on the commitments made in the various approved master planning instruments, an action strategy has been defined that aims to intervene in areas at risk of flooding due to precipitation and/or tidal effects, to reduce their impacts. In addition to the documents described above, Lisbon's Drainage Master Plan (PGDL) and RESCCUE Resilience Action Plan are worth highlighting. During the last years, in order to adresse some of the identified weaknesess in this plan, the Lisbon Municipality, in collaboration with other authorities/ stakeholders, implemented:

- Environmental sensor monitoring for the citizens (platform)
- Tsunami warning and alert system in outdoors
- Tunnel monitoring systems (drainage network), in use by the Municipality
- Flood data catalogue

Main Stakeholders involved In this strategy include water and sanitation management entities, national public services (APA, IPMA, National Authority for Emergency and Civil Protection (ANEPC), universities (FCUL, IST), research centers (LNEC, municipal technology and information services (PGIL), Focus BC, municipal services (Lisbon Municipality, parish councils) and other partner entities (Lisboa E-Nova).

Financial structure necessary

The financial provision for the implementation of the actions of the road map to move toward this target in two years is foreseen in the Municipal Budget 2023-2027 and in the Strategic Planning Guidelines of the Municipality of Lisbon 2023-2027 (GOP 2023-2027). The GOP 2023-2027 encompass the Multiannual Investment Plan of the City, which comprise the projects and actions to be implemented during this period, as well as the financial resources.

These measures are foreseen in the Climate Action

Plan 2030, as well as in the more recent City Climate Contract, and their financing is included in the financial instruments mentioned above.

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

As mentioned before there is already a flood sensor system implemented in the city of Lisbon.
Despite that, the Lisbon Municipality intents to:

- Increase the flood sensor system
- Focus in the high and medium risk flood areas
- Make compatible sensor networks with the existing ground stations
- Allow real-time monitoring
- Early detection of extreme weather events with potential risk and high impacts in terms of finance/economic, social, political, environment and heritage
- Have the first urban tunnel sensors network that will be used to create a pilot project dashboard with outdoors panels (with metrics and indicators) to test the Municipal Civil Protection alarm system in flooding events

This work is being promoted within the scope of Risk Monitoring, Planning Prevention and emergency, through the Municipal Civil Protection Service, the Sanitation Department and the Special Unit for Drainage Master Plan.

Roadmap

In the scope of the implementation of the Climate Action Plan the Lisbon Municipality aims to:

- Continue the ongoing warning, alert and monitoring system, with the reinforcement of monitoring stations at critical points.
- Continue the implementation of the Lisbon Drainage Master Plan, currently ongoing, reinforces this strategy.
- Involvement of Key Stakeholders.

The key stakeholders Involved in this strategy include:

- Water and sanitation management entities
- National public services (APA, IPMA, National Authority for Emergency and Civil Protection (ANEPC)
- Universities (FCUL, IST)
- Research centers (LNEC, technology and information services (PGIL)
- Focus BC
- Municipal services (Lisbon Municipality with all units, parish councils)
- Partner entities (Lisboa E-Nova).

The reinforcement of partnerships is being guaranteed by protocols, commitments, consortium partners and other type of events targeted to different public focus on the emergency cycle in climate change scenarios, Prevention, Planning, Emergency/ Response, Rehabilitation/Build Back Better.

In order to strengthen the capacity to respond to a "critical event" and protect the vulnerable population, the Lisbon Municipality activates the approval of the emergency structure foreseen in the Municipal Civil Protection Emergency Plan.

Financial structure necessary

The financial provision for the implementation of the actions of the road map to move toward this target in two years is foreseen in the Municipal Budget 2023-2027 and in the Strategic Planning Guidelines of the Municipality of Lisbon 2023-2027 (GOP 2023-2027). The GOP 2023-2027 encompass the Multiannual Investment Plan of the City, which comprise the projects and actions to be implemented during this period, as well as the financial resources.

PATHWAY 1
Reducing at least 20% of water demand

Baseline

The city of Lisbon has its current water consumption and its disaggregation per uses and water source public. The data is published in the Lisbon Observatories (https://observatorios-lisboa.pt/en/info_agua.html), a public platform developed by Lisboa E-Nova, with the support of the Municipality of Lisbon and EPAL, the water supplier for the city. Additionally, it is complemented by a bottom-up approach tool to monitor all water meters of the Municipality and its partners, which has a reserved access.

Therefore, these tools are data visualization instruments to monitor and communicate performance, support urban planning and decision making and can be used to systematise, collect and facilitate access to data at city level and single users/ consumers' level.

Roadmap

In cooperation with its partner EPAL, the water supplier of Lisbon, the city aims at continuing to provide high quality water, which can be affected in a context of growing water scarcity scenarios, as foreseen by climate models.

The priority actions and investment, focused on the

water sector, are as follows:

- Build zero-waste rainwater and/or zero-wastewater prototypes (e.g.: gardens, buildings, etc.).
- Continue the implementation of smart, automated irrigation management systems.
- Continue the expansion of the reclaimed water network and increase the use of water from alternative sources for non-potable uses, although these are not actions to reduce the global water demand, but only the potable water use.
- Keep a good maintenance and repair program of water infrastructure.
- Keep the water resources quality monitoring program in public spaces.
- Expand the smart meters use in big water consumption equipment.
- Expand the water consumption monitoring with smart metering (connected to the Lisbon Observatories, mentioned above).
- Evaluate the reduction impact of efficiency measures.
- Develop (conclude) and implement the Strategic Plan for Water Use in Lisbon
- Install new drinking fountains with smart metering, renovate and ensure the functioning of existing ones.

Stakeholders involved include:

- Water utilities (EPAL and AdTA)
- Public authorities (local, regional and national level)
- Research institutions and Universities
- End consumers/civil society

FInancial structure necessary

The financial provision for the implementation of the actions of the road map to move toward this target in two years is foreseen in the Municipal Budget 2023-2027 and in the Strategic Planning Guidelines of the Municipality of Lisbon 2023-2027 (GOP 2023-2027). The GOP 2023-2027 encompass the Multiannual Investment Plan of the City, which comprise the projects and actions to be implemented during this period, as well as the financial resources.

These measures are foreseen in the Climate Action Plan 2030, as well as in the more recent City Climate Contract, and their financing is included in the financial instruments mentioned above.

Increasing at least 15% of water supply

Baseline

The Water supply company of Lisbon (EPAL) already achieved an accessibility of 100% of water supply to customers. This indicator is monitored annually and published by the National Regulatory Entity for Water and Waste Services (ERSAR).

In any case, to face the increasing extreme events, especially droughts, the city of Lisbon intents to implement measures to secure the water supply, by replacing the current use of potable for alternative non-potable water in the non-potable uses, such as irrigation of green areas and street cleaning. Therefore, increasing the resilience and redundancy of the water supply system.

Rroadmap

Roadmap/action plan is being updated from a previous document (Strategic Plan for Water Use), and aims at diversifying non-potable, alternative water sources.

Identify possible alternative sources, namely:
- Reclaimed Water
- Rainwater
- Spring Water
- Groundwater
- Stormwater
- Water Mining (e.g.: from subway tunnels/stations)

Identify all non-potable uses of the city.

Match all alternative water sources with non-potable uses.

This ongoing strategy values quality control from different water sources, monitored by the municipal water and food laboratory, in collaboration with educational institutions, research institutions and water and sanitation management entities.

Stakeholders involved include:
- Water utilities (EPAL and AdTA)
- Public authorities (local, regional and national level)
- Research institutions and Universities
- End consumers/civil society

FInancial structure necessary

The financial provision for the implementation of the actions of the road map to move toward this target in two years is foreseen in the Municipal Budget 2023-2027 and in the Strategic Planning Guidelines of the Municipality of Lisbon 2023-2027 (GOP 2023-2027). The GOP 2023-2027 encompass the Multiannual Investment Plan of the City, which comprise the projects and actions to be implemented during this period, as well as the financial resources.

These measures are foreseen in the Climate Action Plan 2030, as well as in the more recent City Climate Contract, and their financing is included in the financial instruments mentioned above.

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk.

Baseline

As mentioned before, Lisbon is built on a structure of hills and valleys, with a very rich network of water courses. These have been artificialized into the city's (unitary) drainage network, increasing the flooding risk (14% of the city is classified as a flooding area, which affects 192 000 residents (35% of the total) and 21 000 buildings (40% of the total).

The Municipal Master Plan, the Municipal Emergency and Civil Protection Plan, the Climate Action Plan and the Metropolitan Plan for Adaptation to Climate Change already include areas of flooding risk due to precipitation, tidal effects, tsunamis and also include landslides (GIS maps).

Roadmap

To significantly reduce flood risk and increase stormwater retention and infiltration, the Municipality of Lisbon developed the General Drainage Master Plan 2016-2030. The Drainage Master Plan consists of a set of measures to protect the city and its inhabitants from extreme flooding events, which is being implemented:

- Improvement of the drainage system.
- Construction of retention basins.
- Construction of 2 main drainage tunnels.

Financial structure necessary

The financial provision for the implementation of the actions of the road map to move toward this target in two years is foreseen in the Municipal Budget 2023-2027 and in the Strategic Planning Guidelines of the Municipality of Lisbon 2023-2027 (GOP 2023-2027). The GOP 2023-2027 encompass the Multiannual Investment Plan of the City, which comprise the projects and actions to be implemented during this period, as well as the financial resources.

These measures are foreseen in the Climate Action Plan 2030, and their financing is included in the financial instruments mentioned above.

Restoring at least 3 of the city's water bodies (such as rivers, creeks, and wetlands) to significantly reduce flood risks and improve water quality.

Baseline

Lisbon has small bodies of water on the surface, most of which have been artificialized. In alignment with the city's green strategy and sanitation strategy, the aim is to restore these bodies of water.

At a metropolitan level, the identification of these bodies of water is underway and a strategy is in progress to prioritize actions to reduce flooding with the involvement of neighbor municipalities.

The 3 areas of intervention under consideration are:
• Trancão river basin (Lisbon, Loures, Mafra and Vila Franca de Xira)
• Ribeira de Algés (Amadora, Lisbon, Oeiras)
• Caneiro de Alcântara (Amadora, Lisbon)

Roadmap

Given that the identified territories cover more than one municipality, a Metropolitan Spatial Planning, Environment and Urbanism working group was created. The following questions are being addressed in this group:

- Critical areas for planning the Adaptation and Risk Mitigation Intervention Plans
- Terms of Reference for the preparation of Adaptation and Risk Mitigation Intervention Plans
- Financing (priority investment)
- Monitoring

In order to restore the 3 water bodies identified, the Lisbon Municipality has been applying natural based solutions, in order to increase the adaptation, combining the green and blue infrastructures. This type of actions will be further implemented in future restoration of water bodies.

Financial structure necessary

The financial provision for the implementation of the actions of the road map to move toward this target in two years is foreseen in the Municipal Budget 2023-2027 and in the Strategic Planning Guidelines of the Municipality of Lisbon 2023-2027 (GOP 2023-2027). The GOP 2023-2027 encompass the Multiannual Investment Plan of the City, which comprise the projects and actions to be implemented during this period, as well as the financial resources.

Los Angeles

CORE COMMITMENT
Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs.

Baseline

The current version of the City's Local Hazard Mitigation Plan by the Emergency Management Department could be used as the baseline of emergency response for the City.

Roadmap

Initiatives like the 2023 update of the City's Local Hazard Mitigation Plan is being developed. This Plan will identify and assess hazards to which the City is most vulnerable and develop mitigation strategies to reduce its vulnerability to the risks inherent in natural and other hazards.

City Departments and the public are important stakeholders in the development of the latest update to the Plan.

Financial structure necessary

Ongoing initiatives can be planned in the City's budget.

PATHWAY 3
Achieve net-zero greenhouse gas emissions in city water and wastewater systems by 2035.

Baseline

Following the LA100 Study, Los Angeles City Council established an accelerated goal for all of the city's electricity to come from zero-carbon energy by 2035. Since LADWP supplies power to the City's water and wastewater system, the 2022 Power Strategic Long-Term Resource Plan (SLTRP) establishes the city's current baseline and analyzed pathways for achieving this goal.

Roadmap

The 2022 SLTRP provides a roadmap for meeting LA's future energy needs and includes assessments of the feasibility of reaching 100% carbon-free energy by 2035.

Advisory Group members consist of various stakeholders from city and state entities, and non-governmental agencies. A 2024 SLTRP is currently in progress.

Financial structure necessary

Financial analyses is ongoing to determine rate impacts to customers. The City is looking into emerging legislation that will help provide financial resources to meet these goals.

Recently, LADWP was approved to receive $48B in federal dollars to ensure LA has access to affordable, reliable, clean energy.

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Milan

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

CURRENT STATUS
Currently, the Municipality of Milan uses early warning system to inform citizens about the risk of flooding of waterways in the city and about the danger of adverse weather and climate conditions.

PLANNED ACTIONS
to achieve the objectives set by the C40 Water Safe Cities Accelerator, the Administration is drafting the Municipal Civil Protection Plan. Following a detailed study of the city and its inhabitants, this Plan systematizes and coordinates all the actions necessary to prevent (where possible) disasters, to reduce their damage and impacts on the territory and citizens, and to manage emergencies and overcome them.

The drafting of the Civil Protection Plan therefore represents the systemic approach adopted by the administration in order to reduce the impacts of disasters and increase community resilience. Specifically:

1. The Plan will make it possible to carry out a detailed and up-to-date mapping of all areas at risk; It is assumed that this phase will be completed with the development of updated risk maps for all risk scenarios by 2026

2. As each risk scenario is updated, the implementation of early warning systems will be widespread throughout the territory, reaching all citizens who are in risk-prone areas. In addition, these systems will be implemented not only for flood hazard but for all risks that are susceptible to forecasting, such as the aforementioned adverse weather/climate hazards and drought risk.

The early warning systems will target all citizens, not only those in conditions of economic vulnerability. However, the Administration will take special care to facilitate access to information for the latter.

Roadmap

In order to warn citizens about the danger of floods and droughts at an early stage, it is necessary to carry out a detailed analysis of these dangers and of the socio-economic-cultural conditions of the community. The drafting of the Civil Protection Plan will make it possible to achieve these objectives.
The road map of its preparation can be briefly divided into the following phases and macro-activities:

1 . Cognitive phase and elaboration of risk scenarios
- It consists of an in-depth cognitive study of the territory, of the dangers to which it is subject, of the calamitous events that occurred in the past and in general of all the events that can produce harmful effects on people, the environment and the buildings; it also provides for an analysis of the exposure of the various dimensions of buildings, infrastructures, population, etc., the vulnerability related to each specific danger, thus allowing the creation of risk maps, a fundamental part of the Civil Protection Plan;

2. Proposals for identified risk reduction projects
Following this detailed analysis of the territory, the Plan provides the data and knowledge necessary to plan adequate prevention, protection and mitigation of the identified risks;

3. Definition of intervention models
The intervention model is then defined for the management of the emergency, i.e., the preparation and coordination of relief interventions, and for the overcoming of the emergency, i.e., the measures necessary for the return to normalcy.

4. Information to the population
The development of the Plan does not end with its drafting. Its effectiveness will be measured not only through the quality of its structure and content, but also through the level of dissemination, understanding and awareness (effective information) by the population. In fact, the final stage will be to convey the contents of the Plan to citizens, in order to make them aware of the risks present in the area in which they live, work or study, and about the correct self-protection behaviors to be implemented in case of a calamitous event.

