

RESILIENCE ACCELERATOR

CANTHO, VIETNAM

DESIGNING FOR NATURE-BASED INFRASTRUCTURE

JUNE, 2019

100 RESILIENT CITIES

COLUMBIA

Center for
Resilient Cities
and Landscapes



PROGRAM OVERVIEW

The Resilience Accelerator Program, a partnership between 100 Resilient Cities – Pioneered by the Rockefeller Foundation (100RC) and the Center for Resilient Cities and Landscapes at Columbia University (CRCL), connects cities with design expertise and a global network of practitioners and researchers to expand the resilience value of projects, generate investment opportunities, deepen relationships between project teams across sectors, and accelerate implementation strategies. The Accelerator leverages the strengths of 100RC and CRCL to support the city partners most directly responsible for the implementation of priority resilience projects. Local academic partners enhance this work by coordinating research to advance the analysis, design, and planning explorations.

The Accelerator aims to match the research, planning, and design expertise at Columbia University with local knowledge and relationships of partner cities to advance pre-design work of high priority projects within the 100RC network by:

- Delivering of analyses, visualization of issues, and design in support of project development, and leveraging Columbia and other academic partners to advance resilience-based design, research, and decision-making.
- Facilitating immersive workshops that bring together multi-disciplinary teams to advance strategy, project design, and implementation.
- Convening the perspective of hundreds of international and place-based thought leaders, designers, and technical experts chosen for their ability to facilitate and advise on topical subject matter.

Since the launch of the program in the spring of 2018, the Resilience Accelerator has worked with 13 projects across eight cities in the 100 Resilient Cities network.



PARTNERS

100 Resilient Cities — Pioneered by The Rockefeller Foundation (100RC)

100 Resilient Cities – Pioneered by The Rockefeller Foundation (100RC) helps cities around the world become more resilient to the social, economic, and physical challenges that are a growing part of the 21st century.

Center for Resilient Cities and Landscapes at Columbia University

The Center for Resilient Cities and Landscapes (CRCL) uses planning and design to help communities and ecosystems adapt to the pressures of urbanization, inequality, and climate uncertainty.

Can Tho Resilience Office

The Can Tho Resilience Office leads strategy development, resilience project planning, and implementation in Can Tho, Vietnam. It coordinates research and engagement among resilience practitioners, researchers, civil society stakeholders, and government institutions in Can Tho.

The Delta Research And Global Observation Network in Mekong Institute

A premier institute within Can Tho University, the DRAGON-Mekong Institute is an internationally recognized center for research and training related to the impacts of climate change on major river deltas, and enhancing the resilience of delta communities and ecosystems to climate change.

CONTEXT

Can Tho City has an opportunity to rethink development to support urban growth, climate adaptation, and long-term resilience to interconnected regional risks. By integrating nature-based infrastructure into its growth strategies, Can Tho can avoid the mistakes of the past while fostering generational knowledge. Today, Can Tho is nearing the completion of its Resilience Strategy, updating its city-wide master plan, considering the approaches and impacts of current flood infrastructure investments, and advancing new models for integrating planning efforts across the City and on a national scale.

Future plans for Can Tho outline ambitious objectives for the growth of industry, commerce, and services, and identify the City’s gravest risks as flooding and water pollution. Climate change impacts from sea-level rise and increasing extreme weather, subsidence related to groundwater extraction, increasing development on low-lying agricultural land, construction of hydropower dams, and use of concrete for drainage channels are all expected to exacerbate these risks.

Can Tho has focused on hard infrastructure measures to defend against flooding, such as an urban sewage system and physical embankments along rivers and canals. But these conventional approaches fail to sufficiently account for Can Tho’s unique and dynamic climate risk, financial constraints, and natural heritage. As the City undertakes a review of its Master Socio-Economic Development Plan, its new commitment to building resilience offers an opportunity to reconcile these growth imperatives with protection of its fragile riverine ecosystem.

Can Tho is on the verge of becoming a developed, international city, and the central growth engine of the Mekong River Delta region. The city strives to become a hub for tourism, trade and goods distribution, and ecological and high-tech urban agriculture. Can Tho plans to develop in an integrated, balanced, and sustainable manner, in harmony with natural landscapes, and in a way that highlights its identity as a river city. It plans to develop a chain of urban areas concentrated in central districts and satellite urban areas in its rural districts. These plans aspire to take advantage of the natural terrain, preserving existing rivers and channels, while creating new lakes, ponds, and canals that improve drainage.

PROCESS

The Resilience Accelerator Team (the Accelerator Team)—including participants from 100 Resilient Cities (100RC), the Center for Resilient Cities and Landscapes at Columbia University (CRCL), and the Columbia University Urban Design Program’s third-semester Urban Design Studio—partnered with Can Tho City’s Resilience Office and Can Tho University’s Dragon Institute (the Can Tho Resilience Team) to develop a framework for planning and development that prioritizes climate-related risk and resilient design strategies. This report summarizes the Accelerator partnership, outlines the challenges facing Can Tho and the Mekong Delta, offers urban design principles for future nature-based infrastructure investments, and presents pilot concept proposals developed by Columbia students in the spring of 2019.

