

Enhancing Environmental Sustainability in Public Housing Development



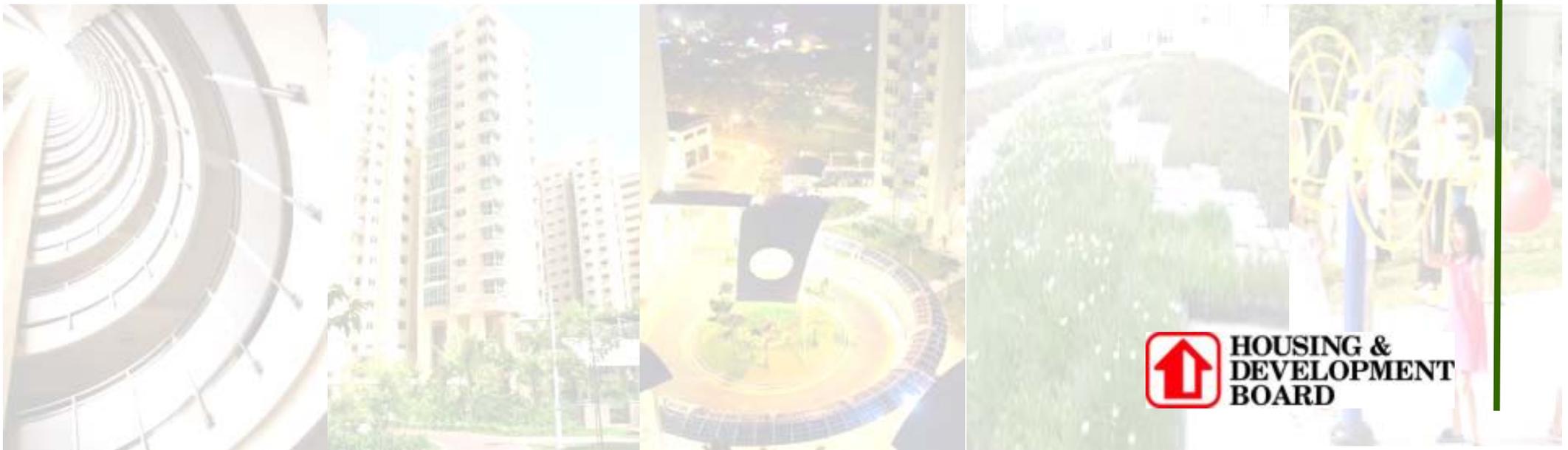
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Housing & Development Board



CONTENT



- **BACKGROUND**
- **SUSTAINABLE STRATEGY**
- **R&D EFFORTS**
- **ECO-INITIATIVES**

BACKGROUND





BACKGROUND

HOUSING & DEVELOPMENT BOARD

FORMED IN: 1960

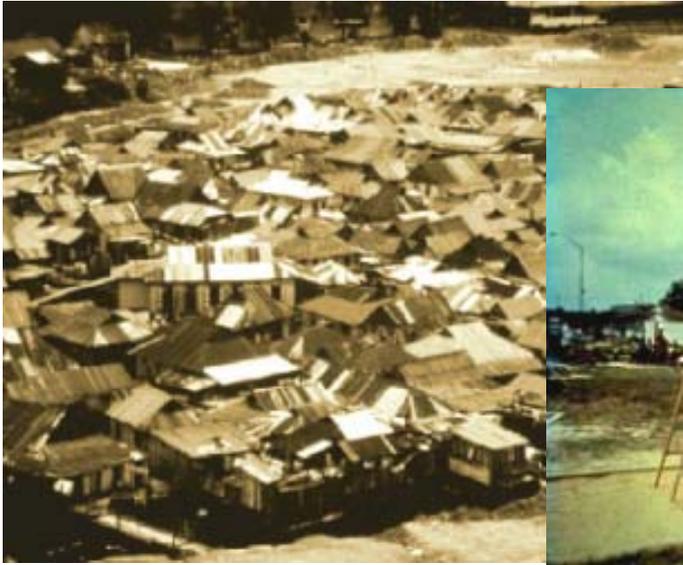
VISION

*Affordable Homes,
Vibrant Towns,
Cohesive Communities*





BACKGROUND



Quality

Shelter



Community



Lifestyle



Environment



BACKGROUND

TRACK RECORD

Apartments Constructed = Over 970,000 DUs





BACKGROUND

INTERNATIONAL AWARDS

- United Nation's World Habitat Award (1991)
- American Concrete Institute Award (1994)
- ASEAN Federation of Engineering Organisation's Award (2001)
- UK's Royal Society for Prevention of Accident (ROSPA) in 1993 and 2002 for excellence in construction safety management