The KPI that will be used to test the effectiveness of the measures put in place regarding early warning and will mainly concern:

- the verification of the improvement of the current dissemination of information, through the monitoring by the municipal administration of the increase in citizens' adhesions to early information systems, in order to get to inform all citizens who are in areas at risk (widespread information)

- the adequacy of the intervention models: also following the population information campaigns (see point 4 above), questionnaires will be administered to citizens to assess the clarity of the early warning notices and the understanding implementation of the indications contained therein.
The stakeholders that will be involved in the drafting of the Civil Protection Plan will be:

- All Departments of the Municipality of Milan, especially: Urban Regeneration, Green and Environment, Mobility, Technical and Digital Innovation

- the investee companies of the Municipality of Milan: AMAT Srl (Urban planning, Environment and mobility), MM SpA (Management of integrated water service, management of subway lines, management of public housing and schools), A.T.M. SpA (Management of public transport), SPV LINEA M4 SpA (management of subway line no. 4) S.E.A. SpA (airport and air traffic management), A2A SpA (Management of electricity distribution networks, gas, waste management), MilanoSport SpA (management of municipal sports centers), Milano Ristorazione S.p.A. (supply of meals to schools and other public and private entities), SO.GE.M.I. S.p.A. (Management of wholesale markets), A.F.M. S.p.A. (Management of municipal pharmacies).

- Institutions: Metropolitan City of Milan

- Components and operational structures of the civil protection system: fire brigade, health rescue, local police, etc. - Scientific community: Milan Polytechnic Foundation (University Foundation)

- Citizenship.

Financial structure necessary

The economic resources necessary for the development of the project are entirely borne by the city administration, which has allocated funds dedicated to this issue.

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

The Civil Protection Plan will provide information on how to implement all the necessary emergency response measures in the event of a disaster. By way of example, here are two specific aspects:

1. the Civil Protection authorities will also be able to ensure support to the population in terms of meeting basic needs also through the study of the CLE ("Limited Condition for Emergency") contained in the Civil Protection Plan. The CLE will identify the strategic facilities that must remain operational even in the event of a disaster and the connections between them that must be ensured for the functioning of the relief apparatus;

2. additionally, through the intervention models, the Civil Protection Plan will specifically define the emergency areas (safe areas) where the evacuated population can be hospitalized following a disaster.

Roadmap

The objectives defined by Target 2 will be achieved through the drafting of the Civil Protection Plan. Therefore, the road map for achieving them corresponds to the development of the Plan itself. The KPIs that will be used for this target include the evaluation of the effectiveness of emergency response operational models. In particular, they will have to be flexible and adapt to the unforeseen and unpredictable conditions typical of each calamitous event.

Financial structure necessary

The economic resources necessary for the development of the project are entirely borne by the city administration, which has allocated funds dedicated to this issue.

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Baseline

The territory of Milan is very vulnerable to the flooding of the rivers crossing the city. The city of Milan is crossed by several watercourses: 9 rivers, 3 canals 'Navigli' and a dense network of irrigation ditches. Only 2 of the 9 rivers create significant flooding problems: the Seveso torrent and the Lambro river. Using a two-dimensional hydrological-hydraulic model, watersheds and overflow areas and hazard and risk maps have been defined. The maps are shown in maps G13 and G15 and in Annex 8 of the City Masterplan (PGT). https://www.pgt.comune.milano.it/componenti-geologica-idrogeologica-e-sismica

The hazard levels of the main watercourses have been articulated according to the following categories: - hazard P3 (High), frequent flooding, return time T = 10 years;

- hazard P2 (Medium), infrequent floods, return time T = 100/200 years;

- hazard P1 (Law), rare floods or extreme event scenarios, return time T = 500 years.

Events with return period below 100/200 years (in relation to the waterbody), should be managed with infrastructure (green and grey).

In 2009 the first "Agreement for the hydraulic protection of the city of Milan" was signed between the Region of Lombardy, Milan Metropolitan Area, the Municipality of Milan and the AIPO (Po River Interregional Authority). As a result of this agreement, a programme of different interventions was developed to reduce flood risk in the Milanese area.

In particular, Seveso torrent doesn't have a real natural hydrological basin, but flood waves mainly derive from the overflow discharges of the mixed sewerage networks that collect rainwater from the municipalities located along the watercourses upstream the city of Milan.

The 2009 Agreement planned, 7 natural river expansion areas and 4 lamination basins along the Seveso torrent to reduce flood risk. One of them is located within the municipality of Milan. This basin is currently under construction and will contribute to the reduction of flooding in the city of Milan and in particular in the peripheral district of Niguarda, with a retention volume of 250.000 cubic meters. With the construction of all the planned basins, the risk of flooding for events up to a return time of 100 years is expected to be eliminated.

In order to increase stormwater retention and infiltration and reduce flood risk, the Region of Lombardy adopted a specific regulation (R.R. no. 7/2017), which imposes the 'hydraulic invariance principle' in all new constructions and significant renovations. Hydraulic invariance principle means that all rainwater falling on the area to be urbanised must be infiltrated or retained on site as before urbanisation. The regulation is currently under adoption and the first hydraulic invariance systems (sustainable urban drainage systems as detention and infiltration systems) are being implemented. Currently, few of them have been implemented.
The Region of Lombardy constantly updates a database (called INVID), which contains the main details (impermeable drained area, retention volume, infiltration discharge, etc.) of all the new stormwater infiltration and lamination systems realized.
At this stage (actual BASELINE) in the city of Milan there are about 90 Private Sustainable Urban Drainage Systems (SUDS) for lamination and infiltration of stormwater:

- 30% provides treatment systems, retention and infiltration of stormwater into the soil and subsoil for a total volume of 11,800 cubic meters;

- 68% provides lamination tanks with discharge into the mixed sewage system;

- 2% provides lamination basins with treatment systems and discharge into natural watercourses.
Recently, the Region of Lombardy adopted another specific regulation (R.R. no. 6/2019), aimed at achieving the environmental objectives set out in Directive 2000/60/EC and in particular the improvement of water quality, the protection of watercourses receiving discharges from the sewage system, the containment of pollutants and the maintenance of the functionality of the sewerage and treatment system. In particular, the regulation establishes discharge limit values in qualitative and quantitative terms for the overflow spillways of the municipal mixed sewerage network through the construction of retention, treatment systems and spillway basins.

In compliance with this regulation, MM, the public water operator of the city of Milan, which also manages the sewerage network, has elaborated the "Sewerage and spillway redevelopment programme", after a detailed survey of the infrastructure and the results of hydraulic modelling. This programme defines the timing of implementation taking into account priority criteria. The redevelopment programme envisage considerable investments estimated at approximately 210 Million euro of works. By 2030, planned works include: the construction of 2 stormwater lamination tanks just upstream of two treatment plants of the city of Milan (Nosedo and San Rocco) and the construction of phytodepuration systems on some of the sewage network spillways according to the priority criteria indicated in the programme.

Roadmap

The application of these two aforementioned regional regulations (R.R. no. 7/2017 and R.R. no. 6/2019) will allow the achievement of the required goal of increasing at least 20% of stormwater retention and infiltration and significantly reduce flood risk by 2030, given that there are currently very few cases of stormwater lamination and/or infiltration systems in the city (BASELINE).
In order to check the progress of how many SUDS are already completed and to monitor the achievement of the target, the Regional Database (INVID), will be downloaded, consulted and analysed once a year with the production of a summary report of key data. As

this regulation has only been in force for a few years, not many systems have been implemented to date. The Municipality of Milan also has its own planning tools for increasing stormwater lamination and/or infiltration in public space that envisage the adoption of Natural Based Solutions (NBS) for sustainable drainage systems (SUDS): PAC: Air and Climate Action Plan: In the field of action 'Cooler Milan', various actions for re-naturalising the city are considered to achieve the goal of reducing the temperature increase and containing the urban heat island phenomenon, such as green roofs and walls, de-paving, tree planting in car parks and schoolyards. Two actions are significant:

– Action 4.3.1: De- paving of 50% of the urban grey impermeable areas by 2030;

– Action 4.3.2: Reduction of hydraulic risk and decrease of rainwater drained by the sewer system with SUDS (creation of a 'Sponge city').
"Guidelines for the design of sustainable stormwater drainage systems within the municipal territory" developed in collaboration with MM, which illustrate the main types of SUDS to be adopted and their design criteria;

"Public Space Guidelines" to give precise indications to both the private sector and the municipality for the planning, design and implementation of public spaces, also considering NBSs, de-paving projects and SUDSs.
City Master Plan (called PGT): Art.10 'Environmental Sustainability and Urban Resilience' defines new sustainability standards, both for new buildings and for the regeneration of existing ones. The article regulates the achievement of the RIC, a climate impact reduction index, understood as the ratio of green surfaces to the area of the intervention, with a catalogue of solutions that includes various kinds of permeable surfaces - green or semi-green - on land, green roofs and walls, underground roofs, etc.
City Master Plan (PGT): Table S03 "Green and blue infrastructure and municipal ecological network" of the City Masterplan indicates the priority areas where interventions for reducing hydraulic risk should be implemented.

In order to increase of at least 20% the stormwater retention and infiltration by 2030 to significantly reduce flood risk, the Environment Department of the Municipality of Milan will involve other municipal departments, such as the Urban Regeneration Department, Mobility Department, Civil Protection, as well as the public water operator of the city of Milan (MM) and the Region of Lombardy (which drafted the hydraulic invariance regulation), and private operators. Technical tables are already planned for Action 4.3.1 and 4.3.2 of the PAC.

The KPI will be the increase in volume of laminated and/or infiltrated stormwater compared to the baseline, which is currently zero.
In order to monitor KPI and the progress of the actions to reach the target, the Municipality will use different tools such as:
Regional database containing the main information (extension impermeable area drained, lamination volume, etc.) of the new stormwater infiltration and lamination systems – SUDS - as required by the R.R. no. 7/2017; Monitoring system of the Air and Climate Action Plan, Action 4.3.1. and 4.3.2;
Progress of the realisation of the basins and lamination areas along the rivers involved in the "Agreement for the hydraulic protection of the city of Milan" of 2009 between the Region of Lombardy, Milan Metropolitan Area, the Municipality of Milan and the Po river Interregional Authority (AIPO) described during the technical and institutional periodic meetings;
Progress of the "Sewerage and spillway redevelopment programme" developed by MM in compliance with R.R. no. 6/2019.

Financial structure necessary

Stormwater run-off and infiltration systems planned in large urban transformation projects and in private areas will be financed by the operators themselves. Some sustainable drainage systems in public areas will be implemented directly by MM as maintenance works of the sewerage network and will be financed with the water service tax.

The lamination basins along the watercourses currently planned and realised are financed with government, regional and municipal funds. The Municipality has financed the construction of a basin along the Seveso stream with a budget of EUR 10 million.

At the same time, the Municipality will identify a budget to allocate to de-paving and de-sealing interventions and look for funds for small interventions (e.g. European funds for NBS, sponsoring, etc.).

New Orleans


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CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

The City of New Orleans operates an Automated Flood Warning System that monitors rainfall and flooding conditions at known vulnerable roadway locations and provides real-time, on-site road hazard warnings as well as transmitting alerts to city emergency managers. The Flood Warning System is complimented by the city's WeatherSTEM network of 20 localized, meteorological monitoring stations, which also provide early warning of potential flood hazards.

The City provides early warnings of threats and hazards to the public through the Office of Homeland Security and Emergency Preparedness (NOHSEP)' Public Engagement Branch, NOLA Ready. NOLA Ready provides a direct connection between NOHSEP and the city served, striving to ensure that New Orleanians are prepared and connected to emergency information before, during, and after disasters. Through year-round public engagement, the NOLA Ready team communicates all-hazards to residents, businesses, and community organizations in Orleans Parish.

NOLA Ready recognizes the need for a comprehensive, holistic approach to engaging the public and breaking down silos that may traditionally exist between communications, community outreach, government, and accessibility. Also recognizing that pre-existing inequities are exacerbated during emergencies, NOLA Ready works with a wide range of partners to pursue the core values of diversity, equity, and inclusion. NOLA Ready's core strategy is to consistently deploy communications that are values-based and solutions-oriented. The result is emergency messaging that is easy to understand and participate in, and which fosters residents' commitment to connecting with emergency information.

While NOLA Ready can utilize the national Wireless Emergency Alert System (EAS) to issue emergency notifications to the public, NOLA Ready provides early warnings of threats and hazards through what is locally known as the "NOLA Ready text alerts," an opt-in text short code EAS that currently reaches 284,331 cell phone users throughout New Orleans. The WEA and the NOLA Ready text alerts complimented by their use of social media, coordination with traditional media, and direct community outreach and training presentations to disseminate timely, relevant, and accurate public information.

In addition to outreach and engagement, NOLA Ready maintains more than one hundred relationships with nonprofit groups that identify as Voluntary Organizations Active in Disasters (VOAD). These VOAD groups activate during grey skies disasters to directly support residents in disaster response and complement City of New Orleans response efforts. Check out the Disaster Partners page for a full list of our community partners.

NOLA Ready also maintains a volunteer corps of 3,000+ members. The NOLA Ready Volunteer Corps (NRVC) was formed in June 2020 in response to the COVID-19 pandemic and the need for a more expanded City-based volunteer group. Since its formation, NRVC has supported the City of New Orleans with emergency activations and public safety support, including but not limited to:

- City Assisted Evacuation Exercises
- COVID-19 Testing, Outreach, & Vaccines
- Hurricane Supply Distributions
- Hurricane Ida Cooling Centers
- Emergency Sheltering
- Mardi Gras First Aid Stations

Roadmap

Develop a plan to maintain and expand the city's early warning systems. The plan would identify high-risk areas for potential future flood warning sensor installations, and would provide recommendations on technical specifications, staff and budget needs, and data management to maximize the utility of the system.

Build partnerships with local community stakeholders

such as The Water Collaborative, Ripple Effect, and Center for Sustainable Economic Development (CSED) to develop a robust, holistic community outreach strategy that includes community meetings, trainings, seminars, etc.
The City will also utilize NRVC volunteers for neighborhood canvass operations that target low-income communities that are at higher risk for flooding and/or drought.
In partnership with the Office of Economic Development, NOHSEP launched the Partners in Preparedness small business resilience program, which will engage with local small businesses to help them develop their preparedness and response plans.
The City will work with community stakeholders to expand the existing NOLA Ready initiative, "Ready for Rain," which aims to educate residents about their flood risk and encourage property owners to seek property insurance for flooding.
NOLA Ready will work with community-based organizations like Together New Orleans and Krewe of Red Beans in developing a workshop training series to expand community capacity for emergency response. This working training series will prioritize low-income communities with high flooding risk, as well as other underserved communities in New Orleans.

Financial structure necessary

- Many of the city's emergency preparedness and response functions are supported by the city's annual operating budget.
- The City has pending grant applications through Hurricane Zeta and Ida HMGP that would support the Partners in Preparedness small business resilience program.
- Since we completed the installation of the AFWS in 2019, securing recurring funding for maintenance and expansion of the system has continued to be a challenge.
- Once a road map has been established, the City will work with stakeholders to identify financial opportunities through local philanthropic foundations such as Foundation for Louisiana, Greater New Orleans Foundation, etc.