The Accelerator Team visited Can Tho in January 2019, joining the Can Tho Resilience Team and Can Tho University students on site visits throughout the Can Tho metropolitan area, and participating in lectures and discussions about the growing and interconnected challenges that urban and rural areas face in the Mekong Delta. Over the next four months, Columbia students developed district-scale urban design strategies that respond to these risks across seven representative sites in Can Tho. The concepts aim to improve housing, agriculture, energy production, tourism, and water management; facilitate urban densification; and enable environmental stewardship in light of global climate and urbanization pressures. Can Tho City officials, the Can Tho Resilience Team, and the Accelerator Team informed the student work with periodic feedback throughout the semester. The student work culminated in an exhibition at the Columbia Graduate School of Architecture, Planning and Preservation.

To inform future implementation of the Can Tho Resilience Strategy and designated priority actions, CRCL, 100RC, and the Can Tho Resilience Team worked together to synthesize student-generated concepts and propose a set of design principles to guide future work, investments, and decision-making in Can Tho City. These concepts and principles, as well as an actionable timeline to engage stakeholders, identify pilot investments, and institutionalize a new decision-making framework around nature-based infrastructure are shared here.

ADVANCING EXISTING PLANS

The Resilience Accelerator Program and Columbia Urban Design Studio aim to build off of several existing plans and initiatives in Can Tho and the Mekong Delta region, including:

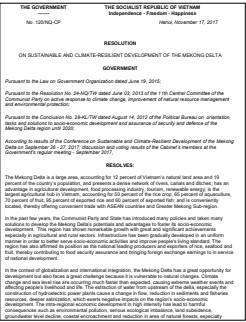
NATIONAL

The Planning Law (November, 2017)

Establishes national, regional, and provincial master plans, including special economic zones and urban and rural plans.

Government Resolution 120

Outlines 2050 and 2100 targets for raising relative income and expanding high-tech and high-quality agriculture, ecotourism, and manufacturing while increasing forest coverage and climate-resilient infrastructure.



REGIONAL

Mekong Delta Plan

Drafted between 2011–2013 by the Vietnamese and Dutch governments to promote a transition to high-tech agriculture throughout the Delta.



MUNICIPAL

Can Tho Resilience Strategy

Outlines the need for further green infrastructure, social infrastructure including health programs and facilities, and poverty reduction.

Master Socio-Economic Development Plan of Can Tho City Until 2020 with Vision to 2030

Master Socio-Economic Development Plan of Can Tho City Until 2020 with Vision to 2030
Land use changes and infrastructure projects that promote industrial growth, increase density in the urban core, and expand urban residential areas in peri-urban and agricultural areas.

Can Tho Urban Development and Resilience Project, World Bank

Flood prevention infrastructure, including a wall around the urban core of the city, sluice gates, retention ponds, and sewage infrastructure.

Green Infrastructure feasibility study, ISET and Can Tho University

Evaluates the effectiveness of bioswales, rain gardens, and other water retention infrastructure.

ON-SITE RESEARCH

The Can Tho Resilience Team led visits to six sites in the Can Tho area, including orchards and aquaculture ponds, new housing developments, waste treatment facilities, waterfront parks and public spaces, heritage sites, and research labs at Can Tho University. Columbia students formed groups to further investigate five topics: agriculture, heritage, infrastructure, new towns, and industry. They presented their findings to officials from Can Tho City, the Dragon Institute, and the Can Tho Office of Resilience.

AGRICULTURE

Rice, vegetable, fruit, and flower farms in Can Tho, where changes to agricultural policy have affected farms, farmers and the lands they manage.

URBAN FARM

RURAL HOUSING

FLOATING MARKET

NEW TOWNS

New urban areas in the southern part of Can Tho, where road-based development is enabled by foreign direct investment.

TRADITIONAL HOUSING

HERITAGE

Historic temples, pagodas, and other cultural sites in Binh Thuy, Can Tho's historic center, where nearby flood infrastructure threatens cultural integrity.

WORLD BANK PROJECT

INFRASTRUCTURE

Water systems in downtown Can Tho, including recent hard-edge retention ponds and canals as well as green infrastructure pilot projects.

INDUSTRY

Waste treatment facilities in Can Tho devoted to the processing and disposal of solid and liquid industrial byproducts.

CONSERVATION AREA

AQUACULTURE

TOURISM AREA

LEARNINGS

AGRICULTURE

Changes to Vietnam's agricultural economy have affected farmland and livelihoods. Most rural and peri-urban farmers continue to grow rice, jackfruit, star apples, and mangoes in canal-irrigated fields, and burn agricultural byproducts for household fuel. But many farms now serve an international market with stricter standards for produce. This means growing higher-value crops and using more packaging to preserve and ship them. This has led to the growth of larger farms, cooperatively managed by several or dozens of families. Can Tho has also seen recent growth in its high-tech agriculture sector, including new hydroponic greenhouse farms, where agricultural production is finally and completely disconnected from local environmental conditions. The group also visited "agritourism" farms where traditional agriculture and aquaculture practices are demonstrated for tourists for supplemental income.