BACKGROUND

ENVIRONMENTAL SUSTAINABILITY



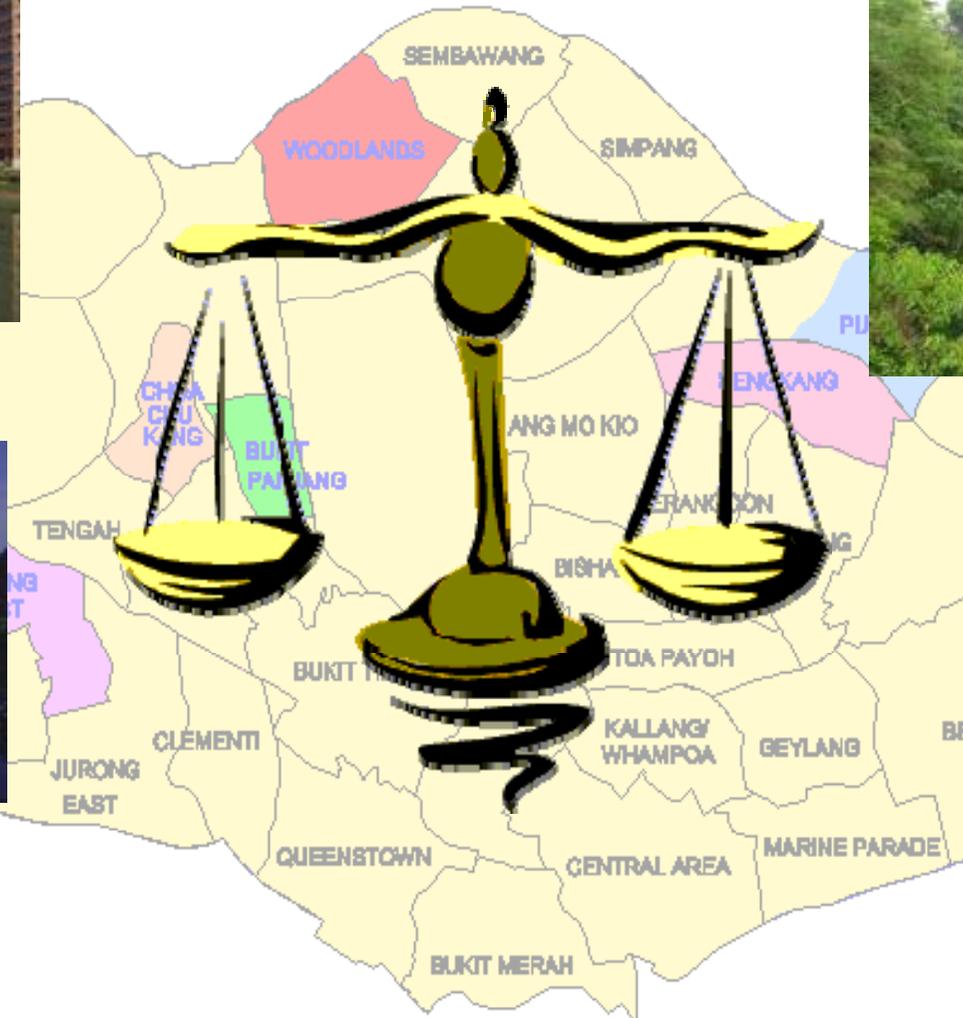
“Development which meets the needs of the present without compromising the ability of future generations to meet their own needs”



BACKGROUND



Housing a Nation



Living Environment

The Balancing Act

SUSTAINABLE
STRATEGY





SUSTAINABLE STRATEGY

Conscious decision to be efficient at the outset of a project.



