URBAN SUSTAINABILITY R&D CONGRESS

Annex B

Minister for National Development's R&D Awards 2017

The biennial Minister for National Development's R&D Awards was launched in 2011 and seeks to recognise and encourage outstanding R&D efforts from the MND Family and partner agencies/institutions which contribute towards MND's vision of making Singapore "An Endearing Home, A Distinctive Global City".

2 This year, 27 nominations from MND Family agencies, partner agencies and Institutes of Higher Learning (IHLs) were received. Projects were evaluated by an evaluation panel, chaired by Prof Lui Pao Chuen, Advisor of MND. The evaluation criteria were:

a) Contribution to MND's Vision & Mission

I. **Significance** in addressing key national challenges faced by MND. Integrated projects that address multiple challenges are encouraged to be nominated.

II. **Strategic Impact** of implementation to a significant population and/or proportion of the related industry in Singapore, and contribute to national strategies or policies on sustainable urban development and liveability.

b) Technological Innovation

I. **Technological Merit** of research that is original, creative and novel, and represents a significant breakthrough or game-changer in associated fields.

3 Details of the winning projects of the Minister for National Development's R&D Awards 2017 are:

a) **Distinguished Award**

URA's project (in collaboration with I^2R / A*STAR) – Development of GIS-Enabled Mapping, Modelling and Analysis (GEMMA) to enhance planning processes and deliver better planning outcomes in Singapore

GEMMA is a Geospatial Information System (GIS) based system for planners to conduct integrated land-use planning analysis and simulation. The system is developed through R&D collaboration with I2R, and in partnership with other development agencies in Singapore.

GEMMA is a powerful collaborative tool that allows planners across agencies to come together to do land-use scenario studies and infrastructure staging plans. Through the system, planners can have ready-access to rich layers of map-based information and data-analytics algorithms for integrated planning analysis. Land-use planning can now be done much faster, and with deeper insights.

b) **Merit Award**

HDB's project (in collaboration with EDF and Veolia) – Complex System Modelling Tool for HDB Towns

Building sustainable towns provides a better living environment and offers green living to residents. HDB has developed a Sustainable Development framework to help guide the implementation of strategies and initiatives for achieving sustainability. To model and simulate the sustainability performance of towns based on the framework, HDB has developed a complex system modelling tool that can simulate the built environment and the impact of green initiatives on resource utilization, the environment and cost.

With this tool, planners will not need to use different software to simulate each initiative separately. HDB will be able to carry out simulations on a single integrated platform to take into account the possible impacts of the initiatives, and can more accurately assess the trade-offs involved when faced with a myriad of green initiatives. This allows HDB to assess the collective effectiveness that different initiatives could contribute towards sustainability, while balancing the costs and manpower involved.

With the tool allowing HDB to conduct analysis on a virtual platform prior to actual implementation, planning and design strategies will be improved, enhancing the liveability of HDB towns.

c) **Merit Award**

LTA's project (in collaboration with NUS) – Jagged Edge Profile for Cantilevered Noise Barriers

As LTA continues to expand Singapore's rail network, LTA is committed to explore more innovative ways to reduce the impact generated by the construction work on stakeholders.

The latest advancement is the use of the jagged-edge cantilevered noise barrier. This design is inspired by cutting-edge noise technology applied for jet engines and employs the scientific principle of destructive interference to reduce noise without increasing spatial or material requirements.

To determine the effectiveness of this design, noise measurements were taken for the original and new noise barrier designs under similar site conditions. The results proved that the jagged-edge noise barrier design consistently achieved a better performance, as compared to the conventional straight-edge noise barrier design. The noise reduction was up to 5.0 dBA, equivalent to 30% reduction to the human ears. Besides being able to lower noise levels, the innovative design has also allowed LTA to achieve better coverage in terms of noise reduction by up to 3 times the height of the noise barrier.

This cost effective and easily scalable design has already been implemented at LTA work sites along the East Coast stretch of the Thomson-East Coast Line.

d) **Special Mention Award**

HDB's project (in collaboration with NUS, NTU, Ngee Ann Polytechnic and Singapore Polytechnic) – A Biophilic Waterway@Punggol – Innovative Floating Wetlands and Freshwater-Tolerant Mangroves

Punggol, as the first Eco-Town of Singapore, provides HDB the opportunity to drive innovation and experimentation of initiatives that support Singapore's efforts to become a liveable and sustainable city.

Greenery and nature are key elements in the design of Punggol Waterway. The aim is to create an environment with abundant greenery and biodiversity that encourages residents to foster deeper connections with the natural world and provide a picturesque backdrop for the residents who have made Punggol their home. To intensify greenery and bring nature close to residents' door step, HDB piloted the first-of-its-kind solutions: Floating Wetlands System and Freshwater-Tolerant Mangroves, in the Waterway.

HDB took great efforts to ensure that the waterway, together with the initiatives test-bedded there, are environmentally sustainable and contribute positively to the biodiversity in the area. Beneath their lush green appearance, these HDB solutions possess far-reaching abilities to protect riverbanks, improve water quality and promote biodiversity.

Since the implementation of these two initiatives, a total of 92 bird species, 11 butterfly species and 17 dragonfly species have flourished along the Waterway.

Monthly tests conducted at the waterway showed that the wetland plants, together with the freshwater-tolerant mangroves, can improve water quality by up to 30 per cent.

e) Special Mention Award

JTC's project – "J-Ops"

J-Ops, an integrated smart estate and building operations system, is a cloud-based system that allows JTC to centrally and remotely monitor, analyse, and optimise our estate and building systems on the facilities management (FM) front. Linked to 19,000 data points with the data collected every 5 minutes from 21 mechanical and electrical systems, J-Ops generates 5,472,000 data transactions every 24 hours that are analysed in real-time to identify faults and sub-optimal configurations.

The system allows the FM team to locate specific faults in building systems or equipment, allowing them to diagnose and resolve the faults effectively. The location of the fault will be displayed on the relevant floorplan, with analytics and historical data related to the fault displayed, to aid in the understanding and diagnosis. The fault analytics will display possible causes and solutions, thus guiding the technician in resolving the fault. The system will also validate almost real-time once the fault is resolved.

J-Ops is expected to reduce energy usage, improve the comfort of tenants and help JTC to be more productive and efficient in managing its facilities. The system leverages data analytics and sensors to provide better insight into how the buildings are operating, thus allowing JTC to make decisions to ensure its buildings' essential services and systems are operating optimally.

With the system, JTC can scale up its capabilities in addressing the facilities management requirements of increasingly complex industrial facilities, without substantially increasing manpower and costs for facilities management and maintenance.