

Cities of Tomorrow R&D Programme

Background

Over the past 50 years, Singapore has successfully built a reputation as a highly liveable and sustainable 'City In A Garden'. To sustain Singapore's success in the decades ahead and to do more for our future city, the Cities of Tomorrow R&D Programme (CoT) is a multi-agency effort, led by MND, that recognises the challenges that cities face and seeks to leverage R&D to address the challenges.

Vision

The vision of CoT is to establish Singapore as a highly liveable, sustainable, and resilient city of the future, and as a vibrant urban solutions hub - a living model which features cutting-edge urban solutions. This will be achieved through the integrated development of R&D in 4 key verticals, namely, a) Advanced Construction, b) Resilient Infrastructure, c) New Spaces, and d) Greater Sustainability. These are supported by 2 enabling horizontals of Urban Environment Analytics, and Complexity Science for Urban Solutions.

Funding

A total of \$150 million has been approved to fund CoT. The funding will be set aside from the \$900 million allocated to the Urban Solutions and Sustainability (USS) domain under Research, Innovation and Enterprise 2020 (RIE2020). CoT will support basic research, applied research, and small-scale demonstration projects.

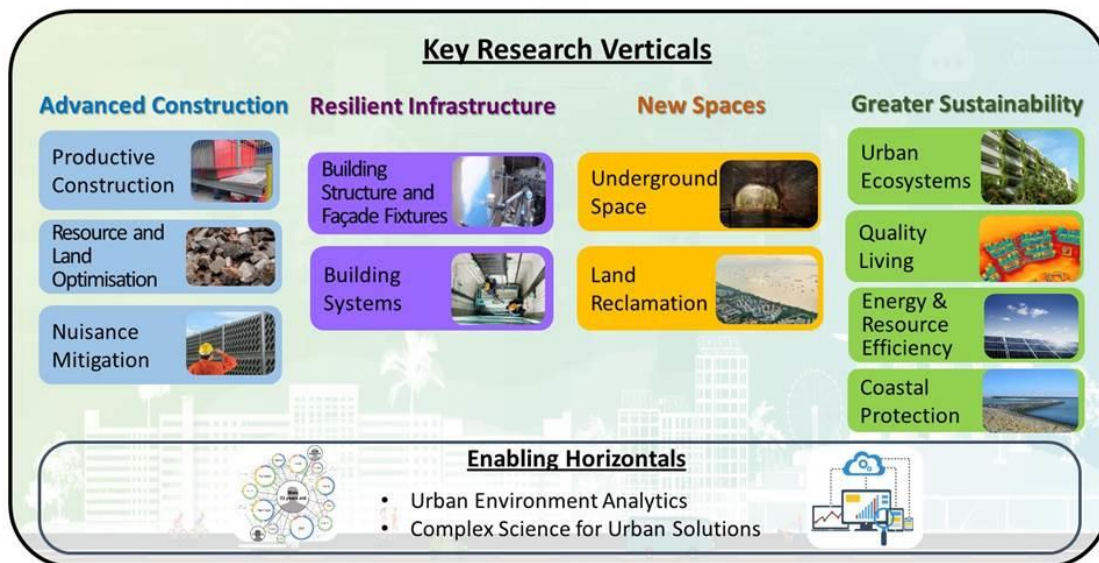
- *The Urban Solutions and Sustainability (USS) domain is one of the four strategic technology domains identified under the Research, Innovation and Enterprise 2020 Plan, and aims to develop a sustainable and liveable city through integrated solutions for Singapore and the world. To do this, USS will take an integrative approach to reap synergies at the intersection of the energy-water-land nexus, and to optimise solutions to better meet Singaporeans' needs. Besides research partners and public agencies, USS agencies will also collaborate with industry partners to create economic value and establish Singapore as an international hub for sustainable urban solutions.*
- *The RIE2020 plan is the sixth edition of Singapore's national strategy to develop a knowledge-based innovation-driven economy and society. For this plan, the*

Singapore government will invest \$19 billion to research, innovation and enterprise over 2016 to 2020, to take Singapore to the next stage of development. Through this plan, Singapore seeks to support and translate research, build up the innovation capacity of our companies to drive economic growth, and leverage science and technology to address national challenges.