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

In all of our planning, NOHSEP considers the needs of vulnerable populations within the community and seeks to address those through planning, engagement, and resources. The city's Comprehensive Emergency Operations Plan (CEOP) guides emergency response operations for all events, including floods. The CEOP and its component plans cover such topics as disaster resource centers, emergency resource distribution, temporary shelters, city-assisted evacuation, and post-disaster recovery coordination. The CEOP and each of its sections are revisited and updated annually by NOHSEP to account for changes in resources, capabilities, strategies, and vulnerabilities. A copy of the CEOP is being submitted with this template.

NOHSEP uses a variety of outreach and community capacity-building strategies to engage and serve vulnerable populations. NOHSEP and the NOHD work in close coordination with the Office of Homeless Support Services to engage with unhoused persons. NOHSEP created a new full-time Access and Functional Needs Coordinator position to focus on strategies to meet the needs of vulnerable individuals during disasters.

Since Hurricane Ida in 2021, the City developed the Emergency Resource Center (ERC) plan. ERCs are designed to provide residents access to information, community, and disaster resources. For example, during the unprecedented extreme heat/drought throughout the City in the summer of 2023, the City activated its ERC plan to keep city recreation centers open 7 days per week to provide resources such as water distribution. These ERCs would be activated in a long-term recovery situation from a major flood.

Roadmap

- Together with the CEOP, the city's Comprehensive Recovery Framework and Hazard Mitigation Plan outline a governance structure, identify stakeholders and outline stakeholder engagement strategies, and include action items with milestones and key performance indicators.

- NOHSEP facilitates several stakeholder groups to develop, implement, and update these plans, including the Recovery Advisory Committee, the Hazard Mitigation Planning Committee, and the Local Emergency Preparedness Committee.

- NOLA Ready will work with community-based organizations like Together New Orleans and Krewe of Red Beans in developing a workshop training series to expand community capacity for emergency response.

Financial structure necessary

- Many of the city's emergency preparedness and response functions are supported by the city's annual operating budget.

- The City also will pursue federal grant funding through programs such as BRIC, UASI, EMPG, HMPG, et

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to s ignificantly reduce flood risk

Baseline

The Greater New Orleans Urban Water Plan outlines a range of strategies and projects designed to manage the surplus of rainfall, exceeding the capacity of existing pump stations. These initiatives typically incorporate a blend of engineering solutions, green infrastructure, policy adjustments, and community involvement to establish a water management system that is both sustainable and resilient. New Orleans, characterized by low-lying terrain and drained marshlands subsided below sea level, faces challenges related to rainfall accumulation in depressed areas, exacerbated by subsidence. To avert flooding, water in these low zones must be either relocated or securely stored. The city, on average, encounters 2-3 significant flood events annually unrelated to hurricanes. The shallow groundwater in New Orleans is influenced by seepage from the Mississippi River and Lake Pontchartrain. The risk of excessive flooding, leading to substantial economic burdens on federal, state, and local municipalities, as well as the city's residents, is heightened by these factors.

Through a series of technical modeling efforts, the Urban Water plan has identified "the water assignment", which denotes the volume of stormwater for a given rain event (typically 10-year storm) that exceeds the total storage and pumping capacity of a catchment area. To reduce flooding, one of the primary objectives of the Urban Water Plan is to find efficient means for meeting the water assignment for each catchment area. The water assignment is calculated as the required storage capacity that a drainage system cannot handle and has been calculated to equate to approximately 1.76 billion gallons of surface water storage. The City currently has 10 projects, identified in the Urban Water Plan, that are either completed or in the construction or design phase, and an additional 9 planned, that implement elements of stormwater management and green infrastructure and total approximately 90 million gallons of detained and store stormwater rainfall. To reach the 20% goal outlined in this commitment, the City will need to identify, design and construct stormwater projects which detain and store an additional 253 gallons of stormwater.

Roadmap

The Office of Resilience and Sustainability (ORS) in partnership with Greater New Orleans, Inc., the Tulane Bywater Institute and the Greater New Orleans Foundation, has co-led an assessment of the Urban Water Plan as it reaches its 10-year milestone in 2023. The team has orchestrated a series of roundtable discussions involving key sectors pivotal to the execution of the Urban Water Plan. These sectors encompass Construction, Implementation & Maintenance of Green Infrastructure, Public Institutions, Design, Planning and Engineering, Nonprofit Organizations, Community-Based Organizations, and Workforce Development. Post the completion of these roundtables, ORS and its partners is distilling 10 crucial "lessons learned" to inform a systematic strategy for integrating these insights into a comprehensive Citywide Master Plan for Stormwater Management & Green Infrastructure.

The citywide Masterplan for Stormwater and Green infrastructure will be founded on data derived from a series of Hydrologic and Hydraulic (H&H) drainage studies 3 of which are currently underway. These H&H studies will assess the current drainage infrastructure, planned stormwater management/Green infrastructure projects, and available water bodies in each subbasin and further identify flood vulnerabilities in each neighborhood/district throughout the city. The H&H studies will investigate a range of rainfall events, such as the 1 year, 5-year, 10-year and 25-year events to discern flooding vulnerabilities. Based on these predicted vulnerabilities, a suite of proposed projects that incorporate both gray and green infrastructure will be developed to mitigate or minimize the flood risk as well as meet the demand of the water assignment. These proposed projects will add to the existing 90M of planned stormwater projects and allow the City to identify the 20% increase goal of stormwater diversion/infiltration.

ORS, in conjunction with the Office of Homeland Security and Emergency Preparedness have submitted a grant request for HMGP funding for continuous H&H modeling. This modeling effort will provide ongoing calibration of a comprehensive citywide H&H model that incorporates all the individual, smaller scale H&H models. The calibrated model will provide a citywide assessment of drainage infrastructure, planned stormwater management/Green infrastructure projects, and available water bodies in each subbasin.

The Citywide Masterplan for Stormwater and green infrastructure will include specific strategies for implementation of the proposed projects. The masterplan will also incorporate strategies from the City of New Orleans Climate Action Plan, the New Orleans Reforestation Plan, and the masterplan of the Sewerage and Waterboard. The City anticipates being able to release an RFP for the citywide Masterplan for Stormwater and Green infrastructure at the end of year 1 of this commitment (October 2024). Stakeholders in the plan development will include local government agencies and departments (I.e. Public Works, Sewerage & Water Board & Dept of Parks & Parkways, CBOs, Design Engineering, Landscape Architecture and Construction professionals, Workforce development agencies

Financial structure necessary

The City has a pending $950,000 Hurricane Ida HMGP application for the comprehensive citywide H&H model improvement and analysis referenced above.

The City also receives a significant amount of money from the the Gulf of Mexico Energy Security Act of 2006 (GOMESA). GOMESA shares oil and gas leasing revenues from federal offshore waters with Gulf producing states and the Land & Water Conservation Fund for coastal restoration projects. Portions of the revenue go directly to the coastal parishes of Louisiana, including Orleans Parish (or City of New Orleans) for restoration projects. The City receives approximately $2M a year in GOMESA revenue. The Citywide Masterplan for Stormwater and Green infrastructure will be funded from GOMESA funds.

Stormwater projects identified from the H&H studies and master plan will be funded either through GOMESA funds or FEMA grant programs such as BRIC and FMA.

Restoring at least 3 of the city's water bodies (such as rivers, creeks, and wetlands) to significantly reduce flood risks and improve water quality

Baseline

The barrier islands, wetlands, and other natural features of the Louisiana coast protect the region from the direct impact of hurricane storm surges. Because the construction of artificial levees has disrupted the Mississippi river's natural processes of annual flooding and silt deposition, the river can no longer change course or deposit fresh sediments in Louisiana's wetlands. Early settlement in New Orleans, as well as the installation of drainage pump stations resulted in drained wetlands and bayous. The Greater New Orleans Urban Water Plan examined the multiple benefits of the wetlands and the impact that urbanization has caused on the few wetlands that remain within the protected levee system. Wetlands acted as natural sponges, soaking up and holding water until it can infiltrate into the ground. Wetlands provided immense water storage benefits while slowing water to reduce the height of floods and erosion rates.

Proposed retrofits in the Urban Water plan to wetlands and other waterbodies interior to the levee system strengthen the function of existing water systems, make use of undervalued water assets, and enhance key corridors. The City has identified 3 water bodies for restoration:

The Dillard Wetlands:
The project site, which is a part of the Gentilly Resilience District, is a 27-acre dense woodland tucked along the western side of the London Avenue Canal. The existing low-lying area will be nourished by an influx of stormwater from the surrounding neighborhoods, supporting a healthy forested wetland ecosystem and reducing flooding to adjacent properties and streets. In addition to introducing additional stormwater, the forested wetland will be enhanced and restored through targeted invasive species removal and replanting with native vegetation that supports wildlife, increases transpiration, and improves tree canopy to reduce runoff. The storage volume of the proposed improvements to the Dillard wetlands is approximately 4.3 Million Gallons (MG).

Bayou Bienvenue:
The Bayou Bienvenue wetlands extend from the Lower 9th Ward in the City of New Orleans to the Lake Borgne Surge Barrier. The wetlands and surrounding communities were heavily damaged by Hurricane Katrina in 2005 and have been identified as a priority restoration project in Louisiana's Coastal Master Plan. Models from the Louisiana Coastal Protection and Restoration Authority (CPRA) show that the area will continue to see habitat degradation and wetland loss without significant action. Rehabilitation of the wetlands will include a combination of wetland creation, vegetative planting, and hydrologic restoration. The proposed work will use a structured decision-making process, informed by past projects and public engagement, to develop a restoration plan that considers project costs, sediment availability, and land ownership issues. The City will then use this plan to develop preliminary designs for the restoration of the area, then contract to finalize the design of an approximately $10-$15M restoration project. Partnering with the City of New Orleans on the project are The Water Institute of the Gulf, Lower 9th Ward Center for Sustainable Engagement and Development, National Wildlife Federation, and Nunez Community College

New Orleans East Landbridge:
The New Orleans East Landbridge is a marsh area located in eastern New Orleans on a landbridge separating Lake Pontchartrain from Lake Borgne, which is the major control on the potential flow of hurricane surge into Lake Pontchartrain. The exposure to wave energy and storm surge has resulted in rapid retreat of the shoreline and the expansion of ponds and lakes within the marsh. The project area includes the Fort Pike State Historic Site, U.S. Highway 90 and the Bayou Sauvage National Wildlife Refuge, the largest urban refuge in the nation, which provides significant estuarine habitat. The New Orleans East Landbridge is identified by the Corps as a critical landscape feature that serves as a crucial line of defense from storm surge for nearly 1.5 million people in eight parishes, including the cities of New Orleans, Laplace, Madisonville, Mandeville and Slidell. The City and Coastal Protection and Restoration Authority are currently designing a restoration project that includes 1,563 acres of wetlands created using hydraulically

dredged sediment from Lake Borgne and 21,597 linear feet of living shoreline protection features to be installed in Lake Borgne.

Roadmap

The H&H studies incorporated in the strategic plan mentioned in the previous section, will analyze existing waterbodies in various drainage basins, such as lagoons, lakes and bayous, to determine potential solutions that will maximize the efficiency for stormwater storage and water quality improvement as well as promoting ecological health within these water bodies. Incorporating surface water flows (stormwater runoff) and higher water levels into everyday water management improves groundwater balance, water quality, and the region's ecological health. The results of these studies will then be analyzed in conjunction with the methodology outlined in the Louisiana Coastal Masterplan to ensure a cohesive approach to water body restoration.

Potential stake holders will include:

- City Park Conserverancy
- Audubon Nature Institute
- Louisiana Coastal Protection and Restoration Authority
- Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA)
- Louisiana Department of Wildlife and Fisheries.

Financial structure necessary

The proposed work in the Dillard wetlands project is supported by an award from the Department of Housing and Urban Development's (HUD's) National Disaster Resilience Competition (NDRC). The Greater New Orleans Urban Water Plan envisaged the Dillard Wetlands as providing a retreat from urban life. Funding for this project currently amounts to $7.1 Million.

The City has been awarded two grants for development of the Bayou Bienvenue project, including $489,813 from the National Oceanic and Atmospheric Administration's (NOAA) Coastal Habitat Restoration and Resilience Grants for Underserved Communities Program and $888,000 from the National Fish and Wildlife Foundation's National Coastal Resilience Fund. Additional funding is available from direct GOMESA funding to Orleans Parish.

Funding for the New Orleans East Landbridge project will likely be a combination of further NOAA grant funding and state CPRA project funding.

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New York

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

The City will track notifications sent out by Notify NY to establish a baseline. Notify NYC is New York City's dedicated emergency public communications program. Notify NYC currently has 1,188,220 subscribers. Registration for the app offers 13 notification types, including basement alerts, and weather emergencies.
About Notify NYC | Notify NYC

Roadmap

The City will expand targeted outreach and marketing campaigns to gain more multilingual subscribers in vulnerable neighborhoods. Notify NYC launched a citywide SMS opt-in system, creating an even simpler way for less tech savvy New Yorkers to receive the most critical notifications via text message. Additionally, NYCEM has bolstered its weather notifications, adding more preparedness-based messaging to Notify NYC's portfolio, including basement preparedness, detailed ad-hoc weather updates to include the most up to date forecast info, and rain/snow preparedness. In 2022, New York City Emergency Management (NYCEM) launched a new initiative to raise Notify NYC awareness and subscribers. NYCEM hosted 15 events at City parks, schools, beaches, and gatherings throughout the five boroughs to help New Yorkers learn about and sign up for Notify NYC. Additionally, in 2022, Notify NYC sent over 2,000 alerts to its subscribers.

2022 Annual Report (arcgis.com)

Financial structure necessary

To fund the implementation of these actions, Notify NYC will utilize UASI funding (U.S. Federal Emergency Management Agency).

PATHWAY 2

Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Developing a baseline of flood risk: The City currently has a baseline of the areas at risk for flooding. These maps, in conjunction, provide NYC with a baseline for both:

- Coastal Flooding: The NYC Flood Hazard Mapper provides a comprehensive overview of the coastal hazards that threaten the city today and how these flood hazards might change in the future.
  NYC Flood Hazard Mapper (arcgis.com)

- Inland Flooding: The NYC Stormwater Flood Maps help New Yorkers better understand stormwater flood patterns and prepare for extreme rainfall events.
  New York City Stormwater Flood Maps (arcgis.com)

Developing a baseline of stormwater retention and infiltration:

- DEP releases annual reports on green infrastructure and cloudburst management in addition to providing an online map of projects across the city. We will use the stormwater volume numbers from our Green Infrastructure Annual report to develop a baseline for stormwater retention and infiltration.

- In addition to citywide green infrastructure retrofits, the City will continue to advance retention and infiltration through the Unified Stormwater Rule and Climate Resiliency Design Guidelines. There are several design options to enhance on-site stormwater management systems for flood resiliency that are included in the Climate Resiliency Design Guidelines:

  Increase footprint or capacity of detention/ retention systems considering 10-40% increased capacity from base design if site conditions allow. Incorporate stormwater reuse practices (rainwater harvesting for reuse in grey water systems or irrigation, evaporative cooling, rain tank, cisterns). Reduce impervious surfaces by using permeable

paving and drainage underlayment.
Increase evapotranspiration and/or infiltration by installing vegetated stormwater management practices (SMPs) such as bioretention, stormwater planters, tree planting, dry basins, grass filter strips, green roofs, and vegetated swales.
Preserve and enhance natural vegetation.
Reduce native soil disturbance from construction activities.
Design site grading to control waterflow and create detention areas for excess water

- In January 2023, NYC announced an expansion of the city's cloudburst program to four new sites as part of ongoing resiliency efforts to better prepare for intense rain events. Supported with nearly $400 million in capital funds, these specially designed, built, and engineered infrastructure projects will protect residents and property in Corona and Kissena Park, Queens, Parkchester, Bronx, and East New York, Brooklyn from future extreme weather brought about by climate change. DEP will focus on these watersheds to track progress towards the retention and infiltration goals.

