

Enhancing Environmental Sustainability in Public Housing Development



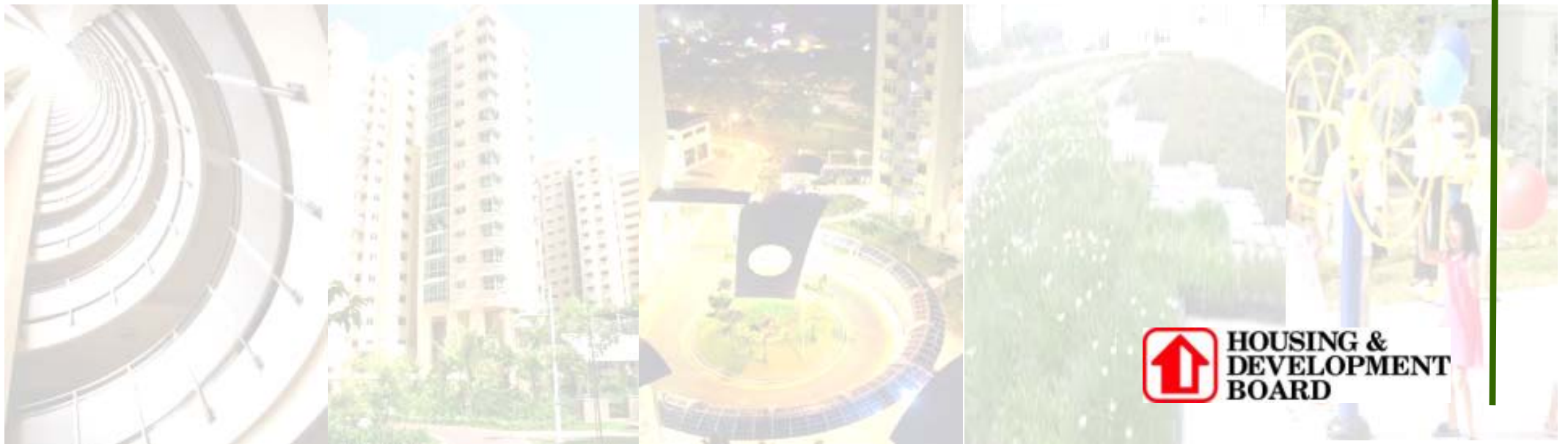
Presented by

Dr Johnny Wong Liang Heng

Deputy Director (Building Research)

