

# Climate Adaptation through Sustainable Urban Development, Can Tho, Vietnam

Enhancing the effective and sustainable urban water system for Can Tho, Vietnam, a rapidly-growing city in one of the world's largest deltas, and highly vulnerable to a changing climate.



# The issue

The largest urban centre in the Vietnam Mekong Delta, Can Tho, has a population of 1.2 million, 60% of whom live in urban areas. The city is located on the Mekong River, about 170km southwest of Ho Chi Minh City. During the last two decades, the economic growth and urbanisation of the region have increased at an immense rate. Residential, commercial and industrial areas have developed rapidly. As a consequence of the rapid urbanisation, Can Tho is now struggling to meet some of the basic requirements that are essential to a growing city, such as providing access to clean water and adequate sanitation. In addition, water-related health problems are widespread across many parts of the city. When considering urban water systems, cities and communities in low-lying coastal and delta regions, such as Can Tho, need to factor in adaptation to longer term challenges such as climate change.



# Our approach

Working with researchers and government agencies in Can Tho, the project engaged provincial and local governments and civil society groups in a collaborative approach to planning urban water services that considers the implications across sectors. In addition to building capacity among the country-partner organisations, the project assessed the risks of climate and population change on the sustainability and availability of fresh water supplies and the functioning of the urban water system, establishing future scenarios, planning and design alternatives. The project was managed as a partnership between CSIRO and Can Tho University (CTU) from 2010-2014.



## Key lessons for development

- By prioritising improved sanitation and using a combination of centralised and decentralised wastewater infrastructure, the impact of urban pollutants on water is reduced and health outcomes improve.
- Government, NGOs and science and community stakeholders have very different perspectives on urban water services problems and solutions. This requires multi-stakeholder planning processes in order to understand and integrate the differing views.
- Multi-stakeholder planning, while time-consuming, greatly enhances participants' capacity by catalysing innovation, new partnerships and empowering communities.

### DFAT-CSIRO Research for Development Alliance

This project was funded by the Research for Development Alliance, a strategic partnership tackling complex development challenges in the Asia Pacific region.

# Project partners

CSIRO, Can Tho University (CTU) College of Environment and Natural Resources, and DRAGON Institute, University of Technology Sydney, the Can Tho Water Supply and Sewerage Company, the Climate Change Coordination Office (CCCCO), Save the Children, and the Australian Department of Foreign Affairs and Trade (DFAT).

# Key achievements

## OUR STORY



City Water Atlas - a map in the WebGIS



Rainwater harvesting system demonstration in a peri-urban household



### What did the project deliver?

**A City Water Atlas** was developed in the form of a map book and a WebGIS (Geographic Information Systems Resource) containing 30 GIS maps summarising current issues and challenges for urban water management. For example, maps showing the percentage of households served by water supply stations, or the level of surface water pollution help the city's water utility company to identify and target the most vulnerable areas for action.

**A Set of Strategic Adaptation Options** was developed to improve the water services and environment, with integrated assessments of both benefits and feasibility. To demonstrate one of the strategic adaptation options, the project established a rainwater harvesting pilot with two plants. Rainwater is treated with a low-cost First Flush device, designed by CSIRO and Can Tho University, which collects the first flow of dirty water at the beginning of every rain event and siphons it off to avoid tank contamination. One system at the Can Tho University campus is being used to study quality and treatment techniques, with rainwater used to flush toilets. This system is estimated to save about 100 000 litres of water per month for the building, currently being used by 500 students. Another system in a household on the urban fringe provides water for domestic use for approximately 20 people. The project team has also developed a Rainwater Harvesting Guidebook for Mekong Delta, the first of its kind in Vietnam.

**A Participatory Planning Method** combined with systems thinking was developed by researchers from CTU and CSIRO, encouraging local stakeholders to depart from traditional 'silo' management to an approach that reflected more integrated thought and collaboration.

### How is it being used?

The City Water Atlas is being used to assist in planning local departments – the Water Supply and Sanitation Company (WSSC), the Centre for Rural Water Supply and Environmental Sanitation (CERWASS) and the Department of Natural Resources and Environment (DONRE).

“Many results from the project, such as the strategic options, GIS database and City Water Atlas, households survey and the demonstration of rainwater harvesting systems are precious science-based or evidenced-based references for developing an adaptation plan of the city,” said Mr Ky Quang Vinh, Director of Can Tho Climate Change Coordination Office.