HERITAGE

Binh Thuy, Can Tho's historic center, has urbanized rapidly in the last two decades. It sits outside a planned dike designed to protect the contemporary city center. The Heritage Research Group traced the northern edge of the Mekong River, studying its material and spatial conditions and documenting river access points. The group's research suggests a spatial relationship between river access points and cultural institutions as well as residential development—a relationship that may be undermined when the waterfront is eventually walled off.



INDUSTRY

The Industry Group visited solid waste and wastewater treatment facilities in Can Tho. The group found an unnatural water cycle, in which groundwater is extracted for domestic and industrial uses, and the wastewater from industrial facilities is dumped—once treated—into the Hau River. Solid waste, meanwhile, is transported by truck to a distant Chinese-owned incineration facility, which produces energy as a byproduct. Considering that groundwater extraction is a leading cause of land subsidence, the group speculated that the current economy of industrial activity, waste disposal, and energy production could be refashioned to reduce net groundwater depletion and foreign ownership of power production.



INFRASTRUCTURE

The Infrastructure Research Group investigated water systems in the urban core of Can Tho. They paid special attention to new flood management structures associated with ongoing World Bank projects, including new canal edges, sluice gates, and a prominent retention pond. The team also visited pilot green infrastructure projects under development at Can Tho University, where constructed wetlands, bioswales, and rain gardens are measured for the water retention capacity, leading them to consider ways that vegetated swales, ponds, and filtration systems could help Can Tho manage stormwater and waste.

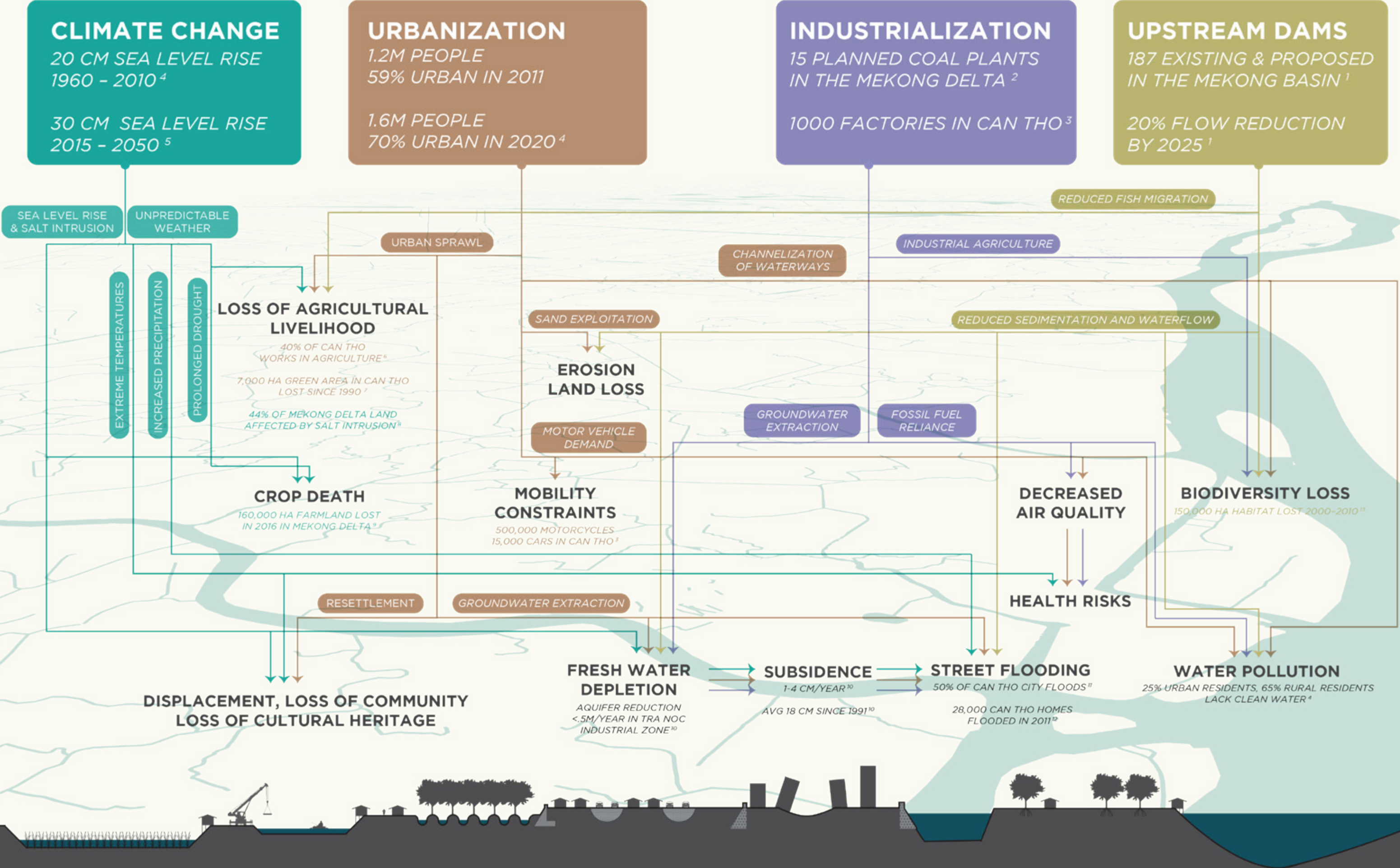


NEW TOWNS

The New Towns Research Group visited new urban areas in the southern part of Can Tho. These towns, which are built on formerly-rural land, are designed with paved roads as the dominant urban form. To build these towns, developers pave over canals and construct road, sewage, and energy systems that ignore local hydrology. The new towns are often unaffordable to the land's previous rural residents, who are left without a viable livelihood in the new land-use regime.



