DRIVING SUSTAINABILITY THROUGHOUT THE PROJECT LIFECYCLE
To maintain and elevate Singapore’s edge in the increasingly competitive regional and international markets, industrial development can be seen as a key driver and tool to accomplish this aspiration. Since the country’s founding days, industrial development has been a cornerstone for Singapore’s progress and growth, attracting investors, creating meaningful jobs and putting the tiny red dot on the global map. Evidently, the industrial landscape is essential to Singapore’s continued success.

As society grows more sophisticated and varied, there is more demand for more of Singapore’s limited land area. More land will now have to be demarcated for residential developments to house a growing population, with yet more land allocated for ancillary services such as shops and schools for the population. Further, as more foreign companies choose Singapore as their springboard into the Asian market, more commercial and office spaces would have to be constructed to support this economic growth. Therefore, the industrial landscape must also evolve.

As Singapore’s lead government agency responsible for the development of industrial infrastructure, JTC pushes boundaries in sustainability to respond quickly to evolving industry needs and overcome challenges such as manpower and resource constraints in today’s fast-changing built environment.

By pioneering the use of sustainable technologies, materials and processes in its existing projects, JTC hopes to positively influence and transform industry practices and standards.

As a master planner and a master developer for industrial buildings and estates, JTC has in place a structured framework to enhance sustainability throughout the entire industrial infrastructure lifecycle. This sustainability framework also helps to improve productivity, and allows for the provision of sustainable procurement at almost every stage.
PHASE 1: Planning for Sustainability, Productivity, Constructability & Safety

Air Quality
Natural elements are considered from the passive design stage, and are used to optimise airflow in each building. Notable installations include JTC CleanTech One’s atrium wind wall, and JTC CleanTech Three’s natural wind corridors; both enhance natural ventilation and reduce the need for mechanical ventilation and air-conditioning.

Water
Systems that facilitate the recycling, reusing and conservation of water are adopted. Examples include harvesting and recycling of grey/rainwater at CleanTech Park, and the water-cooled chilled water system at JTC Space @ Tuas.

Green & Blue Masterplans
These are employed to balance environmental sustainability and existing biodiversity with the commercial needs of each development.

Energy
Smart systems and renewable energy sources are implemented to reduce energy consumption levels. Furniture Hub @ Sungei Kadut, for instance, possesses a solar panel-ready roof design to enable sustainable energy generation.

Transport
By planning for estate-wide connectivity, JTC enables greener, car-lite environments. Initiatives include multi-route shuttle bus services on high-capacity buses; and Personal Mobility Device sharing services to enhance last-mile connectivity; and self-driving taxis.

Shared Services
Technologies that can be deployed on larger scales are considered – such as District Cooling Systems and Pneumatic Waste Conveyance Systems – to achieve greater energy and operational efficiencies.
Once the planning has been finalised, the development will then move into the Design & Construction phase. JTC ensures that its buildings are constructed sustainably, productively and safely through a number of factors:

**Green Mark Features**

International best practices of sustainable, green designs are incorporated into JTC’s buildings and estates. An example is the installation of solar panels at Jurong Town Hall, and provision for future solar panel installations at newer developments like TimMac@Kranji. Provisions are incorporated into JTC’s building design requirements for consultants to include the following into their designs:

- Adoption of energy saving air-conditioning / chiller system
- Adoption of energy saving LED lights for general lighting of common areas such as staircases, corridors, plant rooms, car parks, and circulation areas
- Usage of motion sensors to control staircase and toilet lighting

**Buildability Practices**

Project buildability and constructability are assessed through Virtual Design and Construction (VDC). This helps to reduce resource wastage and speeds up design and construction work dramatically.

**Green Materials**

To lead the adoption of productive and sustainable construction methods, JTC pioneered the use of environmentally friendly materials. These include the use of Green Concrete, Structural Steel and Mass Engineered Timber, all of which boost construction productivity and contribute to a cleaner and safer construction environment. Additionally, JTC encourages the use of materials with recycled content (e.g. recycled concrete aggregate).
Constructing a building is one thing but maintaining one is a whole new ballgame all together. JTC operates its buildings and estates by streamlining resource use and optimising long-term sustainability through the following key features:

**Green Leases & Policies**

Through Green Leases, JTC is introducing tenants to sustainable technologies, and sharing how going green can benefit them in the long run. JTC also encourages the use of environmental friendly and energy efficient equipment, and these can be found on the Singapore Green Building Council’s Directory of Certified Products. JTC Tenants are also encouraged to partake in their own recycling activities.

**Green Living Labs & Test-Beds**

Through Open Innovation Calls, JTC supports start-ups, enterprises and academic institutions in the development, fine-tuning and test-bedding of new sustainable solutions. This accelerates their time-to-market so that industries can benefit from the boost to efficiency and sustainability.

**BIM 6D for Facilities Management**

Beyond using Building Information Modelling (BIM) for design and construction, JTC is piloting the information-rich system for effective facilities management and building maintenance.

**Smart Building Management Systems**

J-Op is JTC’s integrated building and estate operations system that allows JTC to centrally and remotely monitor, analyse and optimise estate and building systems, such as lighting and air-conditioning systems. Instead of just one particular building, J-Op links multiple developments and properties into one comprehensive system.

**Green Bonus Scheme**

Facility management partners are incentivised with contract bonuses for successful implementation of new energy efficient initiatives. This encourages more proactive, innovative approaches for energy management. One of the requirements for this scheme is for the facility management partner to use environmentally friendly and energy efficient equipment (e.g. environment-friendly cleaning agent / equipment with at least 3-5 ticks) and include recycling in all specifications. Since its implementation in 2016, the scheme has seen a 2 percent reduction in energy consump
PHASE 4: Rejuvenation

Essentially retrofitting existing projects for greater performance and sustainability, JTC considers the following when making rejuvenation plans for its buildings and estates:

Retrofitting to Meet Sustainability Guidelines
Existing developments are updated with new green features to meet sustainability goals and guidelines. Some of these updates include energy-efficient lighting and water-saving toilet fittings.

Introducing New Sustainability Features
Installation of new sustainable elements, such as solar panels, low-emissivity glass and smart sensors in our existing buildings.

Repurposing Land for Optimal Land Use
JTC maximises and optimises land use by redeveloping matured buildings and estates into more productive and flexible future-ready spaces. One example is the conversion of standard factories at Ayer Rajah Estate into start-up space, and the redevelopment of the Tanjong Kling industrial estate.

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