Design



Construct

INTEGRATED

APPROACH

Maintain





SUSTAINABLE STRATEGY



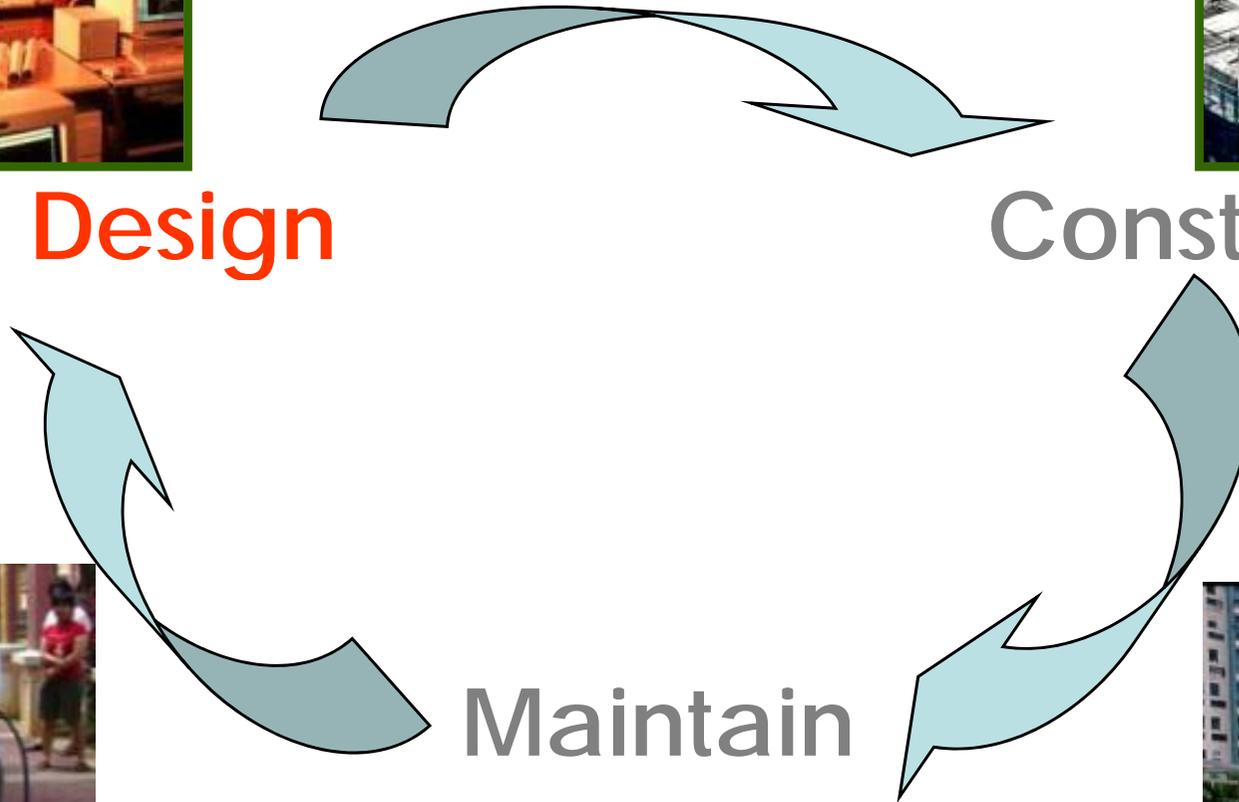
Design



Construct



Maintain

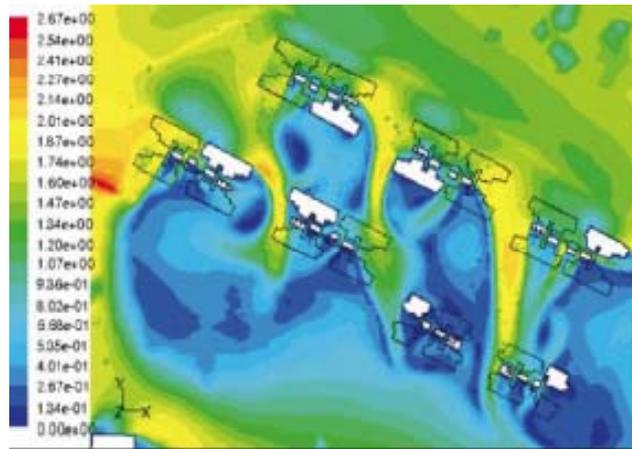




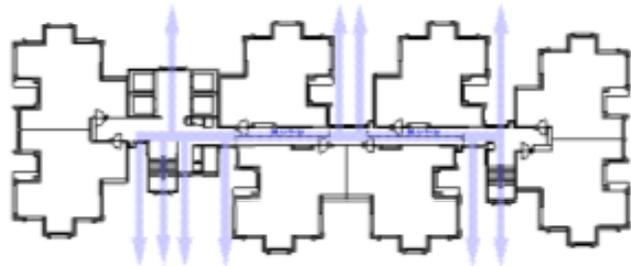
SUSTAINABLE STRATEGY

DESIGN

Take Advantage of Nature



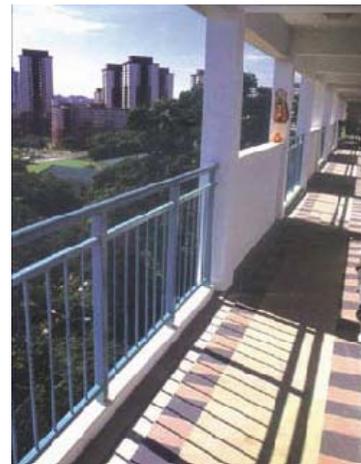
Wind flow analysis



Cross Ventilation



Building Orientation



Natural Daylight



Maximize Greenery