Green Infrastructure Map :
Green Infrastructure Program Map (arcgis.com)
Green Infrastructure Annual Report:
2022 NYC Green Infrastructure
Unified Stormwater Rule
Cloudburst Management

Roadmap

In PlaNYC, the City committed to implement a multilayered strategy for flood resilience which includes:

- Develop a stormwater flooding adaptation plan by 2024 to establish a citywide flood protection target for stormwater infrastructure
- DEP will focus on cloudburst neighborhoods to assess progress in addition to our citywide implementation of GI as part of the roadmap to achieve 20% water retention and infiltration increase
- Create nature-based stormwater management solutions that provide multiple functions, including shade, water and air quality improvement, and wildlife habitats

In developing the adaptation plan, the City will conduct a robust alternative analysis that considers various levels of service, along with the cost and timeline required to achieve them. The plan will guide the future citywide stormwater capital strategy to manage sewer system capacity and prevent combined sewer overflows.

PlanNYC

In conjunction with the efforts outlined in PlanNYC, the City is developing partnerships with stakeholders to address the increasing challenges extreme rainfall events present. The City is working with Rebuild by Design and One Architecture & Urbanism to convene individuals and organizations with interest and expertise in addressing heavy rainfall. We are currently developing working groups comprised of community members and City agency staff, with expertise in various fields to create a transparent and collaborative process. The process, running from January 2024 to approximately June 2024, will culminate in a symposium that will reveal implementable policies and programs to address increased heavy rainfall in NYC.

Rainproof NYC Working Groups

Financial structure necessary

To implement the actions of this program, the City will utilize existing programs, namely City funds, and will continue to solicit Federal funds to advance new stormwater projects. We currently have City funding to expand green infrastructure. We also currently have funding for the Cloudburst Program with City funding and Federal funding. We have successfully applied for funding for three Cloudburst Hubs, two of which received FEMA Building Resilient Infrastructure and Communities (BRIC) funding and one which received FEMA Hazard Mitigation Grant Program (HMGP) funding. To expand our Cloudburst Program, we will continue to seek funding from FEMA-BRIC and other programs as they become available.

Oslo

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

The City of Oslo has an emergency warning system that reaches all inhabitants and people physically present in the city. In case of emergency that put life and health at risk, the city sends a text message to both groups and a voice message to all landline phones. In case of a national emergency that put life and health at risk, the Norwegian state broadcaster will alert the public. In addition, the Police will send a text message to individuals who can be affected by an emergency that put life/health at risk. These three warning systems are key in emergency situations. In addition the Meteorological Institute communicates early flood warnings.

Roadmap

Oslo has an adopted emergency plan, which also includes natural hazards. In addition there is a clear line of command and emergency plans for all critical infrastructure. The city collaborates with the national government, the Civil Defence and the police in emergency situations.

Financial structure necessary

The city is legally obligated to do emergency planning and protect the citizens. The work is funded in the city budget.

PATHWAY 1
Reducing at least 20% of water demand

Baseline

The city water demand varies somewhat from one year to the next. In recent years it has been just above 90 million m3. Our latest official data are from 2022 and it shows a water demand of 83.3 million m3. The decline in demand was mainly due to water saving measures implemented in response to the long summer drought that year.

The Agency for Water and Sewage is continuously working to reduce water loss. For 2023, the goal is to have 30 percent or less water loss. This is achieved through closing leaks and adjusting the pressure in the drinking water system.

Roadmap

The Agency for Water and Sewage will continue the work to close leaks. In addition, the city closes all water fountains and reduce street cleaning when the water supply is lower due to drought. Furthermore, the city has multiple awareness campaigns for reduced water use when we have droughts. The 2022 drought, with its corresponding campaigns to reduce water usage, has resulted in lasting changed behavior among citizens.

Financial structure necessary

All water and sewage services are funded through the fee imposed on all real estate owners, and the services can only be funded through that fee.

Increasing at least 15% of water supply

Baseline

All citizens in Oslo have access to clean water at an equitable price. 99.8% has municipal water.

Roadmap

To ensure a robust water supply that meets legal requirements and orders from the Norwegian Food Authority, Oslo is building a new drinking water supply from a different source than our main, which is the Maridalen lake. When the new supply line is finalized the city will have two fullfledged alternatives.

The new water supply source will be in operations in 2028 and will be able to cover the whole city's water demand. That means that we expect more than doubling current capacity. In daily operations, the new source is a reserve, meaning it will only produce a limited amount of drinking water to ensure the

function of the plant.

Financial structure necessary

The city has made the investment decision. The rising inflation has been a challenge, but the city has developed better methods for cost control to ensure sufficient budget.

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Baseline

In 2019, the City Council adopted the Oslo Storm Water Management Plan. It has 18 action areas. The plan is based on a 3-step model, where step 1 is to capture and infiltrate, step two is to capture, infiltrate and retain, and step three is to provide safe water ways through the city. One of the action areas in the plan is to develop stormwater maps, and these were completed this year by the Agency for Water and Sewage. Thus we have a good idea of where we are vulnerable to stormwater.

Roadmap

Oslo's main challenge is urban flooding. The rivers and streams running through the city will have higher water levels during heavy precipitation events, and an important part of Oslo's storm water management work is to reopen rivers and streams. What is important for the city, is to understand where the water runs during heavy precipitation. As a part of Oslo's storm water management work, the city has developed a flood map that shows how the water behaves during heavy precipitation events.

FInancial structure necessary

All developers are required to invest in storm water management in new projects. The city's storm water management work is funded through the city budget.

Phoenix

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

Phoenix currently has a Drought Management Plan and Water Use Reduction Guidelines that defines stages of actions the City can take in response to increasing levels of water shortage. Phoenix's plan has four stages: Stage One Water Alert; Stage 2 Water Warning; Stage 3 Water Emergency and Stage 4 Water Crisis. This plan inherently protects Phoenix's most vulnerable residents because it curtails discretionary uses of water first and keeps residential water use for human health and safety as the number 1 priority. It also alerts the community to implications of shortage.

The Drought Management Plan covers the entire city and provides the same level of protection for all customers.

Roadmap

Phoenix should create a communications plan that better engages stakeholders on the various stages of the Drought Management Plan and provides a framework for specific communication strategies to inform the public if the stage changes. That should include plans for engagement with stakeholders to discuss the actions Phoenix will take to reduce water use, including addressing concerns about access to water. The plan will also include a strategy for disseminating information throughout the community, using existing pathways (TV, radio, bulletin board, social media) as well as outreach to specific communities (children, seniors, low-income)

Phoenix is currently preparing a conservation communications plan and through the period of the Accelerator, communications on the status of drought/ shortage and actions customers can take to protect themselves will be developed.

Financial structure necessary

Phoenix will determine what additional resources are necessary to implement actions described in each stage of the Drought Management Plan and develop a plan for deploying resources for additional employees and activities described in the Drought Management Plan. Some of the finance structure is provided in the Plan through surcharges.

PATHWAY 1
Increasing at least 15% of water supply

Baseline

Phoenix is using data on Colorado River water produced for public consumption over the last 3 years to develop a baseline need for augmentation as well as strategies to increase the available supply. Currently Phoenix supplies its water from: 58% Salt & Verde Rivers, 40% Colorado River, and 2% Groundwater.

Roadmap

For each new potential water resource, Phoenix will develop the timetable for acquisition, the potential cost, the barriers to acquisition and the sources of funding to support the acquisition.

Currently, Phoenix augmentation plans include Advanced Purified Water (direct potable reuse), increased groundwater pumping, and a new Bartlett Dam on the Verde River.

Financial structure necessary

Once Phoenix determines the potential cost for acquisition of one or more new water resources, it will work with its Finance Department to develop a funding strategy that may include water rates, municipal bonding and extraordinary sources of revenue (i.e. federal investment).

Quezon City

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

Based on the data of the City's Disaster Risk Reduction and Management Office, there are 74 (out of a total of 142) flood risk Barangays (towns) in Quezon City, 57 of which are only equipped with flood markers while the remaining 17, aside from flood markers, are equipped with Automated Weather Stations, rain gauge and water level gauge.

Hydro-meteorological hazard detection systems are not installed specifically in vulnerable low-income areas, but in areas further upstream. This is because if hazard detection systems are installed in low-lying areas, by the time they detect the hazard it is too late. They are installed in key locations where, if a certain flood or water level is reached, it would mean that the vulnerable areas would be flooded at a minimum of two hours.

We have installed the following detection systems: 50 smart weather cameras, 13 rain gauges, 17 flood sensors. They are installed at strategic points and connected to 'gateways' where they transmit information to an Internet of Things (IoT) network. Information from the sensors can be accessed by the public through a web application called UP-NOAH (Nationwide Operational Assessment of Hazards). The Local Disaster Risk Reduction Management Office (LDRRM) has set up an Emergency Operations Center (EOC) where staff monitor and track changes in weather, water and flood levels through these sensors. Information (e.g. flood warnings, orders to evacuate, distribution of relief goods, etc.) is then disseminated to the Barangays that will be affected within the City through the EOC.

The abovementioned sensors are installed within the City..Based on various studies conducted, it would be more effective if our detection systems would be installed further upstream, even outside the boundaries of Quezon City. The installation of these devices would give us more time to evacuate.

Important information is also provided by the Philippine Atmospheric, Geophysical and Astronomical Services (PAG-ASA). PAG-ASA is the national government agency responsible for managing the national security, environment and climate in the Philippines. The city closely coordinates with PAG-ASA as they assign the hydro-meteorological hazard level and advisory when evacuations must take place.

Roadmap

There are 4 thematic areas in the Quezon City Disaster Risk Reduction and Management Plan regarding high risk flooding and drought:

a. Prevention and Mitigation – institutionalize timely, responsive and proactive early warning systems for at risk communities in the City.

b. Disaster Preparedness – Equip Communities with the necessary skills to cope with negative impacts of disaster.

c. Disaster response – Preemptively evacuate communities in hazard prone areas and Address temporary shelter/and structural needs of the affected population.

d. Disaster Recovery and Rehabilitation – Restore shelter and other buildings/ installation and Reconstruct infrastructure and other public utilities.

Aside from these, the City also has a public continuity plan wherein immediate actions are laid out to be able to immediately bounce back from sudden flooding and ensure that services to the public are not hampered.

As for the development of partnerships, Different approaches (formal or informal) may be implemented in terms of building partnerships such as signing of Memorandum of Agreements or Understanding with other sectors and collaboration in project/ program implementation. But to effectively build partnerships, the City Government must have a clear agenda, framework or pathway that is well conveyed or communicated to achieve common goals. Good governance and transparency as well as the presence of plans and policies are the strong points of the

Quezon City Government.

Financial structure necessary

Each Local Government Unit in the Philippines has a Local Disaster Risk Reduction and Management Fund which is 5% of a City's local budget that is set aside as a calamity fund. 70% of this fund is used for disaster preparedness programs including training, procurement of equipment, medicine, and other supplies needed as well as post disaster activities while 30% of the said fund is used as a Quick Response Fund or stand-by fund for relief and recovery programs. Unexpended funds are usually placed in a trust fund to be used to support disaster risk reduction and management programs for the next five years. With this, the City has a fund source to implement actions in the road map.

Aside from this, financing climate actions is also part of the Enhanced LCCAP which identifies various sources of financing. There are conventional funding sources (National Government Funding, National Disaster Risk Reduction and Management Fund, People's Survival Funds, City Government Funding) and innovative financial models such as Public-Private-Partnerships and joint venture agreements, among others.

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

Flooding
The City has conducted various assessments to determine our most vulnerable areas, parts of the population, and structures that may be affected by flooding.

In the Climate and Disaster Risk Assessment (CDRA), Flood Risk Assessment is included. In this assessment, barangays most susceptible to flooding are identified as well as the amount of people displaced per barangay, flood-affected buildings, flooded road segments and post-flood issues.

The causes and effects of flooding were determined through conducting an Exposure Analysis. 372 flood-prone areas were identified through this assessment.

1. Low Elevation - 162 of the 372 flood-prone areas were identified as having low elevation as one of the causes of flooding concern, with 32 areas as having this be the sole cause of flooding concern.

2. Ineffective Drainage Structures - 155 areas were identified as having ineffective drainage systems as one of the causes of flooding concerns, with 47 areas having this be the sole cause of flooding concern. Flood simulation results indicate that flood-prone areas having ineffective drainage systems may experience flood depths of up to 5 ft., and are thus given priority for potential flood management interventions.

3. Obstructed Waterways - Encroached Informal Settler Family (ISF) structures and communities residing along natural waterways obstructing creeks and rivers are the most common causes of flooding concerns. There are 19,556 Informal Settler Families in 2018 that are not yet relocated, while 1574 ISFs were relocated in that same year (source: CDP 2021-2025). 15 areas were identified as having obstructed waterways as its sole cause of flooding concern.

4. Proximity to Waterway - 187 areas were identified that being in proximity with a waterway is considered to be one of the major causes of flooding in their barangay, with 51 areas having it as its sole cause of flooding concern.

Some of the Existing Baselines (May 2023):

1. 485 km of road segments are flooded out of Quezon CIty's 1525.58 km total road network

2. Post-Flood Health Issues - 7934 people are affected by gastrointestinal infection.

3. Approx. 90,000 people (QC. population is 2.96 million) are displaced when flood levels reach 3 meters and above.

4. There are 19,556 Informal Settler Families living in danger zones in 2018 that are not yet relocated. The city addressed this issue, the City has implemented 34 socialised housing projects, of which 18 have been fully completed as of August 2023.

- Some of the Existing Baselines (May 2023):
- 485 km of road segments are flooded out of Quezon CIty's 1525.58 km total road network
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- There are 19,556 Informal Settler Families living in danger zones in 2018 that are not yet
- relocated. The city addressed this issue, the City has implemented 34 socialised housin projects, of which 18 have been fully completed as of August 2023.

Roadmap

In the Enhanced Local Climate Change Action Plan of the City Under Pillar 4, Strategy 6 aims to reduce the number of vulnerable groups by upgrading their quality of life residing in informal and climate vulnerable communities by providing them housing away from danger zones that has sustainable public infrastructure and services.

1. Data Gathering. The City aims to tackle many issues including flooding by establishing the Updated QC Drainage Master Plan, Water Quality Management Plan, City Development Plan.

2. The implementation of Quezon City Drainage Master Plan (QCDMP) - This plan is now in its finalization phase, with completed studies behind project proposals.
3. Water Conservation - Part of the QCDMP is the rainwater harvesting component. This is also in compliance to a National Law that mandates the establishment of RWH in all barangays in the Philippines. The Quezon City Government under the administration of Mayor Joy Belmonte is initiating the establishment of RWH in all city-owned buildings.

4. Relocation of Informal Settler Families. The city's goal is to relocate Informal Settler Families from danger zones. This is first done by identifying the most vulnerable ISFs, relocating them, and then declaring officially cleared areas as "Zero-ISF zones".

Quezon City aspires to be the leading city in advancing inclusive, ambitious and evidence-based climate actions in the Philippines. Being the richest city in the Philippines by revenue, the Belmonte Administration aims to address the perennial flooding problem in Quezon City and finding a long-term solution in partnership with the National and International Agencies as well as neighboring cities that share our borders.