Building Technology Department

Housing & Development Board



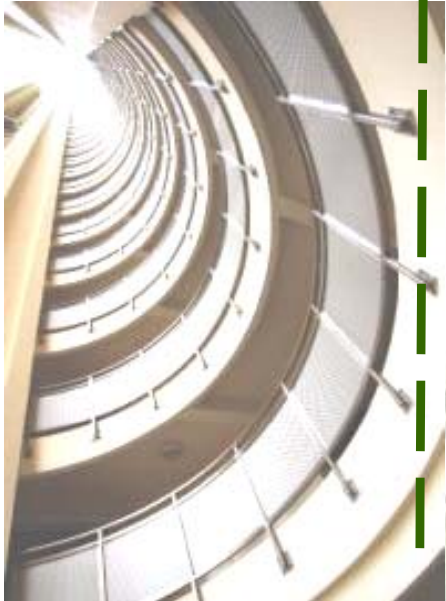
**HOUSING &
DEVELOPMENT
BOARD**

CONTENT



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

BACKGROUND





BACKGROUND

HOUSING & DEVELOPMENT BOARD

FORMED IN: 1960

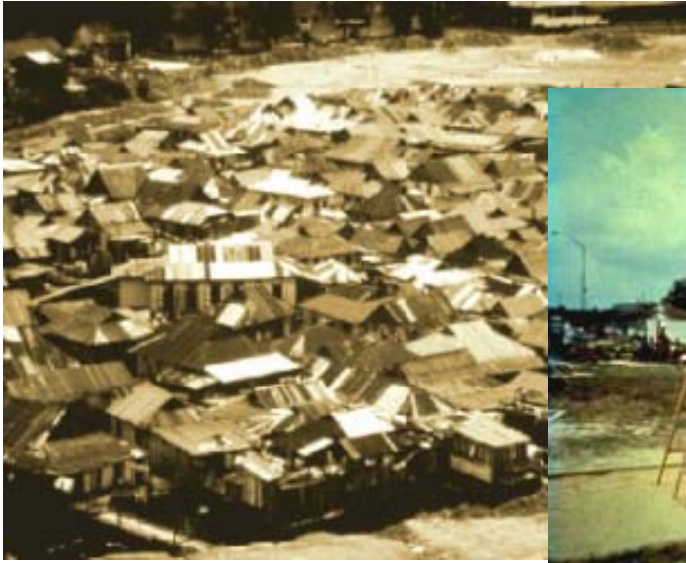
VISION

*Affordable Homes,
Vibrant Towns,
Cohesive Communities*





BACKGROUND



Quality

Shelter



Lifestyle



Environment

Community



BACKGROUND

TRACK RECORD

Apartments Constructed = Over 970,000 DUs



HOUSING MORE THAN 80% OF THE
POPULATION IN SINGAPORE



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



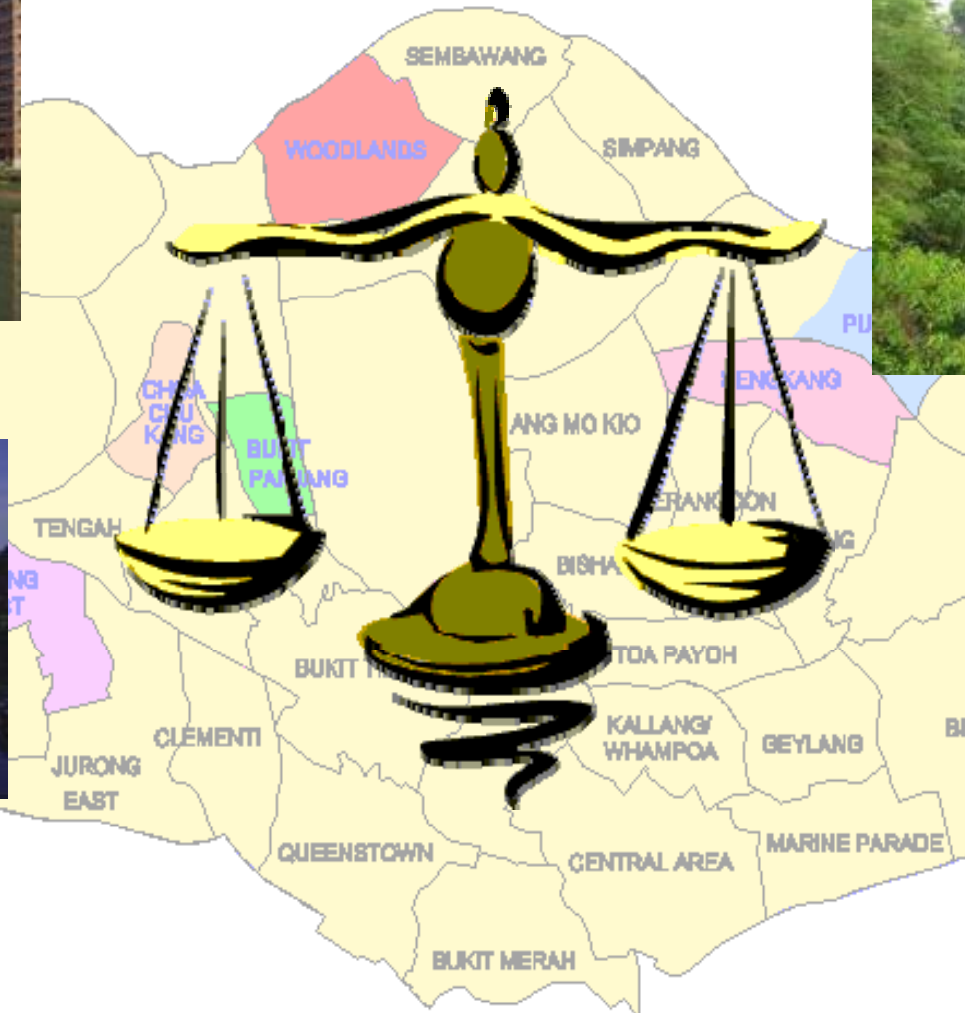
“Development which meets the needs of the present without compromising the ability of future generations to meet their own needs”