SUSTAINABLE STRATEGY

DESIGN

Buildability

Modular Blocks



Unit Configuration –
Door and Window
Standardisation



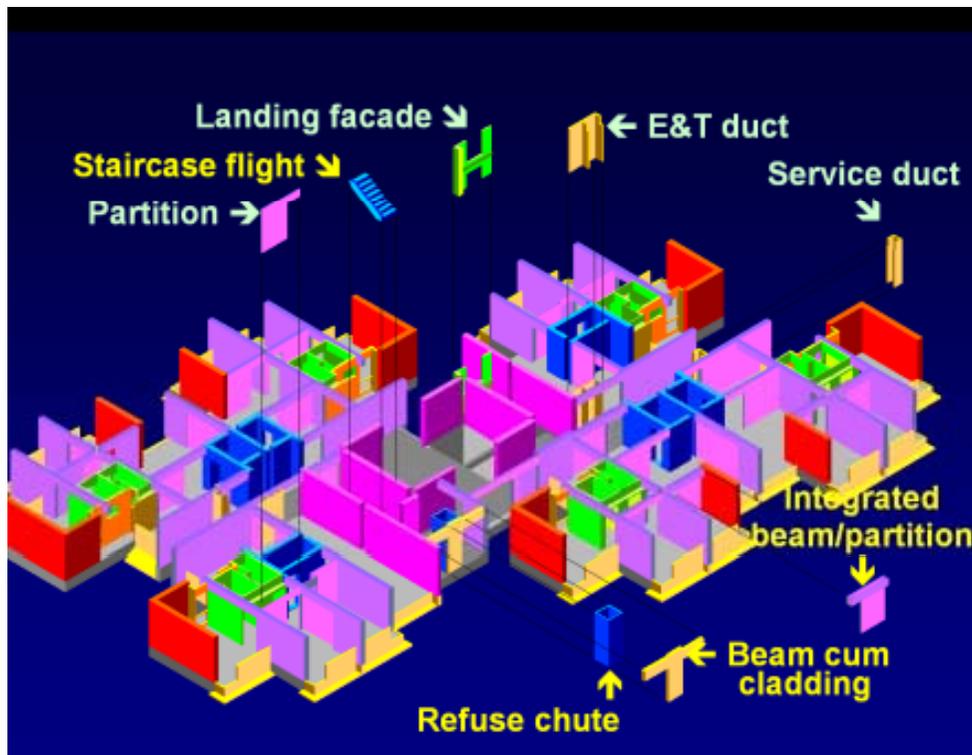
Repeated Features



SUSTAINABLE STRATEGY

DESIGN

Embracing Prefab



Total Precast Building System



Prefab Toilets



Prefabricated Meshes



SUSTAINABLE STRATEGY

Prefabrication

- Reduce Noise
- Reduce Air pollution
- Less traffic Congestion
- Less Wastage





SUSTAINABLE STRATEGY

DESIGN