A pilot study area was used to demonstrate planning and designing sustainable water service options using CSIRO's award-winning sustainability assessment framework. This provided Can Tho decision makers with a very practical tool for sustainable development of its water services.

Leadership and trust emerged among the research team and in-country stakeholders, creating strong, collaborative partnerships.

### What impact did the project have?

The City Water Atlas is helping the local Vietnamese Water Management team to identify the most vulnerable areas for action.

The Atlas has been an effective tool for communication and data sharing; and a practical platform for collaborative development among local government agencies. The city has initiated an adoption plan of the WebGIS, with the Department of Construction and the Department of Information and Communication leading an effort to develop a capacity building program with CTU to utilise and extend the WebGIS for management and planning of the city's infrastructure. The plan would not only include water, but also other issues such as transportation, buildings and electric power systems.

The rainwater tank demonstrations have resulted in the NGO, Save the Children Vietnam, and Can Tho University collaborating to manufacture 200 first flush devices, testing them in rural areas near Can Tho.

CTU is now better-equipped to carry out participatory and systems thinking research. The research team has become recognised amongst their peers as champions of urban water systems engineering. This has resulted in project team members receiving the 2012 Can Tho City Award for their contribution to the development of an Adaptation Action Plan for Can Tho City, Vietnam.



# Impact Pathway

The project’s objective was to help the city to develop options to improve management of water systems and the environment. To achieve this, the research team developed an Impact Pathway consisting of three linked phases (Fig. 1a). Phase 1 focused on ‘capacity building’. This enabled the allocation of resources and the development of plans, agreements and new projects through Phase 2 ‘policy and program development’. Following on from Phase 2, Phase 3 ‘implementation, adoption and scaling out’ would occur. These phases would cumulatively build the adaptive capacity of the project stakeholders. However, while Phase 1 encompassed the project’s activities (solid line), Phases 2 and 3 were out of the project team’s direct control (dashed line). Consequently, the Impact Pathway was clear for Phase 1, but less so for Phases 2 and 3.