INTERCONNECTED RISK

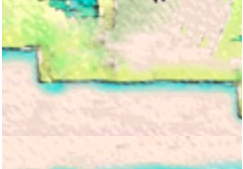


URBAN DESIGN PRINCIPLES

Throughout the Resilience Accelerator process the Team considered on-the-ground research, conversations with City stakeholders, existing plans and projects, and the goals and actions identified by the Can Tho Resilience Strategy to inform a set of design principles. These underpin design concepts and can serve as a decision-making criteria for future investments in nature-based infrastructure in Can Tho. They aim to address the complex set of risks and vulnerabilities that communities face and ensure that the many ecological, social, economic, and institutional assets are prioritized to ensure a more resilient Can Tho and Mekong Delta.

RESEARCH

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Can Tho University. Columbia
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They presented their findings
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CAPITALIZE ON EXISTING LANDSCAPES TO CONSERVE WATER, SOIL, AND LIVELIHOODS

Can Tho’s agriculture sector need not compete with urban development for access to land and resources. A resilient approach to the design of new agro-urban districts could strengthen the competitiveness of Can Tho’s agriculture sector while also providing greater opportunities for housing and jobs. By investing in sustainable agriculture practices such as multi-cropping, the quality of soil can be maintained; stormwater and flooding can be locally managed; and existing livelihoods can be protected. At the same time, new resilient agro-urban districts can create job opportunities in environmental monitoring and management, agri-tourism, and local and sustainable building products and construction.

USE TRADITIONAL AND NEW TECHNOLOGIES TO ENABLE PARTNERSHIPS BETWEEN INDUSTRIAL, INFRASTRUCTURAL, ECOLOGICAL, AND SOCIAL INTEREST GROUPS

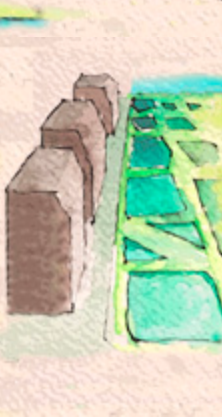
Can Tho’s dependence on fossil fuels for energy puts communities at risk from air pollution, acid rain, and energy disruption. With abundant access to renewables such as sunlight and biomass from agricultural by-products, Can Tho has the opportunity to be a global leader in smart, renewable energy technologies. These technologies can be piloted at the district level with partnerships among the public sector, industry, and civil society, creating healthier neighborhoods, job opportunities, and a secure supply line for Can Tho’s growing energy needs.

USE WATER NETWORKS AND PUBLIC SPACE TO MODERATE FLOODING AND POLLUTION

In the rush of urbanization, Can Tho has been generous to cars. New eight-lane highways cross the city, spreading a blanket of asphalt over the sinking delta landscape. Many more roads are planned, and they will bring more cars and parking lots. These roads might help the city expand economically and geographically, but they also prevent groundwater recharge and hasten the subsidence of the ground on which the city sits, ultimately exacerbating urban flooding. Can Tho could rethink the design of roads and other paved surfaces to provide essential stormwater management, water treatment, and new and innovative kinds of public spaces.

COORDINATE GREEN INFRASTRUCTURE WITH NEIGHBORHOOD PLANNING EFFORTS TO SYNCHRONIZE ENVIRONMENTAL, ECONOMIC, AND SOCIAL BENEFITS

Funding the long-term maintenance of green infrastructure is a major challenge for cities. Fortunately, green infrastructure creates multiple benefits for people—providing great places for recreation, enjoyment of nature, and stormwater management. Communities should be involved in the planning and design of green infrastructure from the earliest stages so residents understand, appreciate, and take advantage of these benefits. With deep engagement, the public sector can also form partnerships with civic organizations to steward green infrastructure.



CELEBRATE CAN THO’S IDENTITY AS A WATER CITY

People who live in the world’s greatest cities—like Can Tho—can lose sight of what makes their city unique. Can Tho’s heritage as a water city sets it apart. The canals running through the Mekong Delta, the houses built on stilts over these canals, and the inventive ways that people have raised and captured fish for generations are just some of the striking features of Can Tho’s water landscape. Protecting these places and practices is paramount to retaining this identity, and could be a foundational way in which developers and planners conceive Can Tho’s future.