Comfortable and Healthy



**Universal Design &
Green Connectivity**



More landscape areas



**Green Areas for
Community Bonding**



SUSTAINABLE STRATEGY



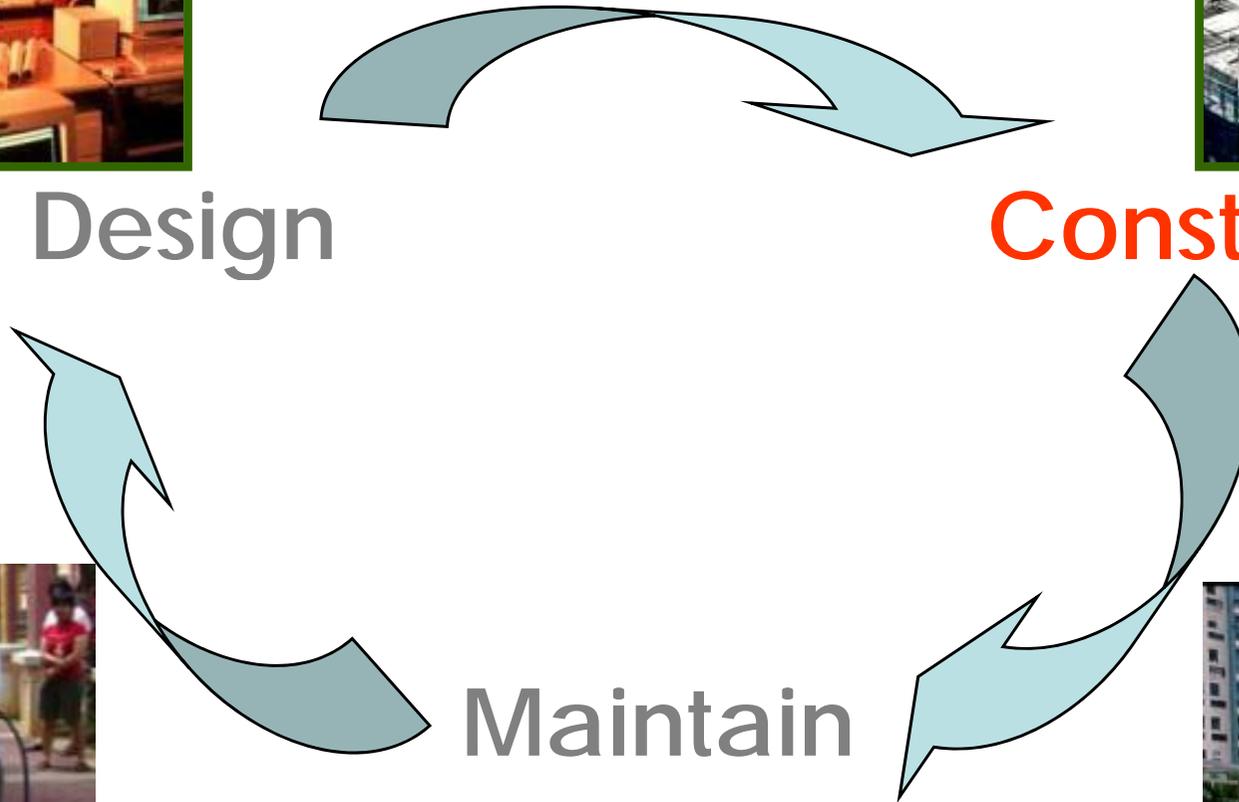
Design



Construct



Maintain





SUSTAINABLE CONSTRUCTION

Construction

Site Mechanisation

- Better Quality Control
- Reduced Wastage



Manual mixing



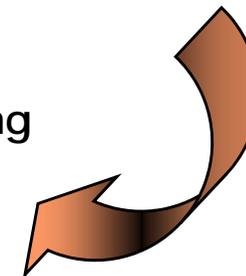
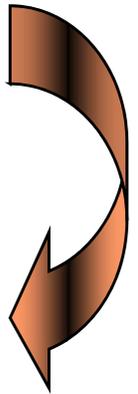
Semi-mechanised mixer