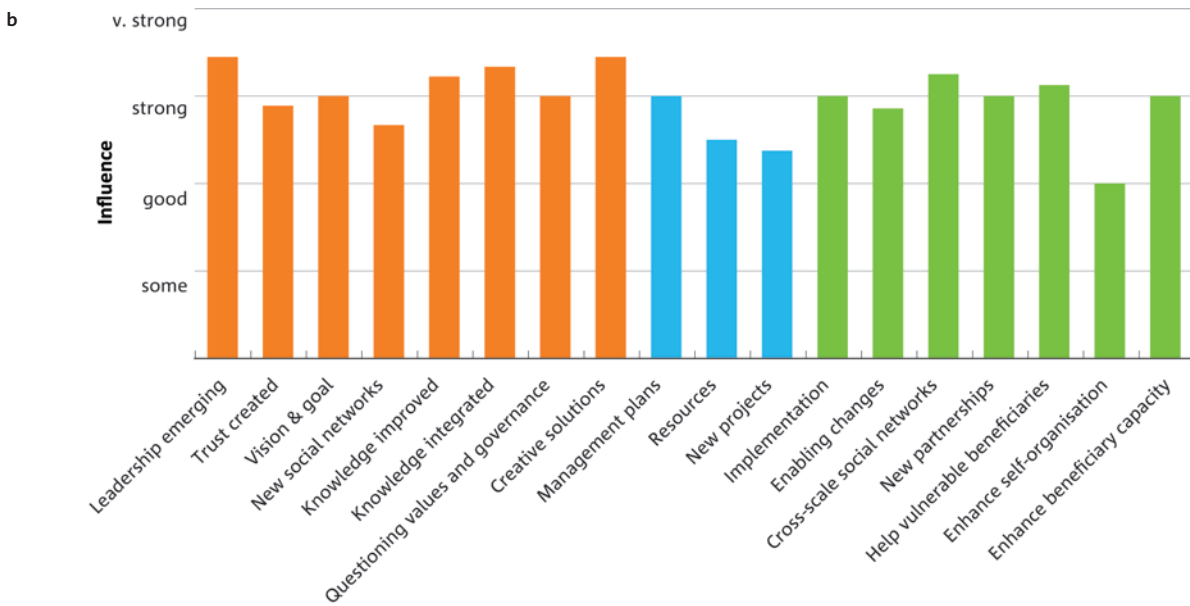
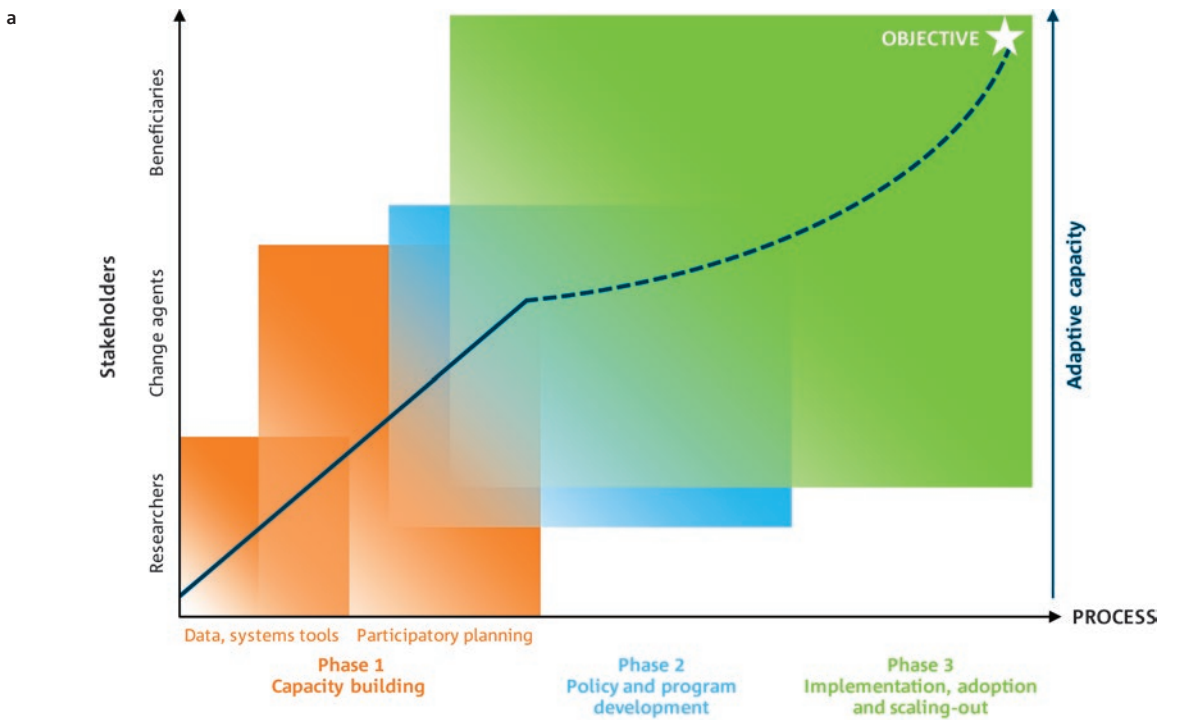


Figure 1. The project’s (a) Impact Pathway and (b) influence on adaptive capacity within the Impact Pathway’s three phases

# Evaluating impact

To track the influence of the project on stakeholders' adaptive capacity, and to enable comparisons between all Alliance projects, a standardised set of 18 indicators was developed. According to the project's Impact Pathway, each phase encompassed a progressively wider group of stakeholders, and the indicators were designed to assess change amongst them. Seventeen researchers and change agents involved in Phase 1 were interviewed at project completion, and asked to give their assessment of change by scoring each indicator, providing evidence for their scores. Results showed that there had been a positive influence for all indicators in all phases (Fig. 1b).

**PHASE 1: Building capacity** had the highest-scoring indicators, which was to be expected since this was the focus of the project's activities. The project encouraged leadership to emerge through the combined use of community-based and science-based approaches exploring options for the supply of safe drinking water for Can Tho. CSIRO demonstrated this collaborative approach while providing technical training to build the capacity and leadership of Can Tho University staff and local leaders.