Financial structure necessary

RA 10121 established the National DRRMC and its budget allocation which is 5% of the Philippines National Budget. This act also mandates that local government units establish and appropriate 5% of their local budget to their own Local DRRMC.

There are conventional funding sources (National Government Funding, National Disaster Risk Reduction and Management Fund, People's Survival Funds) and innovative financial models such as Public-Private-Partnerships and joint venture agreements, among others.

PATHWAY 2
Safeguard people and city's critical infrastructure from major flood events by 2030 by

Baseline

1. Existing Information
The existing drainage system of QC is not yet fully mapped out. Without the complete map of our Drainage System, we cannot determine which drainage systems we can prioritize for Drainage System rehabilitation and improvement. To address this, one of the priority projects of the QC Drainage Master Plan (QCDMP) is Project IRIS - a project that aims to fully map out the drainage system of Quezon City.

We have, however, conducted exposure analysis and determined areas with the highest flood exposure during heavy rainfalls. Another of the priority projects of the QCDMP is the 'Rainwater Harvesting Detention Basin on a Basketball Court'. We have planned 10 initial locations in which to construct this project through Flood Risk Analysis and Exposure Analysis.

2. Rapid Increase in Built Area
Quezon City is rapidly increasing in built area, which reduces infiltration of stormwater.

Roadmap

Stormwater Retention
From the QCDMP, proposed projects include:
- Detention Basins (with RWH) under Basketball Court
- Retention Ponds - Three ponds are currently proposed, with a total of 107, 000 cubic meters volume.

Stormwater Infiltration
From the QCDMP, proposed projects include:
- Rainwater Harvesting - Construction of rainwater harvesting facilities in public buildings, and the revision of the QC Green Building Ordinance to make new buildings compliant with stratified requirements.
- Pervious Pavements "Project SEEP" - also known as permeable pavements or porous pavements, are a type of innovative pavement system designed to allow rainwater to pass through the surface and infiltrate into the ground, rather than creating runoff.

Possible stakeholders for this project are the academe, in this case we are working with the University of the Philippines, Barangays where the retention ponds and detention basins will be constructed.

Financial structure necessary

The City may be able to fund the project or access funding from international financing partners through grants. Further, we may also enter into a public-private partnership for big ticket projects or other financing structures allowed in the Philippines.

Different approaches (formal or informal) may be implemented in terms of building partnerships such as signing of Memorandum of Agreements or Understanding with other sectors and collaboration in project/program implementation.

Restoring at least 3 of the city's water bodies (such as

rivers, creeks, and wetlands) to significantly reduce flood risks and improve water quality.

Baseline

As early as 2007, the deterioration of our river's water quality was very alarming. Our Dissolved Oxygen (DO) Levels were reaching levels as low as 1.63 mg/L (safe levels are 7 mg/L) and Biochemical Oxygen Demand levels are reaching as high as 56 mg/L (well above the safe value of 8 mg/L).

The Quezon City Government has an existing project for the development of a Water Quality Management Plan. The main objective of the project is to develop an ambient water quality management plan, covering the 4 major river systems and tributaries here in Quezon City which include San Juan – San Francisco River, Marikina River, Tullahan River and Meycauayan River. This is aligned with the Philippine Clean Water Act (RA 9275, 2004) wherein local government units are also given a shared responsibility to manage and protect water bodies.

During the development of the plan, baseline water quality assessment was conducted such as geospatial mapping and analysis as well as water quality sampling to get the profile of the waterways for the formulation of appropriate interventions.

The water quality assessment is scheduled to be completed by the end of this year, December 29, 2023. After the assessment is completed, we will begin with our pilot clean water quality initiatives, scheduled to start by January next year.

Roadmap

Data Gathering
The Belmonte Administration recognized that we do not have sufficient data on the Drainage Systems of Quezon City including outfalls towards waterways without treatment. To address this, the City initiated various studies such as the Water Quality Management Plan, the Drainage Master Plan, and the City Development Plan to gather information, and determine gaps to achieving sustainable waterways systems.

Project Development Phase
In the QC DMP, feasibility studies, consultations and determination of adverse effects were conducted. The urgency of each proposed project is determined through consultations and focus group discussions. Some of the priority projects are as follows:

Project IRIS: The mapping of our complete drainage system.

- Detention Ponds: The establishment of three new Detention ponds that has a total capacity of 110,000 cubic meters.
- Detention Basins (With Rainwater Harvesting) under Basketball Court - The establishment of multi-purpose areas for recreation, storing stormwater and relieving flood prone areas.
- "Dukal Kanal, Iwas Baha" or "Canal Dredging, Avoid Flooding": Dredging projects in critical waterways.
- "Tuloy ang Daloy" or "Let the Stream Flow": Drainage System Rehabilitation Project that would be aided greatly by Project IRIS.

Currently, our goals are to complete the Water Quality Management Plan and the implementation of the planned "Project IRIS", which aims to complete the map/data of our City's Drainage System. With all of these completed, a clear picture of our waterways system will emerge, and we can create plans for each individual river.

Sub-activities were identified wherein outputs will be used for the formulation of the Water quality Management Plan aligned with national guidelines and framework including, but not limited to the (1) institutionalisation and mainstreaming including roles and responsibilities of the City Government, stakeholders, and the communities; (2) multi-stakeholder and community engagement; (3) river and waterways rehabilitation and restoration strategies and actions; (4) water pollution reduction/prevention initiatives; (5) sewerage and septage management; (6) monitoring methods, schemes, and technologies; and (7) periodic reporting and evaluation.

Financial structure necessary

Similar to our previous answer, the City Government can fund projects that would meet this target. We can also look into public-private partnership, joint ventures or even access international financial institutions to expedite projects, especially big ticket infrastructure projects.

Quito

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

The city has a technical working group for Early Warning Systems (EWS) within the framework of the Plan Responde Quito, which will coordinate the methodological development for setting up the baseline to identify the most vulnerable sectors or communities to floods and droughts, through the following actions:

- Setting up a technical roundtable.
- Mapping of information and initiatives related to EWS.
- Mapping of stakeholders and strategic partners.
- Methodological development for the identification and prioritisation of the most vulnerable areas.
- Definition of the most vulnerable communities.
- Definition of the scope of the EWS.
- Definition of a management model for the operation of the EWS.

Roadmap

The development of the roadmap will be carried out in compliance with the activities detailed in numeral 1. The General Secretariat for Security and Governance, together with the Metropolitan Public Company for Security and Citizen Coexistence (EP EMSEGURIDAD), lead the EWS technical roundtable, made up of the Secretariat for the Environment, the Public Company for Potable Water and Sanitation (EPMAPS), the National Institute of Meteorology and Hydrology (INAMHI), the Secretariat for Risk Management, and the Institute for Geological and Energy Research.

Managing the exchange of experiences with other cities, articulation with academia and other organisations and institutions such as the Metropolitan Public Company of Mobility and Public Works (EPMMOP), the Sewage Company (EMASEO), the Body of Control Agents, the Metropolitan Traffic Agency, the Fire Brigade, and Zonal Administrations.

Financial structure necessary

During the first year the city will set up the baseline through the respective technical table, according to institutional capacities and competences.

EPMAPS will invest in the maintenance of its hydro-meteorological stations.

From the second year onwards there will be an EMSEGURIDAD budget for EWS implementation, operation and maintenance.

Defining of inter-institutional budgets and management for access to cooperation funding.

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

The city has a Plan Responde Quito, approved by Metropolitan Ordinance, which establishes responsibilities and procedures for emergency response with an emphasis on humanitarian assistance, which will be consolidated until 2027 with the strengthening of institutional and community capacities.

Roadmap

This target will be achieved through training, socialisation, capacity building, activation of the Emergency Operations Committee (COE), technical committees and working groups: water, security, solid waste, health, humanitarian assistance, education, livelihoods, heritage and essential infrastructure.

Community training
Development of simulation exercises and drills for local response.

Strengthen communication strategy.

Financial structure necessary

The roadmap will be directly managed and funded by

the Municipality of Quito and its institutions.

PATHWAY 1
Increasing at least 15% of water supply

Baseline

The scope for Route 1, Objective 2 is the parish of Calderón, Calderón Drinking Water System project.

The parish of Calderón is the largest and most populated parish in the Metropolitan District of Quito (DMQ), which currently has a population of around 310,000 inhabitants, approximately 7.8% of the population of Quito, and covers an area of 79.07 km2. According to studies on the supply and demand of drinking water for the parish of Calderón, in the coming years there will be a significant deficit in the supply of drinking water, mainly due to the accelerated population growth in the sector. In addition, it is becoming increasingly difficult to distribute water from the Bellavista Treatment Plant, resulting in rationing and an inability to provide the service to the higher sectors of the parish of Calderón.

The Drinking Water Master Plan (2010), proposed the Calderón drinking water project, which will allow the population to be served by the year 2050, reaching 478,334 inhabitants in Calderón, 43,450 inhabitants in San Antonio and 5,708 inhabitants in Calacalí; starting with a population of around 320,000 inhabitants, from the start of the project in 2025.

The average annual demand required by the Calderón drinking water project in 2025 will be 670 l/s, rising to 1073 l/s in 2050.

In order to cover this demand, a greater flow will have to be guaranteed in the Interandino alley, developing new projects to optimise the distribution and availability of the collected flow. In particular, the following projects will have to be developed: to put into operation the 4 pumps of the Papallacta system, which will guarantee a flow of 3.0 m3/s; to extend the energy recovery station of Paluguillo; and to install a new pressure pipe from the Quito tunnel to the energy recovery station of Paluguillo. All these actions do not represent new sources per se, but a better distribution of the flow captured and available on the eastern slope.

Roadmap

In order to comply with the increase of at least 15% of the water supply, two actions are proposed, the first one is directly related to the execution of the Calderón drinking water project, and the second one aims at guaranteeing the flow available in the Calderón project through a better distribution of the flow captured.

With regard to the Calderón drinking water project, the following milestones have been established:

Milestone 1. Paluguillo-Puembo pipeline, currently under construction.
Milestone 2. Puembo-Calderón pipeline, in contracting stage.
Milestone 3. Calderón Drinking Water Treatment Plant (PTAP Calderón), under construction.
Milestone 4. Calderón transmission lines, tanks and distribution networks, in contracting stage.

While the milestones related to the availability of captured flow are as follows:

Milestone 5. Put the 4 pumps of the Papallacta system into operation, diagnostics are currently available.

Milestone 6. Expand the Paluguillo energy recovery plant, the final design is currently available.

Milestone 7. Install a new pressure pipeline from the Quito tunnel to the Paluguillo energy recovery station, a diagnosis is currently available.

The stakeholders involved in the development are the following: Empresa Pública Metropolitana de Agua Potable y Saneamiento (EPMAPS), Inter-American Development Bank (IDB) and Fondo para la Promoción del Desarrollo (FONPRODE).

FInancial struccture neccesary

The works contemplated for the Calderón Drinking Water System are financed in part with EPMAPS' own resources, plus loans granted by the IDB and FRONPRODE.

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Baseline

- Risk assessments of uncontrolled surface runoff related to the existing sewerage network are carried out.
- Diagnosis of erosion and edge shrinkage in the main channel of the Monjas River.
- Control points are established in the riverbed to monitor flows and water quality.

Roadmap

Develop a step-by-step roadmap/action plan including a clear governance structure, committed stakeholders, milestones and key performance indicators (KPIs) to put in place actions to move towards the target, based on the commitments made in the city's climate action plan, within one year.

- The city will develop a rainwater management plan for the Monjas River micro-watershed.
- Structural and non-structural measures for rainwater management will be defined.
- Possible locations of storm tanks will be established and will assess their feasibility.
- The city will estimate amounts and specific roadmaps for the proposed measures.
- Evaluating and reporting progress.

The city is managed by a decentralised local government. Management is carried out through secretariats oriented to develop public policy and through public companies that develop rainwater management in the execution of their legal attributions.

The entities related to this management are: Secretary of Environment, General Secretary of Security and Governance, Secretary of Mobility, and Secretary of Territory, Habitat and Housing.

The companies related to the management are: Public Works, Drinking Water and Sanitation, Public Space and Solid Waste Management.

Territorial control is exercised by the Metropolitan Control Agency.

Rainwater management will be carried out by micro-basins, with the participation of municipal entities and with local coordination established by local laws, through the Metropolitan Council.

This project has a high level of investment and technical complexity due to the configuration of the city, but it will be the first experience of this type of infrastructure in the country. The implementation of the rainwater retention system is planned to be completed by 2034.

Financial structure necessary

It is planned to build a storm tank in the Monjas River micro-basin, to be completed by 2034, to be financed by external loans, for capital recovery over the next 30 years. The intention is to reduce 20% of the annual peak flow discharged into the Monjas river.

Rio de Janeiro

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CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

- Collect and treat topographic and flood historical data, in addition to conducting research and on-site surveys;
- Carry out a mapping based on the gathered data, to define the areas susceptible to extreme hydrological events (PhySFI);
- Evaluate technical aspects to define the need and effectiveness of an early warning system;
- Correlate this mapping with socioeconomic data to define the priority areas, in a georeferenced way for the creation of the baseline.

Roadmap

- The creation of a work-group with identification of the main actors; definition of the path to be followed;
- Such a list should be elaborated in greater detail but at first they will be: Rio-Águas, Civil Defense, COR, Housing Secretariat (works with communities), Civil Society, and private entities specialists in alert system;
- Evaluate the flood prediction system to be developed by the partnership of the Data Office and IMPA (Institute of Applied Pure Mathematics). Intersect with work in development with NASA-LHASA;
- For the actors inserted and who have greater contact with the municipality of Rio de Janeiro (PCRJ), it will be something simpler, with a direct indication of those responsible for the sectors. For the participation of civil society, the use of social assistance from the city hall will be suggested. For private entities, a public call may be made for the participation of interested parties.

FInancial structure necessary

- Based on the baseline study, it will be possible to estimate the size of the problem and, therefore, how to request the mayor to provide funding for the implementation of the actions based on what is already under development this year in Canal do Mangue watershed.
- Private partnerships will be welcome to put together the necessary financial structure.

PATHWAY 2
Restoring at least 3 of the city's water bodies (such as rivers, creeks, and wetlands) to significantly reduce flood risks and improve water quality

Baseline

- Assess the rivers with potential for requalification (Urban river restoration index);
- Prioritize the basins with a high risk of flooding;
- Identify the projects and works in progress in the area of water resources;
- Develop a indicator or adapt the URRix indicator;
- Define potential water bodies for requalification.

Roadmap

- Create a working group within Rio-Águas, water and sewage concessionaries, municipal secretariat of environment, and other stakeholders;
- Identification of sewage discharge on the drainage system;
- Define areas non-aedificandi on riverbanks and map irregular buildings. Evaluate the reallocation of those;
- Project the restoration for each water body;
- Implement the requalification project.

Financial structure necessary

- Budget the requalification projects;
- Seek financing from development companies;
- Evaluate whether the city hall will have resources for the implementation.