Automatic batching plant



Semi-Automated Site Batching





SUSTAINABLE CONSTRUCTION

Construction

Prefabrication Management System

- Less wastage
- Good Housekeeping



COMPUTERISED MATERIAL MANAGEMENT SYSTEM

- Components tagged with bar codes
- Tags: ID, weight, block level



- Components tracked from delivery, storage to installation stage
- Provides an up-to-date inventory status for site monitoring





SUSTAINABLE CONSTRUCTION

Construction

Minimize Wastage



Prefab Meshes



Prefab Toilets



Timber Form to Metal Form



ENVIRONMENTAL SUSTAINABILITY

Construction

Safe Construction

- Safety Is **The Basic Responsibility** Of Everyone
- Safety Is **The Priority** In A Work Operation
- Safety Is **To Adopt PRO-ACTIVE Approach** To Prevent Accident Occurrence





SUSTAINABLE STRATEGY



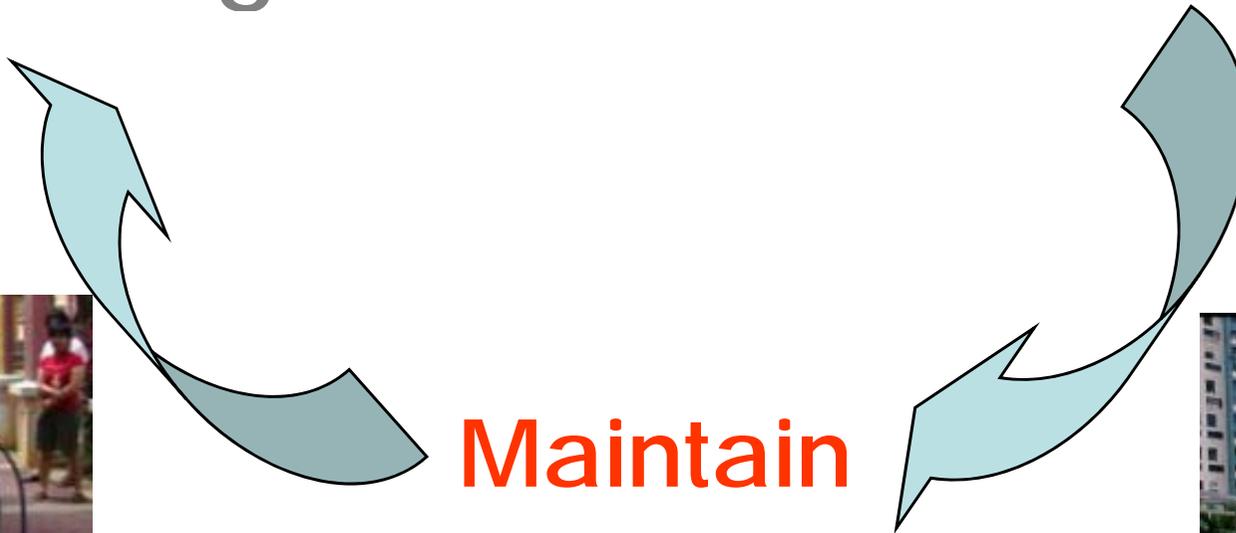
Design



Construct



Maintain





SUSTAINABLE STRATEGY

Maintain

Reduce Maintenance Problems

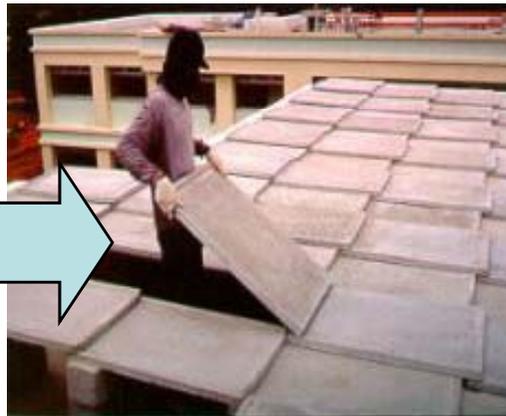
- Better Materials and Solutions
- Feedback loop established



