Climate Transformation Programme: Informing the future of urban water management in Singapore

Climate Transformation Programme : Informer la gestion des eaux urbaines à Singapour

Perrine Hamel[1]

Ning Ding[1]

Xiaosheng Qin[2]

[1]Asian School of the Environment and Earth Observatory of Singapore, Nanyang Technological University - perrine.hamel@ntu.edu.sg
[2]School of Civil and Environmental Engineering, Nanyang Technological University

RÉSUMÉ

Le Climate Transformation Programme (CTP) est une initiative interdisciplinaire qui développe la recherche et les solutions pour rendre les villes plus résilientes, équitables et durables à Singapour et en Asie du Sud-Est. Le programme réunit des travaux de recherche en sciences du climat, biodiversité, ingénierie, finance, santé et sciences sociales, organisés en six pôles stratégiques.

Le pôle dédié aux nouvelles solutions d'ingénierie a pour objectif d'analyser la résilience de la gestion urbaine de l'eau face au climat futur, à Singapour comme dans les pays voisins. Un objectif clé consiste à étudier l'évolution des précipitations extrêmes et des sécheresses afin d'identifier les principaux aléas auxquels les villes d'Asie du Sud-Est devront se préparer. En outre, le pôle examine les lignes directrices du programme local de gestion intégrée de l'eau en milieu urbain — Active, Beautiful and Clean (ABC) Waters — pour comprendre l'impact des futurs régimes climatiques sur la performance des infrastructures bleues et vertes. Les travaux synthétiseront les retours d'expérience d'autres pays, en particulier dans les régions tropicales, afin de mieux intégrer le changement climatique dans les guides d'implémentation des infrastructures bleues et vertes afin de proposer des recommandations pour adapter les programmes locaux et régionaux.

ABSTRACT

The Climate Transformation Programme (CTP) is an interdisciplinary initiative that advances research and solutions to support resilient, just, and sustainable societies in Singapore and Southeast Asia. It brings together research across climate science, biodiversity, engineering, finance, health, and the social sciences, organised into six strategic clusters. Research under the Novel Engineering Solutions cluster aims to examine the resilience of urban water management under future climate, in Singapore and neighboring countries. An important objective of the research is to examine future extreme precipitation and drought patterns to identify key hazards that Southeast Asian cities should prepare for. In addition, the cluster examines the guidelines for the local Water Sensitive Urban Design – the Active, Beautiful and Clean (ABC) Waters programme – to understand where and how future climate patterns may undermine the performance of urban blue-green infrastructure. The research will synthesize how other countries, in particular in the Tropics, have incorporated climate change into blue-green infrastructure guidelines and recommend amendments to the local ABC Waters guidelines.

KEYWORDS

WSUD, climate change, guidelines, ABC Waters

1 OVERVIEW OF THE PROGRAMME

The Climate Transformation Programme (CTP) is a comprehensive, interdisciplinary initiative designed to accelerate knowledge-based solutions that support resilient, just, and sustainable futures for Singapore and the wider Southeast Asian region. Bringing together expertise across climate and Earth sciences, ecology, materials science, artificial intelligence, social sciences, the arts, finance, health, and engineering, the programme fosters innovation that bridges fundamental research and real-world application. Its mission is not only to deepen scientific understanding of climate processes and impacts, but also to empower future leaders and catalyse transformative change across societies.

Organised around six interconnected research clusters and three cross-cutting themes (Figure 1), CTP spans climate science, biodiversity, mitigation strategies, engineered adaptations, climate-finance interfaces, and climate-health linkages. The programme integrates these domains with enabling themes focused on sustainable societies, satellite remote sensing, and artificial intelligence, ensuring that breakthroughs in one area strengthen progress in others. Through this structure, CTP translates cutting-edge science into practical solutions for Singapore and facilitates their transfer across Southeast Asia and beyond, advancing a holistic response to the climate crisis that is grounded in rigorous research, regional relevance, and societal engagement.

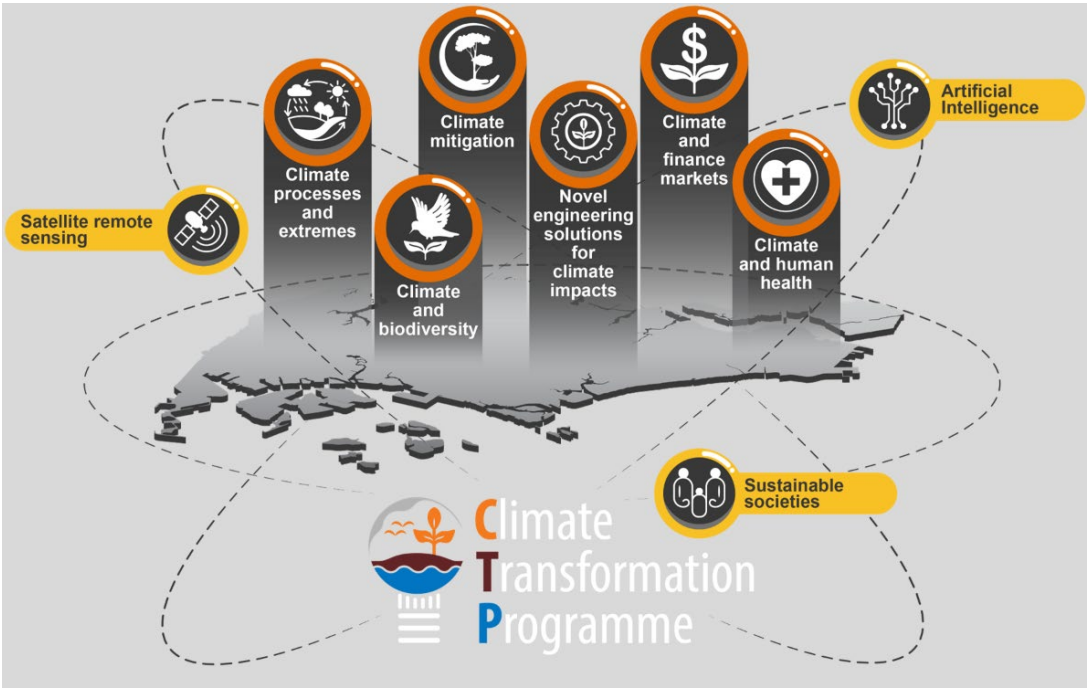

Figure 1. Overview of the Climate Transformation Program main pillars

2 CLIMATE-PROOFING URBAN WATER POLICIES

The Novel Engineering Solutions pillar aims to examine the resilience of urban water management under future climate, in Singapore and neighbouring countries.

An important objective of the research is to examine future extreme precipitation and drought patterns, to identify key hazards that Southeast Asian cities should prepare for. Using a system dynamics model, these future climate patterns will be examined to identify vulnerabilities in water supply and demand in Singapore and selected cities in the region.

A second pillar of the work will review the local Water Sensitive Urban Design guidelines — the Active, Beautiful and Clean (ABC) Waters programme — to identify where and how future climate conditions could reduce the effectiveness of urban blue–green infrastructure. The research will also analyse how other countries and cities, especially in tropical regions, incorporate climate change into their blue–green infrastructure standards (for example, by designing for future climate rather than relying on historical data), and will propose updates to the current ABC guidelines. Methodological approaches and preliminary results will be shared to highlight key challenges and opportunities for collaboration on this topic.

More information on the programme can be found at: https://earthobservatory.sg/research/climate/climate-transformation-programme