The project also produced strong scores on the integration of knowledge and creative solutions. Participants emphasised that knowledge from different disciplines including climate, social, and hydrology, as well as from a variety of stakeholders including local researchers, local government and utility companies was integrated in order to determine local agencies' and communities' water needs and possible opportunities for the future. The project produced tangible outputs, including the development of a rainwater harvesting guideline and the integration of GIS data into thematic water management maps to aid decision making. Project participants welcomed the participatory approach to the workshops and project, although they indicated that this was challenging due to time constraints, leading to new social networks ranked as the lowest-scored indicator.

**PHASE 2: Policy and program development** had weaker indicator scores. While there have been positive discussions about integrating the project results into the city's management plan, a formal agreement has not yet been reached. This was further hampered by the project being concluded early due to funding realignment. The Can Tho Water Supply and Sewerage Company is, however, upgrading their GIS database based on the project's results and will place increased focus on the maintenance and use of the database. The Climate Change Coordination Office has indicated that it would like to use a rainwater harvesting system as an option in the city's adaptation action plan.

While funding for the continuation of this work and the implementation of the strategy is yet to materialise, implementation has, nevertheless, occurred through NGOs. Save the Children has applied rainwater harvesting in over 220 households in Dong Thap province, and the HSF Foundation (Germany) will be setting up a rainwater harvesting system using this project as a baseline. CTU is applying to the Rockefeller Foundation for funding to develop a water supply pipeline connection between the rural and urban water supply.

**PHASE 3: Implementation, adoption and scaling-out** indicators had high scores, with evidence that new relationships have developed between stakeholders as a result of this project. Project participants commented on the active engagement and collaboration between the research team and stakeholders, leading to increased connections between research teams and government authorities, as well as between the agencies themselves; including CCCO and other related departments of the city such as Department of Construction (DOC) and the Department of Natural Resources and Environment (DONRE).

Stakeholders felt that vulnerable beneficiaries benefited from the project, with clean water an urgent need of communities, especially for women and children. The project found an effective solution through the use of proper techniques for rainwater harvesting to provide safe water which, together with the map book and WebGIS, will be useful for the city. The project contributed to raising awareness amongst the local community residents that they have to actively organise themselves to cope with their problem; however, it was felt that this aspect could have been explored further.

# Household survey highlights water-quality issues

The largest urban centre in the Vietnam Mekong Delta, Can Tho has a population of 1.2 million, 60% of whom live in urban areas. The main issue facing the city's water managers is inadequate infrastructure; resulting in limited access to clean water and sanitation, frequent flash flooding and pollution. Consequently, water-related health problems are widespread across many parts of the city, especially in semi-rural and rural areas; with the Ministry of Natural Resources and Environment stating that 80% of disease in Vietnam is caused by polluted water.

The project was designed to consider the impacts of climate change on the city's water needs, with special emphasis on poorer households that are acutely vulnerable to climate change impacts predicted for Can Tho. In an attempt to understand the problem, the project undertook a survey which would identify the concerns and issues related to individual household's access to water and sanitation services, rapid urbanisation, and perceptions of the potential future impacts of climate change. This is the largest and the most comprehensive survey ever conducted on water issues in Can Tho.

The project's survey of 1200 households showed that those households on the urban-rural fringe have the least access to an adequate water supply and sanitation. The households use many different water sources for various domestic purposes. Such a mix mode of water usage has resulted in adverse effects on their health outcomes. Approximately 80% of the urban population and only 40% of the rural population have access to safe drinking water. Overwhelmingly, households considered that the most important local water-related issue over the next ten years was the pollution of surface water. Monitoring of surface water quality at 45 sites across Can Tho shows that coliforms, suspended solids, phosphates and ammonia exceed permissible levels. Over the last ten years, organic pollutants concentrations have doubled in canals. This increase is a direct result of increased urbanisation and poor sanitation infrastructure.





# Alliance wide lessons

Designing investments to assist vulnerable communities in developing countries adapt to global change (e.g. globalised markets, population growth and climate) is typically complex. This is particularly true for the Alliance where our portfolio of multi-year projects focused on global development challenges related to climate, water resources, sustainable cities, and food security. Each of the projects involved multiple actors (e.g. planning, emergency services, and primary industries) at multiple scales (local, provincial, national and global) and over time, reflecting the broad domain of R4D.