COMPLEMENT URBAN GROWTH WITH CONSERVATION STRATEGIES THAT PROTECT RURAL LANDSCAPES, LIVELIHOODS, AND COMMUNITY NETWORKS

Can Tho is attracting foreign investment which is propelling its transition from an agrarian economy to one based on commerce, services, and real estate. Economic transition does not have to lead to the erasure of existing landscapes, livelihoods, and community networks. Design and planning standards for urban growth could prohibit the filling of canals, restore some that have been filled, and promote the expansion of the canal network both for drainage and water transportation. Road networks can be planned to minimize the impact on existing agricultural or natural landscapes. Land could be subdivided at a scale that could allow existing residents to develop their own holdings and preserve small farms instead of into large development parcels.

ADAPT BUILDINGS AND INFRASTRUCTURE TO ADDRESS LONG TERM CLIMATE TRANSITION

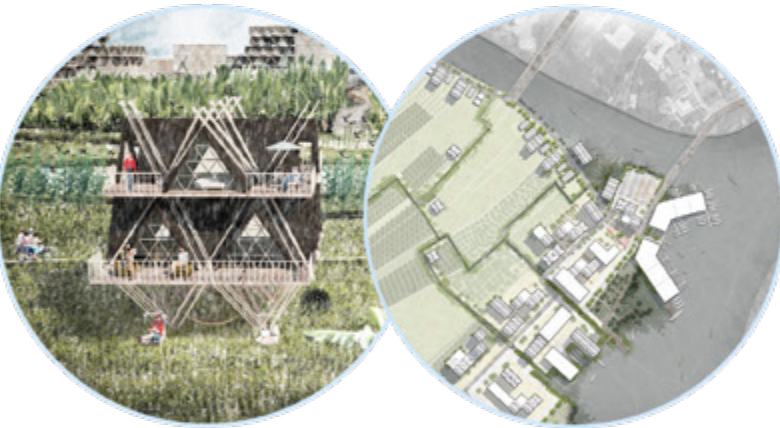
As Can Tho urbanizes, sustainable agriculture, regenerative industry, green infrastructure, generous public space, and the City’s water identity can drive adaptation and resilience to the stresses and shocks of the future. Can Tho faces sea level rise and accelerating subsidence, and the City’s floating markets offer insights into how it could become progressively more amphibious and able to stay in business on the rainiest days. Coastal and delta cities around the world are exploring water-based transportation, floating infrastructure, and housing over water in response to sea level rise. These adaptations already exist in Can Tho, which could accelerate them by redesigning the edges of its rivers and canals to better promote and support floating and amphibious housing, commerce, and infrastructure.



As Can Tho urbanizes, sustainable agriculture, regenerative industry, green infrastructure, generous public space, and the City’s water identity can drive adaptation and resilience to the stresses and shocks of the future.

URBAN DESIGN CONCEPTS

Based on the design framework and on-site research, graduate students in the Columbia University Urban Design Program developed seven concept proposals for design projects that address interrelated risk in Can Tho. They compiled their work in an e-book, which can be accessed at <https://www.arch.columbia.edu/programs/9-m-s-architecture-and-urban-design>



Agriculture: Leveraging Linear Landscapes

Shuyuan Li | Sharvi Jain | Jianqi Li | Devaki Handa

Principle: Capitalize on existing landscapes to conserve water, soil, and livelihoods.

Concept: High-density development strategy that protects agricultural land.



New Towns: The Urban Frame

Aniket Dikshit | Mariam Hattab | Burke Kalemoglu

Principle: Complement urban growth with rural conservation.

Concept: Small-lot planning for local investment and economic development.



Industry: New Energy Landscape

Angela Crisostomo | Bohong Zhang | Peiqing Wang | Wenjun Zhang

Principle: Use traditional and new technologies to enable partnerships between industrial, infrastructural, ecological and social interest groups.

Concept: Community-driven, decentralized model for energy production from agricultural byproducts.

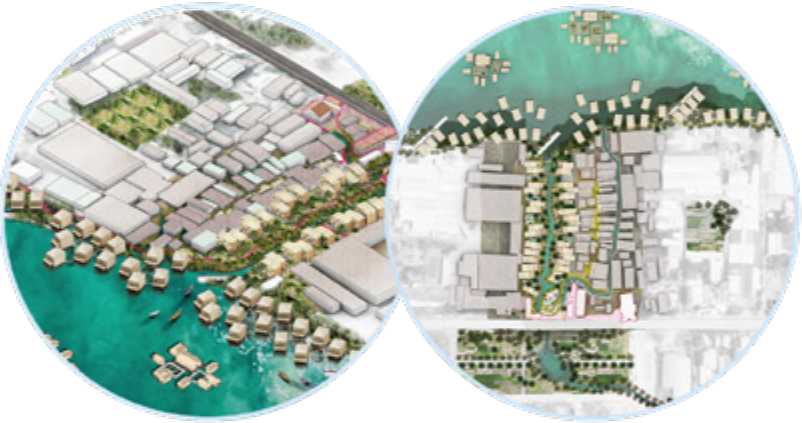


Amphibious Can Tho

Amanpreet Duggal | David Mauricio | Gabriel Vergara

Principle: Adapt buildings and infrastructure to address long term climate transition.

Concept: Flexible embankment zones to support amphibious programming.