Sao Paulo

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

The City of São Paulo has had legal instruments providing for the Alert System since 2006:

- Civil Defence System (Decree 47.534/2006): Warning System provided for in Section V and VI, Article 16.
- Municipal Climate Change Policy (Law 14.933/2009): Alert System provided for in Section VI, Article 41.
- Strategic Master Plan of the Municipality of São Paulo - PDE (Law No. 16.050/2014)[1](Art. 217, III) develop georeferenced mapping and cartography of flood risk areas and improve warning and emergency systems; (Art. 299, XVIII) implement prevention and warning protocols and emergency actions in disaster circumstances.
- Municipal Risk Reduction Plan - provided for in Article 300 of the Strategic Master Plan - PDE (Law 16.050/2014) as an integral part of the National Civil Protection and Defence System. It is currently being drawn up.
- Climate Action Plan (Decree 60.289/2021): Action 29 of the Plan aims to strengthen the governance of the Municipal Civil Defence System in order to reduce risks and disasters and, in addition, to consolidate emergency actions, among other activities. This action aims to implement and monitor the Early Warning and Detection System for Civil Defence Risks in the Municipality of São Paulo.
- In addition to the legal provision, the city of São Paulo already monitors hydrological risk areas on a regular basis through the Municipal Civil Defence System, as well as monitoring meteorological conditions through the Climate Emergency Management Centre (CGE). These integrated activities allow the city to present an integrated system, coordinated by the CGE, for monitoring risks, forecasts and information aimed at local government agents and press outlets for local communication.
- Thus, the current baseline to be worked on by the city to achieve the goal proposed in the main requirement is to consolidate the mapping of communities vulnerable to hydrological risk areas, to be served by the current risk monitoring, forecasting and information system.

[1] On 8 July 2023, the new text of the Master Plan came into force as a result of the Mid-Term Review of the Master Plan (Law 17.975/2023).

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Roadmap

Drawing up the Action Roadmap will briefly follow the following stages, according to the city's current baseline:

- Mapping vulnerable communities: this activity is already underway across the city. Data available through methodologies already defined by the City Council will be used. The mapping of hydrological risk areas for the City of São Paulo is expected to be finalised by the end of 2024. This mapping is carried out by city sub-prefecture, i.e. by the administrative divisions established in the municipal territory, and so far the risk areas of 25 of the 32 existing sub-prefectures have been mapped, with all 32 regions expected to be mapped by the end of this year. In addition, critical areas are mapped using the Hydrographic Basin Notebooks , the methodology for which is

the intersection between flood areas associated with hydrological risk, flood risk, the structural road system and vulnerable land use located in flood areas. Data such as the São Paulo Social Vulnerability Index (IPV), return period and demographic density are used to identify these critical areas. It is expected that by 2026 the City will have presented the 50 Notebooks planned (29 of which will be published by the end of 2024), which will allow all vulnerable communities, including the most critical ones, to be served by the Alert System by 2027.

- Development: identify the specific adaptations and resources needed to install the Alert System in each community. Define an Implementation Plan for the installation of the identified resources with a timetable and areas of focus, which may include the installation of sirens, development of mobile applications, mass text messaging and other effective communication methods. The Plan should also include a community involvement strategy.
- Testing, monitoring and operationalisation: define a timetable for the system testing programme and for technical training to make the system operational. Define the responsibility matrix of the parties involved for monitoring and operationalisation. In this regard, the current system of the Emergency Management Centre (CGE) , the São Paulo City Hall body responsible for monitoring weather conditions in the city, should be considered. Revision of the Implementation Plan based on the tests carried out.
- Implementation of the Implementation Plan

Stakeholders - development and implementation: Municipal Secretariat for Urban Security - Civil Defence, Municipal Secretariat for Urban Planning and Licensing, Secretariat for Urban Infrastructure and Works, Climate Emergency Management Centre of the Secretariat for Urban Infrastructure and Works, Municipal Secretariat for Sub-prefectures and Municipal Secretariat for Government. The latter is responsible for the Water Safety Committee (CSH), created by Decree 62.690 of 23 August 2023, which regulates article 3 of Law 17.104 of 30 May 2019, which establishes the Municipal Water Safety and Management Policy.

Consolidating partnerships: include in the roadmap analysing the need to involve technology companies, communication service providers and other private entities that can contribute technical expertise and financial resources.

FInancial structure necessary

The funds earmarked for the implementation of warning systems in all low-income areas where communities are exposed to a high risk of flooding and drought may come from the Municipal Treasury under the responsibility of the Municipal Treasury, the Municipal Fund for Basic Sanitation and Infrastructure (FMSAI), and the Urban Development Fund (FUNDURB).

PATHWAY 2
Restoring at least 3 of the city's water bodies (such as rivers, creeks, and wetlands) to significantly reduce flood risks and improve water quality

Baseline

For this Path 2 goal, the definition of the baseline should be structured on the basis of the selection of the city's bodies of water that present a hydrological risk, followed by the integrated mapping of the activities and municipal instruments that intervene in these bodies, with the aim of measuring their potential for reducing flooding, improving water quality and increasing open spaces for enjoyment in favour of the community's well-being.
For the selection of the city's water bodies, the River Basin Notebooks will be used, published and provided for by the guidelines of the Drainage Master Plan (currently 21 Notebooks have been published out of a total of 50). The main objective of the Notebooks is to propose flood control measures based on the hydrological risk per basin studied. The Cadernos should therefore be analysed in conjunction with other data available in the city, such as the Water Quality Index, and the guidelines of the C40 Water Safe Cities Accelerator Technical Note should be taken into account.
For the integrated mapping of municipal activities and instruments, the items below list examples of activities planned by local instruments that have an impact on the target:

- PlanClima SP - Action 26: Follow up the Clean Stream Programme to clean up urban streams. This action aims to expand and strengthen the Clean Stream Programme in the Municipality of São Paulo.
- PlanClima SP - Action 37: Protect and requalify springs and watercourses. This action aims to map the municipality's springs, institutionalise the Plan for the Protection and Requalification of Springs and Watercourses in the Municipality of São Paulo and expand feasible connections in the municipality.
- Target programme (2021-2024) - target 67: Promote 17,000 household sewage connections in the municipal territory of the Guarapiranga and Billings Reservoirs.
- Target programme (2021-2024) - target 33: Clean 9,200,000 metres of streams, branches and galleries.
- Strategic Master Plan of the Municipality of São Paulo - PDE (Law No. 16.050/2014): establishes guidelines for Urban and Environmental Systems.

For the Environmental Sanitation Policy and System (Chapter IV), the guidelines for the Drainage system emphasise adapting land use to river characteristics, the preservation of drainage areas and the Valley Bottom Environmental Recovery Programme. The Policy and System for Protected Areas, Green Areas and Open Spaces emphasises the creation of linear parks, urban interventions in watercourses and the implementation of parks proposed in the Strategic Master Plan. Implementation requires integration between sanitation, mobility, social urbanisation, environmental conservation and landscaping.

Roadmap

The Roadmap will be drawn up in the following summarised steps:

- Initial Survey and Assessment: use the city's monitoring tools for water bodies, including rivers, streams, lakes and reservoirs.

- Selection of Alternatives and Interventions: Identify and evaluate different options for interventions to restore water bodies, such as sediment removal, reforestation of the banks, depollution, feasible connections, removal of families from risk areas, linear parks, among others.

- Justification: To identify and measure how the type of intervention selected will be able to contribute to improving water quality and reducing the risk of flooding.

- Monitoring and operationalisation: identify the necessary interventions, the resources required, the implementation schedule and the responsibility matrix of the stakeholders.

Stakeholders - development and implementation: Secretaria Municipal de Subprefeituras, Secretaria Municipal de Habitação , Secretaria Municipal de Urbanismo e Licenciamento, Secretaria do Verde e Meio Ambiente, Secretaria Municipal de Infraestrutura Urbana e Obras and Secretaria de Governo Municipal and related Management Councils. The Municipal Government Secretariat is responsible for the Water Security Committee - CSH, created by Decree no. 62.690 of 23 August 2023, which regulates article 3 of Law no. 17.104 of 30 May 2019, which establishes the Municipal Water Security and Water Management Policy.

Consolidation of Partnerships: Institutional articulation for partnership with the Basic Sanitation Company of the State of São Paulo (SABESP), the Secretariat for the Environment, Infrastructure and Logistics of the State of São Paulo (SEMIL), the Department of Water and Electricity of the State of São Paulo (DAEE) - Living Rivers Programme.

FInancial structure necessary

Depending on the type of intervention to be carried out, the financial structure can be developed through city funds:

- Special Fund for the Environment - FEMA: expansion of green areas, implementation of municipal and linear parks, expansion of Payments for Environmental Services - PSA, in addition to the city's Green Plans, actions of the Municipal Plan for Urban Afforestation (PMAU), Municipal Plan for Protected Areas, Green Areas and Open Spaces (PLANPAVEL), and Municipal Plan for Conservation and Recovery of the Atlantic Forest (PMMA).
- The Urban Development Fund (FUNDURB), whose allocations are based on the objectives, guidelines, plans, programmes and urban and environmental projects that are part of or result from the PDE, and with reference to the provisions of the Municipality's Programme of Goals (Art. 339 - PDE), which include, among others: infrastructure, drainage, sanitation, implementation of linear parks, public leisure spaces and green areas.
- Municipal Fund for Basic Sanitation and Infrastructure (FMSAI): intended to support basic and environmental sanitation and infrastructure actions in the municipality. The Fund's resources come from transfers made by the Basic Sanitation Company of the State of São Paulo - SABESP.

The São Paulo City Hall also has a contract, through the Municipal Secretariat of Subprefectures, to check for irregular sewage connections in the rainwater drainage network. This contract could be used to intensify inspections in selected catchments. Stream cleaning actions could be focussed on the chosen locations, contributing to the general improvement of the water body. There are already contracts in place for cleaning up streams at SMSUB and the city's 32 subprefectures.

In addition, financial instruments that are conventionally referred to as "green or sustainable" can be used from various actors, such as urban institutions, industry and services, as well as individuals and community organisations.

It is important to consider that financial responsibility must be shared with other government bodies, both state and federal, as these are issues that go beyond municipal boundaries, considering the management of the river basins most affected by water events and related federal programmes.

Rotterdam

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

Vulnerable unbanked areas (not protected by dikes) in the urban Rotterdam City

- There is a minimum elevation level for both public and private space in new developments. This minimum elevation level takes care that new developments are safe from fluvial floods.
- There is an operational crisis management plan and team running. This team is (among others) placing warning signs at areas threatened by flood when needed.
- The municipality communicates online (website municipality) and via social media about flood risks and possible measures to the civillans living in the unembanked areas.

Roadmap

The city of Rotterdam is planning to develop local adaptation strategies for the urban areas vulnerable for fluvial floods. When finished, each local adaptation strategy provides an integral approach (urban planning, crisis management and communication) how to deal with flood risks (today and in the future). The way how the city of Rotterdam is going to develop these strategies is described in RWW Handreiking Denken-Buiten-Kaders.

This document describes the iterative process how to develop such a strategy and which stakeholders are involved. These steps are 'Weten > Willen > Werken > Borgen > Evalueren" : Know > Want > Work > Secure > Evaluate.

The list of most important stakeholders is as followed:
- City of Rotterdam
- The social housing cooperations,
- Water boards
- Civillians

Partnerships with the first three stakeholders are already present within the Rotterdam climate adaptation program Rotterdam Weather Wise. Partnerships with the civillans need a customized approach.

PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Baseline

Recently our newest adaptation strategy was approved by city council (June 2023). This framework describes both the challenges and opportunities for climate adaptation until 2030. This is both Rotterdam's baseline as an action plan to build towards a climate proof city. It can be downloaded here: Link

Roadmap

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Moreover, we are actively taking concrete steps towards climate-proofing the city by implementing 50 climate-adaptive projects within public spaces, alongside the development of 15 climate-resilient squares. All these initiatives are slated for completion by the end of 2027, well within the current political term.

These projects and squares focus not only on stormwater retention but also on stormwater reuse and heat reduction. Their execution involves a close partnership with our community members. We invite our citizens in early stage to design the projects together with us to create tailor made solutions.

In the Netherlands, water management is a collective responsibility shared among the national government,

water authorities, and the municipality. Thus, we are collaborating closely with these governmental stakeholders, with a shared financial investment in the initiatives. The city, however, plays a leading role in driving these efforts.

Many of these projects and squares feature innovative solutions, developed in collaboration with esteemed research institutions such as TU Delft and Rotterdam University of Applied Sciences.

Financial structure necessary to achieve both targets

Annual investment costs (in million euro)	2023	2024	2025	2026	Total
Public space – 50 climate adaptive projects	1	2	4	8	**15**
Public space – 15 climate adaptive squares	0,5	1	5	8,5	**15**
New real estate – climate proof development	1	1	1	1	**4**
Totaal	**2,5**	**4,0**	**10,0**	**17,5**	**34,0**

Annual operational expenses (in million euro)	2023	2024	2025	2026	Total
Staff	2	1,5	1	1	**5,5**
Subsidies	1,12	1,02	0,92	0,82	**3,88**
Adaptation strategies unembanked areas	0,05	0,10	0,10	0,10	**0,35**
Research	0,05	0,10	0,10	0,10	**0,35**
Monitoring	0,05	0,10	0,10	0,10	**0,35**
National subsidy	0,025	0,05	0,05	0,05	**0,175**
Communication	0,10	0,15	0,10	0,10	**0,45**
Neighborhood approach	0,15	0,30	0,30	0,30	**1,05**
Totaal	**3,545**	**3,32**	**2,67**	**2,57**	**12,105**

Tshwane

CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

CoT in its Climate Action Plan has established a baseline of areas which are prone to flooding. According to the Climate Action Plan, CoT is located in a summer rainfall region with a rainy season that begins in October, peaks in the summer months and ends in April. CoT receives most of its precipitation (80%) through convective storms that often lead to localised flash floods and are sometimes accompanied by hail and strong winds. Large-scale flooding events also occur when the summer rainfall volume is above average as is often the case in La Niña years.

Areas that face a medium to very high risk of annual flooding are settlements within Region 1 (Mabopane, Soshanguve and Ga-Rankuwa), Region 2 (Hammanskraal, Temba View and areas around Doornpoort), Region 3 (Atteridgeville, Lotus Garden and the Pretoria CBD), Region 4 (Olievenhoutbosch and Centurion CBD), and Region 6 (Mamelodi, Eersterust and Nellmapius). These areas are the most populated and house numerous economic activities. Localised flooding in these areas is exacerbated by ageing infrastructure, inadequate stormwater drainage systems, as well as inadequate maintenance and clearing of stormwater systems.

CoT has established a robust early warning systems in these areas backed by the South African Weather Service (SAWS). Early warning messages are sent by CoT Emergency Services Communications Section through different social media platform and major radio stations. However, with regards to drought, CoT plans to review its 2021 Drought Contingency Plan to establish a baseline and set targets respecting the minimum proposed by the accelerator.

Roadmap

CoT has established an IoT Standard Notification Alerting Protocol (SNAP) Early Warning System (EWS) which include:

- Weather
- Updates from live emergency situations that may require public alerts.
- Security threats and imminent life-safety threats

The SNAP EWS harvests information for emergency alert and early warning filtering for dissemination. It is the primary entry point network that allow for simultaneous dissemination and defined geo-targeting dissemination of emergency alerts over a wide variety of existing, emerging and new alerting platforms. It provides a comprehensive real-time emergency alerting and early warning system throughout CoT including in informal areas.

To enhance the SNAP EWS and close any gaps, CoT is proposing a benchmarking exercise with other cities during the 2024/25 FY.

