PRE-EMPTIVE AND PREDICTIVE MONITORING SOLUTION TO ENHANCE SAFETY OF MAINTENANCE CREW

CONTEXT

CapitaLand and Lendlease Global Commercial REIT ("LREIT") are two major stakeholders in the Jurong Lake District (JLD). CapitaLand is one of Asia's largest diversified real estate groups. Headquartered in Singapore, CapitaLand's portfolio focuses on real estate investment management and real estate development, and spans across more than 260 cities in over 40 countries. LREIT is a real estate investment trust established with the principal investment strategy of investing, directly or indirectly, in a diversified portfolio of stabilised income-producing real estate assets located globally. In Singapore, LREIT's portfolio comprises retail and commercial properties, including Jem and 313@somerset. Within JLD, CapitaLand and LREIT operates retail malls Westgate and Jem respectively.

CapitaLand and LREIT have identified the safety of employees and contractors working on facilities management as an area which can be enhanced through technology. Safety issues can be categorised based on (a) severity (e.g. fall from height may result in severe consequences but are rare occurrences) or (b) frequency of exposure (e.g. slip-and-fall incidents may be more frequent but with relatively minor consequences). Both CapitaLand and LREIT have identified manual corrective maintenance of facilities and equipment as a high-risk task due to its critical and urgent nature. This places a lot of stress on the maintenance crew, and such pressure may lead to safety lapses. The facility management teams of both organisations are keen to reduce the amount of manual corrective maintenance work required, thereby reducing the chances of incidents. While technology has been able to reduce reliance on manual maintenance work, there remains some unavoidable tasks that employees and contractors must perform. One example is the requirement to conduct corrective maintenance of the water supply system.

The water tanks of a water supply system in a development (large shopping mall or an international business park) are usually placed in hard-to-reach areas – typically on the roof. The following risks are associated with water tank maintenance: (1) the risk of falling from height, and (2) exposure to external weather conditions. Existing solutions are unable to provide fool proof monitoring of the water tanks and pipes. Both CapitaLand and LREIT have experienced instances where the current sensor technology is not sensitive enough to detect low water levels in the water tank and anomalies of the pump systems or the location of leaking water pipes resulting in water wastage. There were also instances where the sensors failed, without a failsafe mechanism to continue monitoring the water supply system.

Both CapitaLand and LREIT are keen to create a reliable, user-friendly, sensitive and robust solution that can ensure accurate monitoring and safer maintenance of the water supply system with fewer human resources involved.

This sector-wide challenge is supported by the Urban Redevelopment Authority (URA) and Smart Nation & Digital Government Office (SNDGO) for the development of sustainability and smart nation initiatives within Jurong Lake District.

PROBLEM STATEMENT

How might we design a pre-emptive and predictive water tank monitoring system that reduces the need for corrective maintenance work?

WHAT ARE WE LOOKING FOR?

CapitaLand and LREIT are looking for a solution that can help them to collect accurate data and predictive analytics about the water supply systems in their commercial properties. The intention is to integrate these data into their system to reduce the need for manual corrective maintenance and even when required, it is done in a pre-emptive manner where the maintenance crew can address the issue in a timely and safe manner.

The solution should include the following features:

- Environmental monitoring. The solution should be able to collect information about the water tank and other parts of the water supply system (such as pipes). It must provide helpful diagnostics about the system that the facilities managers can use to determine the health of the water supply system.
- Incident detection. The solution should be able to identify and detect affected equipment and location of the incidents and issues which are within the water supply system that requires attention from the facilities management team.
- Predictive asset lifespan tracking. The solution should trigger maintenance or replacement work based on the predicted lifespan of equipment. Such assessments can be predictive, based on analysis of equipment lifespan and wear-and-tear information.
- Pre-emptive and just-in-time inspection triggers. The solution should trigger manual inspections in a timely manner when it detects a risk in leaks or breakdowns, to reduce need for urgent corrective maintenance work.
- Feedback loop. The solution should integrate with and provide feedback to the various facilities management systems.
- Self-calibration. The solution should be able to respond to deviations in its accuracy and provide self-adjustments to readings and values.