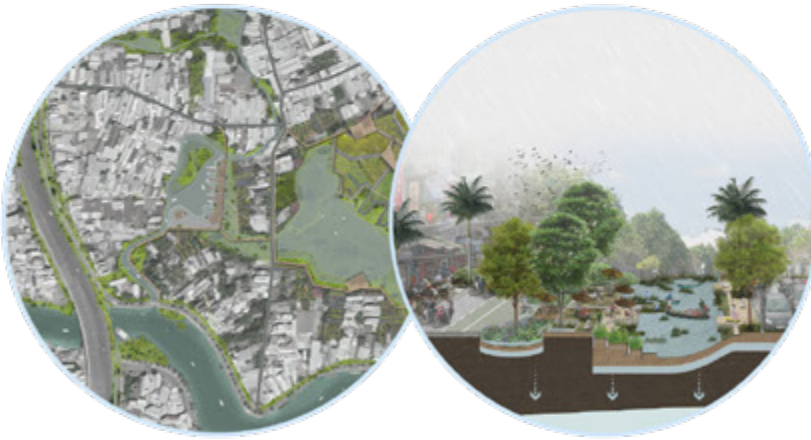


Infrastructure: [Re]Flow Can Tho

Shivani Agarwal | Hsin Yi Chao | Greg Lemaire | Tanaya Kadam

Principle: Use water networks and public space to moderate flooding and pollution.

Concept: City-wide network of vegetated spillways and retention parks.



New Towns: Reconnect to Biosphere

Alaa Marrawi

Principle: Coordinate green infrastructure with neighborhood planning.

Concept: Residential planning with integrated vocational training facilities, healthcare facilities, public spaces and garden allotments.



ACTION PLAN

The Accelerator Team aligned urban design principles and concepts with the specific actions identified in the Resilient Can Tho strategy and engagement process to inform future pilot projects, and guide related coordination of stakeholders and investments.. As a first step, Can Tho City might begin by broadening awareness and engagement of nature-based design concepts in the short-term term (6-10 months) to align with planning and project efforts occurring in the City. Then, in alignment with the actions and target time frames established in the Resilience Strategy, evaluation and testing of design feasibility and institutionalization of nature-based design principles may define the parameters of pilot projects. This will ensure that new pathways for resilient infrastructure design are encoded in Can Tho City’s land use review and approval processes. Together, these steps aim to influence future development and investor partnerships towards resilient and innovative approaches.

2017–2019
Nov 2017
Jan – June 2019

RESILIENCE STRATEGY

Establish a strategic vision for a resilient Can Tho

RESILIENCE ACCELERATOR

Define urban design principles and concepts to guide nature-based infrastructure investments

THE PLANNING LAW

New mandate for integrated planning passed for Vietnam

2020–2030

STRATEGY IMPLEMENTATION

Implement high priority actions by 2030

BROADEN AWARENESS AND ENGAGEMENT OF NATURE-BASED DESIGN CONCEPTS

- **Share and coordinate feedback on urban design principles and concepts with key stakeholders including:**
 - Can Tho Departments of Construction, Foreign Affairs, and Environment and Natural Resources
 - Key City leadership, including Chairman of the Municipal People’s Committee
 - Stakeholders such as community leaders and local businesses
 - Can Tho University
- **Share concepts and coordinate plan alignment with ongoing infrastructure and planning efforts including:**
 - Master Socio-Economic Development Plan of Can Tho
 - Green infrastructure Master Plan
 - World Bank Urban Development and Resilience project advisory committee
- **Share principles and concepts with funders and investors at Can Tho Investment and Promotion conference**

Planning Outcomes

- Long-term plans are integrated across land use, transportation, and urban master plan and reflect current and future risks
- Development partner activities and criteria for investment and planning are aligned with nature-based urban design principles

2019–2021

HIGH PRIORITY PILOTS

Green infrastructure measures (increasing rainwater harvesting and storage and permeable surface) at the household level and in public buildings (schools, government offices, hospitals, etc.)

EVALUATE AND TEST DESIGN FEASIBILITY OF POTENTIAL PILOT CONCEPTS AND PROJECTS

- **Identify and test project pilots in high priority neighborhoods derived from urban design concepts, for example:**
 - Agro-urban district
 - District-wide biomass collection and processing
 - Multi-purpose street design for stormwater management
 - Water-based transport system
 - Floating and amphibious housing
- **Identify and evaluate funding opportunities and timelines across a range of leverage sources to inform scaling:**
 - Existing City and national capital identified for green infrastructure, streets, housing, transportation, and flood protection
 - Potential multilateral investment partners, such as the World Bank and Asian Development Bank
 - Private sector partners and operators, across the energy, construction, transportation, and agricultural sectors

Project Outcomes

- Defined owner of project delivery
- Established limits and boundaries of project scope
- Defined budget and funding plans
- Pathway to address/overcome legal and regulatory constraints
- Implementation schedule and operating/maintenance plan

2020–2023

Integration of resilience approach into flood management plans and the design of flood protection infrastructure of the City to minimize the impacts of extreme and abnormal events.

2019–2030

Green infrastructure measures in public spaces such as squares, parks, and lawns in core urban areas to improve rainwater permeability and storage capacity and release pressure on the underground drainage system.