The following are the Stakeholders to be involved during the benchmarking exercise:

- Office of the Executive Mayor
- Office of the City Manager
- Emergency Services Department
- Tshwane Metro Police Department
- CoT Environment and Agricultural Management Department
- CoT Community and Social Development Department
- CoT Water and Sanitation Department
- CoT Electricity Department
- CoT Sustainability Unit
- CoT Housing and Human Settlement Department
- CoT Communications, Marketing and Events Department
- CoT Group Financial Services Department
- South African National Defence Force
- NGO/CBOs/FBOs
- SASSA
- SAPS
- State Security Agency
- Provincial Health Department'
- National Department of Water and Sanitation
- National Department of Agriculture, Forestry and Fisheries
- National Department of Environmental Affairs

- C40

Financial structure necessary

A consultant could be appointed to benchmark CoT SNAP EWS at an estimated cost of R1 million. CoT will require funding support from C40.

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

CoT Emergency Services Department, Disaster Risk Management Unit has developed a Summer Contingency Plan in August 2023 which addresses extreme events of fires, heat, heavy rainfall, flash flooding, hail and thunderstorm focusing on social disruption such as road blockages, business continuity, farming and agricultural activities.

Roadmap

The Summer Contingency Plan provides guidelines for the prevention and appropriate responses to emergencies and disasters across CoT. The most prevalent summer hazards and risks in CoT are thunderstorms, lightning strikes, heavy rainfalls, road accidents and floods.

To deal with the above risks, CoT has developed a disaster risk reduction strategy as part of the Summer Contingency Plan. The disaster risk reduction strategy in its current format is not comprehensive and therefore does require update and improvement. In terms of responding to emergencies and recovery, CoT has established a well-coordinated 24/7 Disaster Operation Centres (DOC)/ Emergency Operation Centre (EOC) to manage incidences consistently. Roles and responsibilities of different stakeholders including their contact details are clearly stipulated when dealing with disasters/emergencies via the DOC/EOC. CoT has also established safe and accessible shelters per region to house communities.

To enhance the Summer Contingency Plan and close any gaps, CoT is proposing to review its disaster risk reduction strategy and benchmark its emergency response with other cities during the 2025/26 FY.

In terms of drought, CoT Department of Emergency Services, Disaster Management Unit has developed the 2019 Drought Contingency Plan. The plan in its current form doesn't specify areas that are prone to drought. CoT will review the Drought Contingency Plan in 2024/25 FY including the Drought Emergency Protocol.

The following stakeholders will be involved during the review of the CoT disaster risk reduction strategy and the update of the Drought Contingency Plan:

- Office of the Executive Mayor
- Office of the City Manager
- Emergency Services Department
- Tshwane Metro Police Department
- CoT Environment and Agricultural Management Department
- CoT Community and Social Development Department
- CoT Water and Sanitation Department
- CoT Electricity Department
- CoT Sustainability Unit
- CoT Housing and Human Settlement Department
- CoT Communications, Marketing and Events Department
- CoT Group Financial Services Department
- South African National Defence Force
- NGO/CBOs/FBOs
- SASSA
- SAPS
- State Security Agency
- Provincial Health Department'
- National Department of Water and Sanitation
- National Department of Agriculture, Forestry and Fisheries
- National Department of Environmental Affairs
- C40

FInancial structure necessary

It is estimated that R1 million will be required for the update of the CoT Drought Contingency Plan in 2024/25 FY and R500 000 for the review of CoT disaster risk reduction strategy in FY 2025/26. CoT will require funding support from C40.

PATHWAY 1
Reducing at least 20% of water demand

Baseline

CoT receives water supply (Table 1) from Rand Water (79%), Magalies Water (2.5%), and own sources (18.5%). Water Supply from Rand Water is capped at 666ML/ day (75%) based on Rand Water project 1600. Due to high water demand, CoT is exceeding its license target from Rand Water by 5% almost daily. The major contributor to the high-water demand in CoT is the high Non-Revenue Water (NRW) which was 32% by 2022/23 FY end. CoT is targeting to reduce NRW by 1% annually in order to reduce the demand.

Roadmap

CoT has developed a Feasibility Study in 2019 (FS) which provides a holistic action plan to tackle NRW and enhance revenue. The FS has identified 240 District

Management Zones with potential interventions. Also, the FS provides the following Key Performance Indicators to be monitored and evaluated:

- Authorised Annual Average Daily Demand (Billed, Unbilled)
- Minimum Night Flows
- Water loss (Volume, %)
- System Input Volume saving (kL/d, ZAR/a)
- Total billed amount (ZAR/a)
- Customers with 60d+ debt (%)
- Total collected revenue (ZAR/a)
- Pressure Reducing Valve / Critical Point /Average pressures

According to the FS, R471,391,412.00 (€27,248,058.50) capital debt amount is required to implement the interventions excluding pipe replacement. If pipe replacement is included approximately R2.728 BN (EUR157.7M) debt capital will be required.

The City has partnered with the Development Bank of Southern Africa, African Development Bank, Urban Municipal Development Fund (AfDB UMDF), DANIDA Sustainable Infrastructure Fund (DSIF) and the Danish Embassy in South Africa to update the FS in 2024. AfDB UMDF has made 400 000 U$ available for the project.

Financial structure necessary

The total programme Capex is estimated at R3.2BN (EUR184.9M). Potential available funding sources for the recommended interventions are presented in table below.

Implementation Timeline	Potential Available Funding Sources			
	Debt Component			Grant Component
	IIPSA Grant (to unlock debt funding)	Debt	IIPSA Grant and Debt Unlocked	CoT Approved Budget (Grants/Own Funds)
FY 2022/23	R69,200,000.00		R69,200,000.00	R90,000,000 (Approved Budget)
FY 2023/24		R65,347,735.00	R65,347,735.00	R100,000,000 (Approved Budget)
FY 2024/25		R137,069,856.00	R137,069,856.00	R80,000,000 (Approved Budget)
FY 2025/26		R59,799,203.00	R59,799,203.00	R100,000,000 (Proposed Budget)
FY 2026/27		R62,382,698.00	R62,382,698.00	R100,000,000 (Assumed Budget)
FY 2027/28		R77,591,920.00	R77,591,920.00	R100,000,000 (Assumed Budget)
Total Expected Funding Available	**R69,200,000.00**	**R402,191,412.00**	**R471,391,412.00**	**R470,000,000.00**
Total Funding Required			**R471,391,412.00**	**R2,728,608,588.00**
Expected Funding Shortfall			**R0.00**	**R2,258,608,588.00**

The European Union Infrastructure Investment Fund for South Africa has approved €4 million (R80 000 000) grant capital to further unlock funding for the programme. CoT is planning to start using the grant capital in 2024/25 FY.

Increasing at least 15% of water supply

Baseline

Bulk Water Supply Overview

- The City's Average Annual Daily Demand (AADD) of Potable water is approximately 987 Ml/d.
- This includes water that is exported to City of Johannesburg (Midrand), Moretele Municipality, Madibeng Municipality and Thembisile Hani Municipality.
- An approximately 79% of the total AADD is supplied by Rand Water, that is sourced from Vaal River.
- The remainder is acquired internally from CoT's own fountains, springs, boreholes and WTP's (Water Treatment Plants), of which Rietvlei WTP (produce 40 Ml/d), Roodeplaat WTP (produce 60 Ml/d), Bronkhorstspruit (produce 54 Ml/d) and Temba WTP (produce 60 Ml/d).
- Magalies Water also owns and operates three WTP's which supply CoT, namely Klipdrift WTP (18 Ml/d), Wallmannsthal WTP (12 Ml/d) and Cullinan WTP (16 Ml/d).

Percentage of Total External and Local Sources:

- Boreholes/Springs 7.0%
- Rietvlei 4.5%
- Roodeplaat 5.2%
- Temba 5.9%
- Bronkhorstdpruit 6.4%
- Magalies Water 0.9%
- Rand Water 70.5%

Factors Driving Water Sustainability:

- Contemplated adverse effects of climate change.
- The increased standard of living and quality of life.
- In-migration.
- Increasing residential developments.
- The economic growth (i.e. re-industrialisation of Gauteng / Tshwane as an economic hub).
- The cost of new infrastructure developments and funding thereof, and
- Excessive non-revenue water loss, to be more than 30% on average per annum.

Climate Change

- According to the national response document (DEAT, 2004), the implications for SA's water resources as a result of the effects of climate change are somewhat dire.
- SA's rainfall is already highly variable in spatial distribution and unpredictable, both within and between years. Much of the country is arid or semi-arid and the whole country is subject to droughts and floods.
- Bulk water supplies are largely provided via a system of large storage dams and inter-basin water transfer schemes and such infrastructure takes years to develop.
- Thus, a reduction in the amount or reliability of rainfall, or an increase in evaporation would exacerbate the already serious lack of surface and ground water resources.

Availability of Water Resources in Gauteng (Vaal River System)

- Gauteng uses 11% of the country's water, whilst contributing 38% to the national economy. The biggest single user of water resources in the country is the irrigation sector with 62%, the urban sector is the biggest user of water in Gauteng with 79%, and therefore the driver of future growth in water use.
- All of the Cities within Gauteng Province depend on transfers to meet their water requirement needs. It is clear that the volume of water required by 2025 will not be met, if additional storage infrastructure is not built.
- Gauteng is estimated to face a water deficit in 2025 and beyond if investment into the additional dams is not given the priority it deserves.
- The anticipated water requirement deficits are expected to occur throughout 2016-2025 (when the second phase of the Lesotho Highlands Water Project is expected to come online).

Tshwane Water Resource Impact Study and 2055 Master Plan

- The CoT falls within the Crocodile and Olifants River catchment areas. It further obtains most of its potable water from the Vaal River catchment through transfer schemes.
- The National Government, through its water resource strategies must, inter alia, estimate the present and future water requirements. It also must set out principles relating to water conservation and water demand management.
- The Vaal River Reconciliation Strategy concluded inter-alia that, relating to potable water as managed by Local Government, it has become vital that:
  Water Conservation and Demand Management be implemented extensively, and
  Water re-use be done on a large scale.

Water Catchment Areas
The City of Tshwane is located on the water shed between two catchment areas and receives portable water from one another.

Tshwane's Local Surface Water Resources

- Roodeplaat Dam
- Rietvlei Dam
- Leeukraal Dam
- Bronkhorstspruit Dam

Roadmap

Surface Water Treatment Plant Upgrades: up to 2055

- Rietvlei Water Treatment Plant (WTP): Phased upgrade from 40 – 140 Ml/d
- Rietvlei WTP with transfers from Olifantsfontein WWTW: phased upgrade from 40 – 240 Ml/d
- Roodeplaat WTP: phased upgrade from 60 – 240 Ml/d
- Temba WTP: phased upgrade from 60 – 180 Ml/d
- Bronkhorstspruit/Cullinan WTP's: no expansion possible
- Bronkhorstbaai WTP: phased upgrade from 0,5 – 5,5 Ml/d
- Groundwater resources: status quo remains.

Rietvlei WTP 40 – 140 Ml/d Upgrade Phases

- Current capacity = 40 Ml/d
- 2020: 25 Ml/d expansion
- 2030: 25 Ml/d expansion
- 2040: 25 Ml/d expansion
- 2050: 25 Ml/d expansion
- WTP capacity at 2055 = 140 Ml/d

Rietvlei WTP 40 – 240 Ml/d Transfer Scheme

- A receiving works on the site of the Olifantsfontein WWTW.
- A pumping station.
- 13 km of pipeline to transfer the raw water across the catchment.
- Receiving works at the Marais Dam.
- 2020 - 80 Ml/d.
- 2040 - + 40 Ml/d = 20 Ml/d.

Rietvlei WTP 40 – 240 Ml/d Expansion Phases

- Current capacity = 40 Ml/d
- 2020: 100 Ml/d expansion
- 2035: 50 Ml/d expansion
- 2045: 50 Ml/d expansion
- WTP capacity at 2045 = 240 Ml/d

Rietvlei WTP (with transfer) 40 – 240 Ml/d: Land/ Property required

The current Rietvlei site is constrained. Expansion to the Rietvlei WTP can be achieved on a new site immediately north of the current WTP.

Roodeplaat WTP 60 – 240 Ml/d: Expansion Phases

- Current capacity = 60 Ml/d
- 2015: 30 Ml/d expansion
- 2025: 50 Ml/d expansion
- 2035: 50 Ml/d expansion
- 2045: 50 Ml/d expansion
- WTP capacity at 2045 = 140 Ml/d

Roodeplaat WTP 60 – 240 Ml/d: Phasing and Utilization
Sufficient provision has been made on the current site to add 30 Ml/d WTP (1st phase expansion). Expansion of the other phases will necessitate development on the north-west (Council owned land)

Provide a list of stakeholders that will be involved to develop and implement the actions of the road map; provide a description on how the city will build partnerships.

The following are potential stakeholders:

- Office of the Executive Mayor

- Office of the City Manager
- CoT Water and Sanitation Department
- CoT Sustainability Unit
- CoT Housing and Human Settlement Department
- CoT Communications, Marketing and Events Department
- CoT Group Financial Services Department
- National Treasury
- Development Bank of Southern Africa Infrastructure Fund
- National Department of Water and Sanitation
- Infrastructure South Africa
- Development Financing Institutions
- C40

Financial structure neccesary

There are sufficient surplus yields available in the Crocodile River basin for CoT to increase the capacities and supply areas of Temba, Rietvlei and Roodeplaat Water Treatment Plants, and despite significant Capex it can be achieved at a unit cost for water which is lower than the Rand Water tariff.

Indirect re-use of wastewater should be the preferred option to optimise potable water supply while still maintaining the reserve for basic and environmental needs in the Crocodile River system.

The CoT has various possible options to fund the execution phase/s of this project, namely:

CoT Capital Budget
Loan Funding
Municipal Infrastructure Grant
Regional Bulk Infrastructure Grant / USDG
PPP funding mechanism
Development Bank of Southern Africa
World Bank
Commercial Banks
Investment Banks
International Funding

Infrastructure South Africa (ISA) created the Infrastructure Investment Project Appraisal and Approval Process for public sector led and procured infrastructure projects under the current legal framework.

With funding from ISA, the Water and Sanitation Department, in conjunction with the Enterprise Programme Management Unit, initiated a process namely the Five Case Model (5CM) as the foundation model for this project's (Rietvlei Upgrade) lifecycle.

The first and second stage in the ISA process requires the Municipality to submit the proposed project details and project program for submission to ISA for registration, which has been done.

The Review Stages (stages three to five) of the Five Case model requires the compilation of an Early Business Case (pre-feasibility study), Intermediate Business Case (feasibility study) and Full Business Case.

The required work entails the compilation and submission of the Early Business Case, with the option for the further compilations of the Intermediate- and Full Business Case, subject to approval by ISA the preceding stages.

The Early Business Case for the project has been completed by an appointed service provider and submitted to ISA for approval.

The Enterprise Programme Management Unit has appointed a service provider to commence with the Intermediate Business Case.

PATHWAY 2
Restoring at least 3 of the city's water bodies (such as rivers, creeks, and wetlands) to significantly reduce flood risks and improve water quality

Baseline

- CoT in its Climate Action Plan has set a target of ensuring that 100% of spatial frameworks and plans incorporate green spaces, and critical biodiversity and ecological support areas by 2025. And that all resources (ecosystems and water) currently exhibiting poor quality are improved to adequate quality levels by 2030.

- In 2011 the Gauteng Department of Rural Development and Agriculture (GDARD, 2011) GIS data mapped watercourses in CoT according to their present ecological status.