Our experience is that the context-specific nature of these investments is best served by a well-informed approach to project structure and design. Practical learning from these projects can support the development of guidance to improve aid investment outcomes. Key findings included:

- **Strong partnerships and collaboration lead to better outcomes:** Partnerships can be developed or evolve in a number of ways, all of which can be effective. Our projects included partnerships where we led, where we worked with our in-country partners to build demand, and those where we responded to demand. These partnerships were formed and evolved around relationships and purpose. A general observation is that ‘pull’ type projects appear to have the most clearly articulated impact pathway at the national policy level and provide the least scope for expansion; whereas co-developed or evolutionary type projects provide greater flexibility and also more opportunities to broaden partnerships over the life of projects, which can significantly improve impact. In all cases, it takes time to build appropriate, effective communication processes and trust; especially when there are cultural and institutional differences. This can be expedited through ongoing in-country presence and two-way exchanges of personnel, which provides high strategic value but carries a high operational cost.
- **Capacity building and engagement:** Engagement early on (i.e. pre-project) provides a valuable platform for co-development of projects that are then shaped by and can be responsive to local context. This has the added value of building trust between partners, which can be increased over time through capacity building initiatives. Traditional develop-deliver skillsets such as two-way mentoring, use of trusted advisors and local champions to facilitate engagement, improved project management and engagement skills, remain important; however, our experience is that conjointly developed knowledge, products and services are more context-specific and tractable.
- **Participatory approaches:** Partner institutions have high levels of connectedness with government institutions and other boundary partners – giving the research a stronger pathway to impact and increasing its relevance. Participatory approaches can improve the status of research partners and encourage buy-in from key decision-makers, which is important for longer-term support. Participatory planning approaches also strengthen formal and informal networks amongst decision-maker communities and between decision-makers and researchers, building capacity of all participants.
- **Creation of and access to data:** Datasets that are well-structured and accessible will have ongoing value. Where mandates or jurisdictions are unclear and there is a limited history of data curation and sharing, a trusted relationship between parties needs to be developed in order to overcome such procedural and institutional challenges. A trusted third party can play an important role in these situations.
- **Scenario planning:** Scenario planning provides a structured and powerful tool to think about the future and challenges, especially where there are large uncertainties such as changes to natural systems (e.g. water and climate), changes in rules or an adjustment of goals (e.g. livelihood goals); and can be based on existing data, modelled, or a combination of both. Scenarios work best when elicited from in-country partners or developed in conjunction with in-country partners rather than imposed.
- **Systems thinking and approaches:** Systems approaches to better integrate biophysical with social and economic information are highly valued by project partners, from design through all stages of the project lifecycle to decision making. Systems approaches also promote participation from a broader range of stakeholders. In general most local research teams had limited experience of these approaches, including scenario planning, and Alliance activities significantly enhanced their capacity to understand and apply such systems tools.
- **Evaluation methods:** Assessments often take place in complex policy settings and systems where there are multiple actors. Accurately defining, measuring and attributing impacts is vital to describing and communicating the success of investments. The use of mixed methods approaches, and better understanding of which approaches work best under certain conditions, will improve the quality of impact evaluation studies and the articulation of impact. Also, the timely return of results to project research teams and partners is important to maintain the salience of results.

# Steps required to maintain the Impact Pathway

- Can Tho University is keen to extend its knowledge and influence through training programs. The focus of the expanded training program will be implementation organisations, such as the Red Cross Save the Children, and CTU students, so that they can become informed decision makers of the future. CTU will be producing a guideline for the training and workshop approach.
- Consultation on the establishment of a new Centre of Excellence in a sustainable urban and rural settlement in Can Tho University is currently underway, building on the skills developed in the research team, the connections with government and the new understanding of the challenges. By working in different provinces, the Centre would address the lack of coordination in the Mekong Delta. Work has commenced on the development of a list of specific research activities required to fill existing knowledge gaps.
- There is an opportunity to upscale this activity, with a growing number of cities in 13 provinces in the Mekong Delta. Can Tho is looking to further the participatory approach to governance and policy research including engaging with local communities and possibly expanding the water company engagement more widely than in Can Tho. Alternatively, by collaborating with the Centre of Excellence, work could expand into exploring problems in the coastal areas where saline intrusion and intensive agriculture are leading to increased pollution of the water supply.



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## DFAT-CSIRO RESEARCH FOR DEVELOPMENT ALLIANCE

This project was funded by the Research for Development Alliance, a strategic partnership tackling complex development challenges in the Asia Pacific region.

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