Brickwalls replaced with precast walls



Ferrocement Secondary Roofing System



Concrete Water Tanks



SUSTAINABLE STRATEGY

Maintain

Lower Energy Consumption

- Energy Efficient Technologies
- Power Saving Strategies



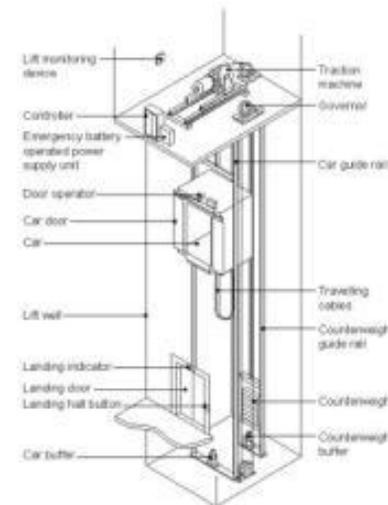
Energy Efficient Light Fittings



Light Control and
Motions sensors



Power Saving
Devices



Lift Systems



SUSTAINABLE STRATEGY

Maintain

Easy Maintenance

- Landscaping Maintenance
- Cleaning of estates



Hardy plants



Anti-fungal External Paint



Centralised Refuse Chutes

R&D EFFORTS





R&D EFFORTS

OUR R&D EFFORTS



- Exploiting New Technology and New Materials
- Embracing Change
- Doing things differently
- Sustainable