Out of the 28 major rivers in CoT, three (3) rivers were selected for their potential in advancing the mission to curb the water scarcity in the city. The criteria used for the selection of the below mentioned rivers is based on the city of Tshwane jurisdiction/ boundary, volume of mean annual runoff (millions cubic meter per annum), water quality and pollution level (non-point and point sources) as well as confluence of applicable rivers.

Apies River
Apies River originates from Fountains Valley and flows northwards through privately-owned Bon Accord Dam. The river then leaves the CoT at Hammanskraal Township and heads towards Northwest Province. It is one among the city's most urbanized and contaminated watercourses. Point sources of pollution in the Apies River include sewage discharged from wastewater treatment plants, informal settlement establishments along the river, and agricultural operations. Illegal industrial discharge, illegal dumping, stormwater

runoff, and erosion are examples of non-point pollution sources.

Pienaars River
The Pienaars River originates at Moreleta township within the CoT boundaries, flows north to the Roodeplaat Dam, and exits CoT from Dinokeng Game Reserve. There is less water and more sludge in the Pienaars River water that enters Roodeplaat Dam. The two rivers that pour into the Roodeplaat Dam are Moreletaspruit and Edendalespruit. They have comparatively higher water quality since they are diluted. The water quality of the Pienaars River when it enters Roodeplaat Dam is significantly worse than the exit of the river from the dam.

Agricultural practices, informal residential settlements, and sewage discharge from wastewater treatment plants are the main point sources of pollution in the Pienaars River. Illegal industrial discharge, illegal dumping, stormwater runoff, and erosion are examples of non-point pollution sources.

Bronkhorspruit
Bronkhorspruit is a river system traversing important agricultural areas. It enters the CoT from the Mpumalanga Province and flows northwards to the Bronkhorpruit Dam where it later converges and exits as Wilge River. The water quality of Bronkhorspruit River entering the CoT and before the Bronkhorspruit Water Purification Plant is better quality than after its passing.

Point source pollution of the Bronkhorspruit includes agricultural activities (poultry, cattle, and piggery farming), algae and water hyacinth infestation, informal settlement establishments, coal mining activities and sewage discharge from wastewater treatment plant. Non-point pollution sources include illegal dumping, illegal discharge from industries as well as stormwater runoff and erosion.

Roadmap

CoT is planning to revise the GDARD (2011) classification in 2024/25 using the GDARD 2022 rivers and wetlands GIS data to show the current ecological status of watercourses at a finer scale and set a new baseline. The city shall focus on the rehabilitation of the following 3 waterbodies namely Apies, Pienaars and Bronkhorstspruit. Interventions to be used to modify the river water quality from seriously polluted to less polluted include but not limited desludging, desiltation, installation and monitoring of proper stormwater infrastructure, enforce polluter pay principle (where applicable) and upgrade the water purification plant.

The following stakeholders will be involved during the revision:

- CoT Water and Sanitation Department
- CoT Emergency Services Department
- CoT Environment and Agriculture Department
- CoT Human Settlement Department
- MAP Forum
- Department of Water and Sanitation
- Department of Forestry, Fisheries and Environment
- SANBI
- GDARD
- City of Aarhus (Denmark)
- University of Pretoria
- Friends of Nature Reserves and Rivers and Wetlands (NGO)
- NGOs
- Department of Science and Innovation

Financial structure necessary

It is estimated that R5 million will be required to revise the GDARD (2011) watercourse classification. CoT will require funding support from C40.

Tokio


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CORE COMMITMENT
Establishing early warning systems in all low-income areas where communities face a high-risk of flooding and drought

Baseline

(1) Creation and publication of flood inundation area maps
Created and published flood inundation area maps for all 14 areas in FY 2020 assuming the heaviest possible rainfall.
URL: https://www.kensetsu.metro.tokyo.lg.jp/jigyo/river/chusho_seibi/index/menu02.html
https://www.kensetsu.metro.tokyo.lg.jp/english/jigyo/river/07-01.html

(2) Provision of information on water disaster preparedness
Provide real-time precipitation information for 149 locations, river water levels for 176 locations, and images from river monitoring cameras at 126 locations in Tokyo (Flood Control Integrated Information System). * The number of locations is as of October 2023.
Additional river monitoring cameras and other observation equipment are being installed.
URL: https://www.kasen-suibo.metro.tokyo.lg.jp/im/uryosuii/tsim0102g.html
https://www.kasen-suibo.metro.tokyo.lg.jp/im/uryosuii/tsim0102g_en.html
Distribute live video of river monitoring cameras through YouTube (Tokyo Suibou Channel)
URL: https://www.youtube.com/channel/UCaydvLwWthLMbfKLEQSY2UQ

(3) Designation of flood forecast rivers and water level information rivers
Designate 19* flood forecast rivers and water level information rivers, mainly in prioritized basins, for which flood danger information is announced to help residents evacuate in the case of impending floods.* The number as of October 2023.
URL: https://www.kensetsu.metro.tokyo.lg.jp/jigyo/river/chusho_seibi/index/menu10.html

(4) Improvement of awareness of disaster preparedness
Raise awareness of disaster preparedness fine-tuned to different generations to help households get fully prepared through the distribution of the Disaster Preparedness Tokyo App.
Distribute Tokyo My Timeline as content in the Disaster Preparedness Tokyo App, link the completed My Timeline with disaster preparedness weather information, and introduce a reminder that urges a user to check their Timeline.

(5) Collection, analysis, and provision of information in response to a disaster
Operate the Disaster Information System (DIS), which is an important core information system for a disaster response in Tokyo, share disaster information in TMG and with related organizations, and improve disaster information provided to Tokyo residents.
Consolidate information, such as congestion in municipal evacuation centers, by DIS to provide it through our website, a Disaster Preparedness Tokyo App and L-ALERT.

Roadmap

The Tokyo Climate Change Adaptation Plan was formulated in March 2021. In March 2023, the Climate Change Adaptation Plan - Action Plan 2023 was formulated. The Action Plan incorporates new initiatives, strengthens response capabilities, and includes a schedule of initiatives for the three years starting FY 2023. The following initiatives will be promoted based on these plans.
When formulating the plans, the opinions of Tokyo residents were solicited through a public consultation and other occasions.
https://www.kankyo.metro.tokyo.lg.jp/policy_others/zeroemission_tokyo/adaptation/plan.html

(1) Improved provision of information on flood risks
Create hazard information, including inundation predictions, based on more frequent multiple rainfall events, with a view to using it for urban development, including flood control for buildings.

(2) Improved provision of information on water disaster preparedness
Install additional river monitoring cameras and

other observation equipment in places affected by inundation to enhance the provision of information for disaster preparedness along rivers.
Publish images from river monitoring cameras at approximately 200 locations and water level gauges at approximately 280 locations by FY 2030.

(3) Additional designation of flood forecast rivers and water level information rivers
Designate additional flood forecast rivers and water level information rivers.

(4) Improvement of awareness of disaster preparedness
Control the operation of the Disaster Preparedness Tokyo App, enhance its capability, make it multilingual, and raise public awareness according to targets.

(5) Collection, analysis, and provision of information in response to a disaster
Rebuild the Disaster Information System, control its operation, and operate it.

Financial structure necessary

The Tokyo Metropolitan Government has made the realization of a safe city one of its main policies. We create a budget to actively develop our policies for both hard and soft aspects for the realization of a resilient and sustainable city that will ensure "Safety for the Next 100 Years."
https://www.zaimu.metro.tokyo.lg.jp/syukei1/zaisei/20230127_reiwa5nendo_tokyotoyosanangaiyou/5yosanangaiyou.pdf

Developing emergency responses to protect all people during critical events with actions such as ensuring safe and accessible shelters and provision of basic needs

Baseline

(1) Development of evacuation measures
Formulate the evacuation center management and operation guidelines and the guidelines for measures for supporting vulnerable communities based on the viewpoints of measures against emerging infectious diseases and also the various perspectives of women and vulnerable communities.
https://www.fukushi.metro.tokyo.lg.jp/joho/soshiki/syoushi/syoushi/hinanjo-shishin/index.html
https://www.fukushi.metro.tokyo.lg.jp/joho/soshiki/soumu/soumu/oshirase/saigai_youhairyosya.html
Consider wide-area evacuation measures in the event of a large-scale flood in collaboration with the national government, related local governments and organizations.

(2) Promotion of elevated urban development
In order to respond to a large-scale flood associated with climate change etc., the national government and the Tokyo Metropolitan Government published the Vision for Creating a Disaster-Resilient Capital Tokyo in December 2020, which includes flood control measures for the eastern lowlands.
https://www.mlit.go.jp/river/shinngikai_blog/renrakukaigi/pdf/vision1.pdf
A working group was formed with local wards in March 2021, and is working to give shape to urban development with elevation, including the integrated implementation of a land readjustment project and super levee development project.

Roadmap

The Tokyo Climate Change Adaptation Plan was formulated in March 2021. In March 2023, the Climate Change Adaptation Plan - Action Plan 2023 was formulated. The Action Plan incorporates new initiatives, strengthens response capabilities, and includes a schedule of initiatives for the three years starting FY 2023. The following initiatives will be promoted based on these plans.

When formulating the plans, the opinions of Tokyo residents were solicited through public consultation and other occasions.
https://www.kankyo.metro.tokyo.lg.jp/policy_others/zeroemission_tokyo/adaptation/plan.html

Promotion of evacuation measures

- Support municipalities through the timely and appropriate revision of evacuation center management and operation guidelines.
- Promote measures for supporting vulnerable communities in the event of a disaster.
- Encourage the building of a framework for providing/communicating information and a system for wide-area evacuation in collaboration with the national government and municipalities.

The TOKYO Resilience Project was launched in December 2022 with the aim of accelerating infrastructure development by reviewing the preconditions of existing disaster prevention measures, assuming a 10% increase in future precipitation and a maximum sea level rise of approximately 60 cm due to climate change. The following initiatives will be promoted based on this project.
https://www.seisakukikaku.metro.tokyo.lg.jp/documents/d/seisakukikaku/-en-tokyo_resilient_project-1

Promotion of elevated urban development

- In the short to medium term, consider ensuring that parks and other public facilities are built on elevated areas. In the medium to long term, consider introducing a new mechanism to promote the construction of super levees in

collaboration with the national government, allowing for the acquisition of elevated areas that can serve as a base for rescue and relief operations along the Arakawa, Edogawa, and Tama rivers, all of which are at risk of severe flooding.

Financial structure necessary

The Tokyo Metropolitan Government has made the realization of a safe city one of its main policies. We create a budget to actively develop our policies for both hard and soft aspects for the realization of a resilient and sustainable city that will ensure "Safety for the Next 100 Years."
https://www.zaimu.metro.tokyo.lg.jp/syukei1/zaisei/20230127_reiwa5nendo_tokyotoyosanangaiyou/5yosanangaiyou.pdf

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PATHWAY 2
Increasing at least 20% of stormwater retention and infiltration to significantly reduce flood risk

Baseline

(1) Basic Policy for Measures Against Heavy Rainfall
The Tokyo Metropolitan Government Basic Policy for Measures Against Heavy Rainfall (Revised) was formulated in June 2014 to stipulate efforts for maintaining rivers and sewerage systems as well as installing storage and infiltration facilities and promote them as comprehensive flood control measures.

(2) Flood control measures for small and medium-sized rivers
In response to inundations caused by heavy rains that far exceed the target development level, the annual probability of exceeding the baseline has been set at 1/20 to strengthen the flood control measures taking priorities into consideration. The basic policy is to construct revetments for precipitation of up to 50 mm per hour and develop regulating reservoirs for precipitation above that level.

(3) Development of sewerage facilities
Promote the construction of sewerage prioritizing districts at high risk of inundation.

(4) Promotion of initiatives based on the Local Biodiversity Strategy
The Tokyo Local Biodiversity Strategy was formulated in April 2023.
Reaffirm the various functions of the natural environment to actively use them in green infrastructure for the purpose of the conservation and restoration of nature.

Roadmap

The Tokyo Climate Change Adaptation Plan was formulated in March 2021. In March 2023, the Climate Change Adaptation Plan - Action Plan 2023 was formulated. The Action Plan incorporates new initiatives, strengthens response capabilities, and includes a schedule of initiatives for the three years starting FY 2023. The TOKYO Resilience Project was launched in December 2022 with the aim of accelerating infrastructure development by reviewing the preconditions of existing disaster prevention measures, assuming a 10% increase in future precipitation and a maximum sea level rise of approximately 60 cm due to climate change. The following initiatives will be promoted based on these schemes.

When formulating the plans, the opinions of Tokyo residents were solicited through public consultation and other occasions.
https://www.kankyo.metro.tokyo.lg.jp/policy_others/zeroemission_tokyo/adaptation/plan.html
https://www.seisakukikaku.metro.tokyo.lg.jp/documents/d/seisakukikaku/-en-tokyo_resilient_project-1

(1) Revision of the Basic Policy for Measures Against Heavy Rainfall
Explore future measures for heavy rains in Tokyo taking into account the effects of climate change in the future, and consider the revision of the Tokyo Metropolitan Government Basic Policy for Measures Against Heavy Rainfall.
When revising the policy, the opinions of academics and Tokyo residents will be sought through review committees and public consultation.

(2) Flood control measures for small and medium-sized rivers
Promotion of river channel maintenance
Promote the maintenance of river channels, including the widening of river channels, maintenance of river revetment, and excavation of riverbeds.

Promotion of regulating reservoir development
Promote the development of regulating reservoirs, including the Wide-Area Regulating Reservoir under Loop Road No. 7.

Development of new regulating reservoirs
Bring forward the target of the start of development of new regulating reservoirs of approximately 1.5 million m3 by FY 2030 to facilitate the faster development of regulating reservoirs.

Promotion of initiatives based on the Vision for River Facilities in light of climate change.
The Vision for River Facilities will be formulated in FY2023 and will take into account increased precipitation, rising sea levels, and more powerful typhoons under the effects of climate change.
Efforts will be made to develop facilities in response to

climate change based on the results of studies on new development methods, including that for underground rivers.
When formulating the Vision for River Facilities in light of climate change, the opinions of academics and Tokyo residents will be sought through review committees and public consultation.
URL:https://www.kensetsu.metro.tokyo.lg.jp/kasenbu0217.html

(3) Development of sewerage facilities
Develop sewerage trunk lines, storage facilities, etc. in the 23 wards in response to increased precipitation under the effects of climate change.

(4) Promotion of rainwater runoff control measures
Promote measures to control rainwater runoff that align with the concept of green infrastructure, infrastructure that utilizes the environment's natural features to solve social issues, by strengthening the communication and support needed for public and private facilities to introduce these measures.

(5) Promotion of initiatives based on the Local Biodiversity Strategy
Spread Nature-based Solutions (NbS) that solve social issues by utilizing the natural environment, such as disaster preparedness and mitigation through rainwater infiltration.

Financial structure necessary

The Tokyo Metropolitan Government has made the realization of a safe city one of its main policies. We create a budget to actively develop our policies for both hard and soft aspects for the realization of a resilient and sustainable city that will ensure "Safety for the Next 100 Years."
https://www.zaimu.metro.tokyo.lg.jp/syukei1/zaisei/20230127_reiwa5nendo_tokyotoyosanangaiyou/5yosanangaiyou.pdf

In implementing our initiatives, we have been working to ensure financial resources through the use of Tokyo Green Bonds and other Tokyo Metropolitan Government bonds as well as the national government subsidies.

C40
CITIES