INSTITUTIONALIZE NATURE-BASED DESIGN PRINCIPLES AND IMPLEMENTATION MODELS

- **Adopt nature-based urban design principles into formal decision-making processes, such as:**
 - Committee review of urban infrastructure, housing, transportation, and flood management projects
 - Adoption of principles into Mekong River Commission technical guidelines
 - Development of nature-based design guidelines into building code, zoning, and infrastructure standards that reflect current and future risks
- **Cultivate local capacity for nature-based and resilient urban design at Mekong Delta institutions and firms through:**
 - Coordination of research and nature-based design with Can Tho University College of Engineering and Technology and College of Environment and Natural Resources
 - Integration of nature-based design principles into procurement requirements of City design and construction contractors and operators for infrastructure projects
 - Engagement of the local business community in nature-based design principles and strategies

RESILIENCE STRATEGY ACTIONS ADVANCED

GOAL/DIRECTION 1: HEALTH AND WELL-BEING

COMMUNITIES HAVE A SECURE AND STABLE INCOME, AND LIVE IN A GREEN AND CLEAN ENVIRONMENT THAT’S SAFE FROM THE IMPACTS OF ECONOMIC, SOCIAL, AND ENVIRONMENTAL SHOCKS AND STRESSES.

PRINCIPLES FOR NATURE-BASED URBAN DESIGN

Capitalize on existing landscapes to conserve water, soil, and livelihoods.	Use traditional and new technologies to enable partnerships among industrial, infrastructural, ecological, and social interest groups.	Use water networks and public spaces to moderate flooding and pollution.	Adapt buildings and infrastructure to address long-term climate transitions.	Complement urban growth with conservation strategies that protect rural landscapes, livelihoods, and community networks.	Celebrate Can Tho’s identity as a water city.	Coordinate green infrastructure with neighborhood planning efforts to synchronize environmental, economic, and social benefits.
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RESILIENCE ACTIONS ADVANCED

URBAN DESIGN CONCEPTS

	Leveraging Linear Landscapes	New Energy Landscapes	[ReFlow] Can Tho	Amphibious Can Tho	The Urban Frame	Life Aquatic	Reconnect to Biosphere
1.1 Improving the effectiveness of policies and programs to support livelihood changing, vocational training and job seeking for disadvantaged groups (which include poor and near-poor households, households in hardship, and vulnerable households). Time Frame: 2020 - 2025	●	●	●	●	●		●
1.2 Strengthening the effectiveness of support policies and programs in improving and shifting agriculture production model for disadvantaged groups in rural areas to improve their resilience. Time Frame: 2020 - 2025	●						
1.3 Developing and implementing a collaborative mechanism and support programs on vocational training and livelihood changing for resettlement households. Time Frame: 2020 - 2025							●
1.8 Adjusting housing support policies and programs to strengthen the resilience of poor and near-poor groups Time Frame: 2020 - 2022	●	●					●

RESILIENCE STRATEGY ACTIONS ADVANCED

GOAL/DIRECTION 2: INFRASTRUCTURE AND ENVIRONMENT

A GREEN AND SUSTAINABLE RIVER CITY WITH AND AN INFRASTRUCTURE SYSTEM THAT IS WELL-COORDINATED, MODERN, FLEXIBLE, DIVERSE AND RESILIENT TO EXTREME NATURAL HAZARDS.

PRINCIPLES FOR NATURE-BASED URBAN DESIGN

Capitalize on existing landscapes to conserve water, soil, and livelihoods.	Use traditional and new technologies to enable partnerships among industrial, infrastructural, ecological, and social interest groups.	Use water networks and public spaces to moderate flooding and pollution.	Adapt buildings and infrastructure to address long-term climate transitions.	Complement urban growth with conservation strategies that protect rural landscapes, livelihoods, and community networks.	Celebrate Can Tho’s identity as a water city.	Coordinate green infrastructure with neighborhood planning efforts to synchronize environmental, economic, and social benefits.
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RESILIENCE ACTIONS ADVANCED

URBAN DESIGN CONCEPTS

	Leveraging Linear Landscapes	New Energy Landscapes	[ReFlow] Can Tho	Amphibious Can Tho	The Urban Frame	Life Aquatic	Reconnect to Biosphere
2.1 Integrating the resilience approach into urban infrastructure development plans and the design of urban infrastructure. Piloting the integration of resilience approach into flood management plans and the design of flood protection infrastructure of the city to minimize the impacts of extreme and abnormal events. Time Frame: 2020 - 2030; 2020 - 2023 pilot project	●	●	●	●	●	●	●
2.2 Developing a master green infrastructure development plan for core urban districts of Can Tho City (Ninh Kieu, Binh Thuy, Cai Rang). Time Frame: 2020 - 2025			●				●
2.3 Surveying, identifying and recovering encroached and filled channels and canals. Strengthening the monitoring and surveillance of any encroachment, filling and waste disposal in channels and canals with community participation. Time Frame: 2019 - 2022			●		●	●	
2.4 Implementing green infrastructure measures in public spaces such as squares, parks, lawns in core urban areas to improve rainwater permeability and storage capacity and release pressure on the underground drainage system. Piloting a model at the park area along Ngong Channel, Thoi Nhut resettlement area in An Khanh Ward. Time Frame: 2019 - 2030		●	●				●
2.5 Implementing green infrastructure measures (increasing rainwater harvesting and storage and permeable surface) at the household level and in public buildings (schools, government offices, hospitals, etc.). Piloting a model at An Khánh Secondary School. Time Frame: 2019 - 2030; 2019 - 2021 for pilot project		●					
2.6 Reinforcing management regulations and strengthening the supervision of urban development plan implementation to ensure natural water storage and absorption spaces are not narrowed, and mechanism to incentivize the application of green infrastructure measures at the household level and in urban development projects and new public facilities. Time Frame: 2020 - 2022				●	●	●	
2.8 Assessing the benefits of green infrastructure to support developing the master green infrastructure plan and application of green infrastructure measures in Can Tho. Time Frame: 2019 - 2021	●						●