R&D EFFORTS

ENHANCING GREEN

Green Roofs





R&D EFFORTS

ENHANCING GREEN

Vertical Greening



- Testing Plant Species
- Vertical Systems
- Maintenance Requirements



R&D EFFORTS

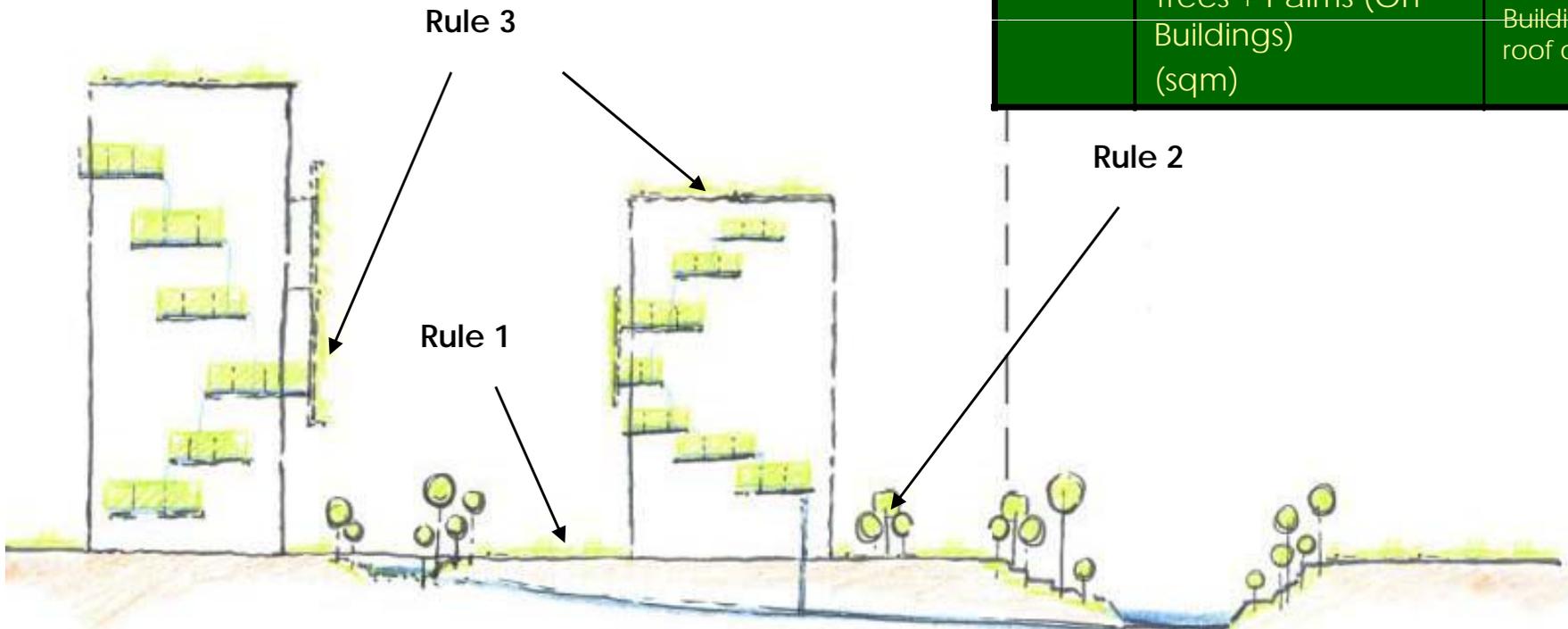
Greenery Provision

Formulae :

Quantitative Effects of Greenery

$$\text{GnP} = \frac{(\text{Rule 1} + \text{Rule 2} + \text{Rule 3}) \text{ Total Green Area}}{\text{Site Area}}$$

Conceptual diagram of Rule Tabulation

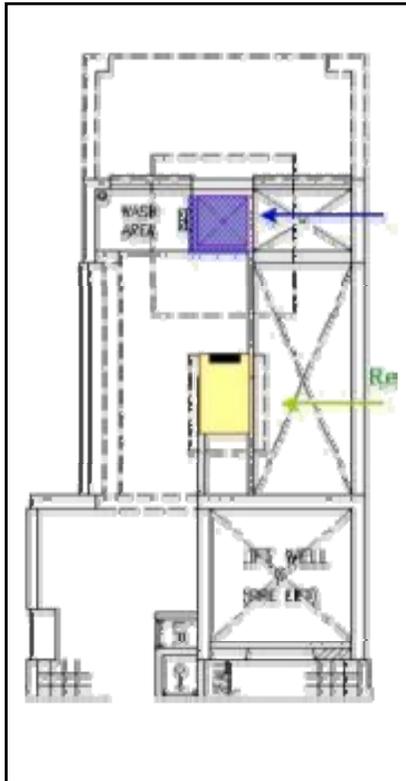


No.	Component / Units	Based On
Rule 1	Grass / Ground Cover (sqm)	Green Area of Ground Cover / Grass (Thru Ground)
Rule 2	Shrubs + Trees + Palms (sqm)	Green Area of Shrubs + Trees + Palms (Thru Ground)
Rule 3	Grass + Shrubs + Trees + Palms (On Buildings) (sqm)	Green Area of Grass + Shrubs + Trees + Palms (On Building surfaces such as roof or façade)



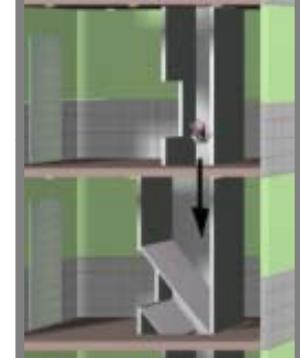
R&D EFFORTS

ENCOURAGING RECYCLING



Recyclable Intermediate Chute System (RICH)

- To provide a convenient mode for HDB dwellers to recycle
- Present door to door collection method is labour intensive
- Collaborated with SembEnviro on RICH





**HOUSING &
DEVELOPMENT
BOARD**

ECO - INITIATIVES





ECO-INITIATIVES

ECO-PRECINCT



Eco Precinct @ Punggol successfully launched 28 March 2007



REJUVENATION EFFORTS



Sustainable Construction... the HDB way....



Creating a Sustainable Living Environment!