Development of R&D Roadmap and Research Focus

The CoT programme was developed by MND Family in conjunction with our partner agencies, with the aim of delivering outcomes in collaboration with the research community and industry partners. 4 verticals were identified to address key issues of national concern and R&D roadmaps were drawn up to direct funding through the setting of challenge statements. 2 horizontals, which represent specialisation in fields that are cross-cutting, were also identified as key enablers for the 4 verticals.

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The vision and research focus areas for each of the verticals and horizontals are as follows:

(a) Vertical 1 - Advanced Construction

Vision: To build a highly productive, integrated and technologically advanced construction sector

Key Research Themes:

- i. *Productive Construction* – Develop an integrated, intelligent, digitally-enabled construction environment that is highly productive and cost effective.
- ii. *Resource and Land Optimisation* – Reduce and reuse resources required in construction, and intensify land use for off-site production.
- iii. *Nuisance Mitigation* – Reduce the environmental impact of construction activities.

(b) Vertical 2 - Resilient Infrastructure

Vision: A robust, flexible and well-maintained city that has reliable and cost-efficient infrastructure

Key Research Themes:

- i. *Building Structure and Façade Fixtures* - Minimise building defects and enhance building inspection processes, as well as to reduce the cost and manpower needs for maintenance.
- ii. *Building Systems* - Enhance the performance and reliability of key Mechanical and Electrical services.

(c) Vertical 3 - New Spaces

Vision: To ensure sufficient space capacity to support Singapore's growth, yet maintain a liveable environment

Key Research Themes:

- i. *Underground Space* - Enhance underground mapping accuracy and reduce cost of underground development.
- ii. *Land Reclamation* - Reduce material usage, cost, and environmental impact of land reclamation.

(d) Vertical 4 - Greater Sustainability

Vision: A high quality living environment that is inclusive, resource efficient and adaptive to climate change

Key Research Themes:

- i. *Urban Ecosystems* - Create sustainable, resilient and green cities through applying an ecosystem approach to urban planning, development and management.
- ii. *Quality Living* - Create a comfortable and pleasant living environment for residents.
- iii. *Energy and Resource-Efficiency* - Enhance the energy and resource efficiency of towns, estates and buildings to reduce the environmental impact of operations.
- iv. *Coastal Protection* - Future-ready coastal protection for sea level rise.

(e) Horizontal 1 - Urban Environment Analytics

Vision: To achieve responsive and targeted service delivery as well as resource efficiency in municipal services and urban planning

Key Research Themes:

- i. *Data Analytics, Sensing and Predictive Diagnosis* - Provide targeted services, anticipate emerging trends for better response, and prioritise resources to optimise output
- ii. *Mapping, Modelling & Simulation* - Assess the impact of climate change on the natural and built environment, and to incorporate mitigating measures in planning processes
- iii. *Intelligent Systems* - Improve industry productivity through automation, as well as to improve reliability and consistency of compliance checks

(f) Horizontal 2 – Complexity Science for Urban Solutions

Vision: Applying complexity science to solve dynamic urban problems, by finding hidden regularities and parameters that affect urban planning

Key Research Themes:

- i. *Improving Liveability in Singapore* - Use complexity science to create decision support tools for urban planning, so as to better plan for a dense and liveable Singapore

Focus on Value Chain Approach and Innovation & Enterprise

The CoT will support R&D across the value chain from upstream research to downstream technology deployment and adoption, with emphasis on projects that have a high potential for practical implementation and commercialisation. It is a collective effort that requires the whole R&D value chain, including stakeholders from industry, research community, and the government, to work in tandem to address challenges. Different approaches would be undertaken to strengthen collaborations across the 3 groups to develop innovative R&D solutions. This includes open call for proposals, setting up of consortiums, and joint labs.