OVERALL PERFORMANCE REQUIREMENTS

The solution should meet the following performance criteria:

- Scalable. Tests will be run at CapitaLand's and LREIT's commercial properties within JLD as a proof-of-concept and could be scaled throughout JLD.
- Cost-effective. The solution should achieve return-on-investment so that the savings from deployment make sense.
- Brand image. Its application should help to enhance the brand image of both CapitaLand and LREIT by reducing need for urgent correct maintenance work and reducing safety incidents.
- High quality data. The data collected by the solution is high quality and can be trusted by the facilities managers that utilise the information to better plan their maintenance programme.
- Backwards compatible. The solution must be plug-and-play and able to integrate with the existing (integrated) building management systems and communications systems within the properties and with the capability of future integration (ie. not a closed system)
- Robust and weatherproof. The solution should withstand varying weather conditions and can function within a wide range of temperature and humidity.
- Sensitive. The system must be able to detect even minor changes in water levels and leakages in the water tank.
- Lean and productive. The solution should result in a reduction in demand for manual maintenance and servicing. Upkeep of the water supply system should require as few human interactions and interventions as possible.

There are no restrictions on the geographic location of the problem solvers who may choose to apply to this challenge. However, the prototype needs to be demonstrated in Singapore.

Proposals that are non-digital or combine digital and non-digital components which address the challenge statement are welcome too and will be assessed accordingly.

POSSIBLE USE CASEs

1. Facilities management team responds pre-emptively to possible maintenance requirements. The CapitaLand facilities management team receives an alert to do a check on the water tank in the roof. The alert was triggered because the solution sensed a potential situation (based on various environmental factors and the condition of the water supply system) where the system is able to automate the check on the water tank to verify the fault.

2. Facilities management team fixes a leak. While looking through the dashboard/digital report in their (integrated) building management system, Lendlease property management team is alerted to an equipment that might need to be replaced within three months. They run through the stock of replacement parts and make a purchase to prepare for a situation where they might need to fix the leak. Within the next few weeks, they visit the location as pinpointed by the solution and find that a part is close to wearing out and are able to replace it before it fails. In the past, they would have had to scramble to fix the leak and are glad to be able to work on it without the time pressure.

WHAT'S IN IT FOR YOU

- S$50,000 of prize money for each winner of this challenge (see Award Model)
- Access to IMDA's innovation consultancies (e.g. Design Thinking, Digital Storytelling, UI/UX) and PIXEL corporate innovation hub (e.g. hot-desking, project studios, ARVR, usability, 5G test labs) for prototyping and commercialisation
- Co-innovate with CapitaLand and LREIT with access to their expertise, facilities, and human resources in developing the solution
- Contribute to JLD's sustainability efforts and towards the collective green ambitions of the district, with profiling opportunities and potential to scale successful solutions within the district

EVALUATION CRITERIA

The evaluation process shall take place over 2 stages. Proposals shall be evaluated based on the evaluation criteria below for the first stage. Thereafter, shortlisted proposals shall be subjected to a second stage evaluation in the form of an interview / pitch, and the scoring shall be based on a re-defined assessment criteria for the selection of the challenge finalist(s).

Solution Fit (30%)	Relevance: To what extent does the proposed solution address the problem statement effectively?
Solution Readiness (30%)	Maturity: How ready is the proposed solution to go to the market? Scalability: Is there any evidence to suggest capacity to scale?
Solution Advantage (20%)	Quality of Innovation: Is the solution cost effective and truly innovative? Does it make use of new technologies in the market, and can it potentially generate new IP?
Company Profile (20%)	Business Traction: Does the product have user and revenue traction? Team Experience: Do the team members possess strong scientific/technical background?

AWARD MODEL

30% of the prize money will be awarded to each selected finalist at the start of the POC/prototype development process. The remaining 70% will be awarded after completion of the POC/prototype solution, based on milestones agreed between Problem Owner(s) and the solver. Prize money will be inclusive of any applicable taxes and duties that any of the parties may incur.

Note that a finalist who is selected to undertake the prototype development process will be required to:

- Enter into an agreement with Problem Owner(s) that will include more detailed conditions pertaining to the prototype development;
- Complete an application form with IMDA that will require more financial and other related documents for potential co-funding support.

Teams with public research performers are required to seek an endorsement from their respective Innovation and Enterprise Office (IEO) and submit the IEO form together with the proposal.

SUBMISSION GUIDELINES AND DEADLINE

The proposal should include the following:

- 1 deck of slides in PDF format explaining the proposed solution, how it addresses the problem statement and meets the desired performance requirements. To include information such as the proposed cost model, data inputs, system that the proposed solution will run on, potential benefits, and the team's implementation plan.
- Video or pictures (300dpi) of any prototype or simulation, if applicable.
- Track record of the company/ CV of the team.

All submissions must be made by **21 April 2023, 1600 hours (SGT/GMT +8)**. Problem Owner(s) and IMDA may extend the deadline of the submission at their discretion. Late submissions on the OIP, or submissions via GeBIZ, will not be considered.

Please visit https://www.openinnovation.sg/challenges to sign up for this challenge.