RESILIENCE STRATEGY ACTIONS ADVANCED

GOAL/DIRECTION 3: ECONOMY AND SOCIETY

A KNOWLEDGE ECONOMY THAT IS PROACTIVE, DIVERSE AND DEEPLY-INTEGRATED, WHILE REMAINING STEADY WHEN FACING REGIONAL AND GLOBAL ECONOMY FLUCTUATIONS.

PRINCIPLES FOR NATURE-BASED URBAN DESIGN

Capitalize on existing landscapes to conserve water, soil, and livelihoods.	Use traditional and new technologies to enable partnerships among industrial, infrastructural, ecological, and social interest groups.	Use water networks and public spaces to moderate flooding and pollution.	Adapt buildings and infrastructure to address long-term climate transitions.	Complement urban growth with conservation strategies that protect rural landscapes, livelihoods, and community networks.	Celebrate Can Tho’s identity as a water city.	Coordinate green infrastructure with neighborhood planning efforts to synchronize environmental, economic, and social benefits.
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RESILIENCE ACTIONS ADVANCED

URBAN DESIGN CONCEPTS

	Leveraging Linear Landscapes	New Energy Landscapes	[ReFlow] Can Tho	Amphibious Can Tho	The Urban Frame	Life Aquatic	Reconnect to Biosphere
3.1 Strengthening the capacity of city departments on economic projection, integrated socioeconomic development planning and assessment of the impacts of shocks and stresses on the city’s economic objectives. Time Frame: 2020 - 2025					<div></div>		
3.4 Restructuring the agriculture sector towards improving added value and sustainable development until 2020 with vision to 2030 Time Frame: 2017 - 2030	<div></div>	<div></div>		<div></div>	<div></div>		
3.5 Improving the effectiveness of coordination mechanism among related departments to support developing sustainable agriculture value chains. Implement pilot project on catfish value chain. Time Frame: 2020 - 2022	<div></div>	<div></div>					
3.10 Strengthening the competitiveness of Can Tho’s agriculture sector. Time Frame: 2021 - 2027	<div></div>	<div></div>					
3.12 Developing the mechanism and policy to encourage the development of enterprises focusing on clean agriculture products and improving the lives of poor people. Time Frame: 2020 - 2025	<div></div>	<div></div>					

RESILIENCE STRATEGY ACTIONS ADVANCED

GOAL/DIRECTION 4: POLICY AND LEADERSHIP

POLICIES AND PLANS ARE DEVELOPED AND IMPLEMENTED IN A SYSTEMIC, INTEGRATED MANNER AND WITH ACTIVE PARTICIPATION OF ALL RELEVANT STAKEHOLDERS AND ABLE TO RESPOND TIMELY AND EFFECTIVELY TO EXTREME SHOCKS AND STRESSES.

PRINCIPLES FOR NATURE-BASED URBAN DESIGN

Capitalize on existing landscapes to conserve water, soil, and livelihoods.	Use traditional and new technologies to enable partnerships among industrial, infrastructural, ecological, and social interest groups.	Use water networks and public spaces to moderate flooding and pollution.	Adapt buildings and infrastructure to address long-term climate transitions.	Complement urban growth with conservation strategies that protect rural landscapes, livelihoods, and community networks.	Celebrate Can Tho’s identity as a water city.	Coordinate green infrastructure with neighborhood planning efforts to synchronize environmental, economic, and social benefits.
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RESILIENCE ACTIONS ADVANCED

URBAN DESIGN CONCEPTS

	Leveraging Linear Landscapes	New Energy Landscapes	[ReFlow] Can Tho	Amphibious Can Tho	The Urban Frame	Life Aquatic	Reconnect to Biosphere
4.1 Building capacity for city departments on integrated and systematic planning, consistent to the new Law on Planning Time Frame: 2020 - 2025	●		●		●		
4.4 Establishing a flood management office and developing an integrated flood coordination and management mechanism for Can Tho City. Time Frame: 2019 – 2021			●	●			
4.6 Raising awareness and disseminating knowledge on resilience and sustainable development among high school students in Can Tho City. Time Frame: 2020 – 2025		●					●
4.7 Engaging communities in actions to build resilience in Can Tho City. Time Frame: 2019 - 2025		●					●

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