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

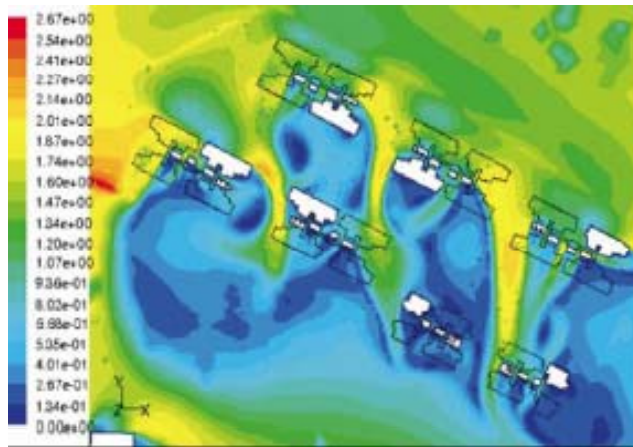




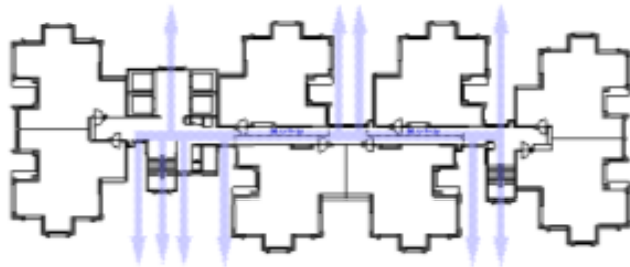
SUSTAINABLE STRATEGY

DESIGN

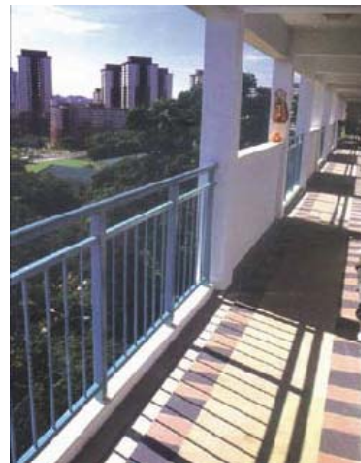
Take Advantage of Nature



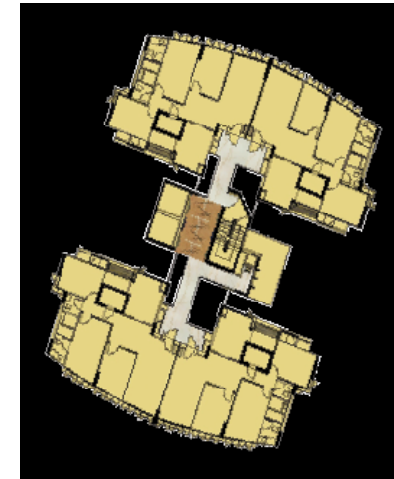
Wind flow analysis



Cross Ventilation



Natural Daylight



Building Orientation



Maximize Greenery



SUSTAINABLE STRATEGY

DESIGN

Buildability



Unit Configuration –
Door and Window
Standardisation

Modular Blocks



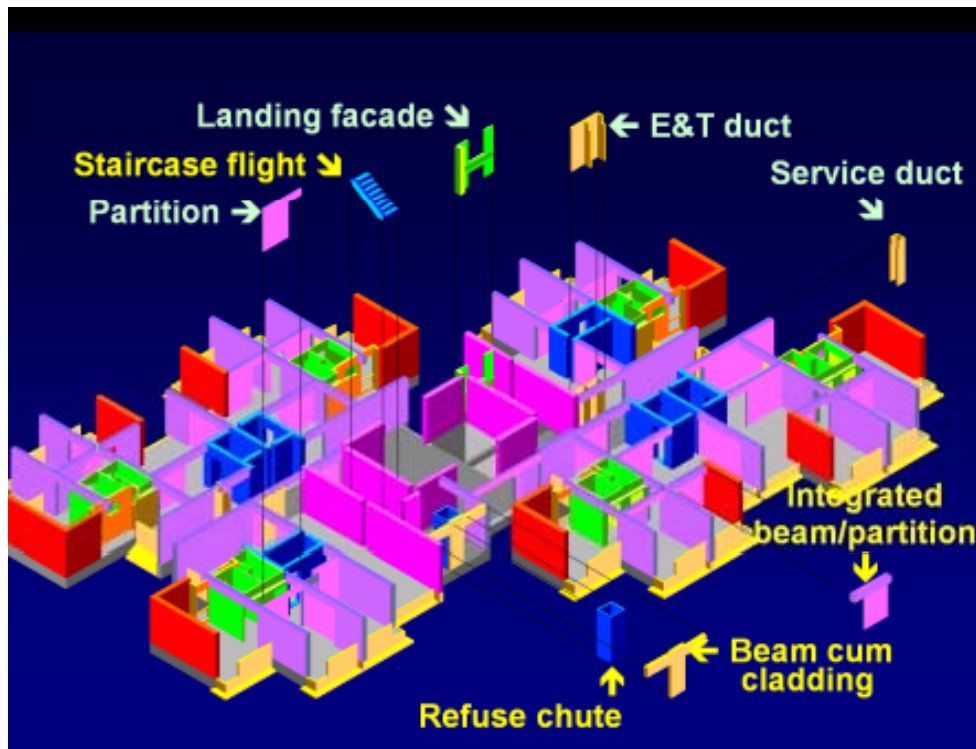
Repeated Features



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



PLANK



COLUMN



LIFT WALL



SAI



BEAM



WATER TANK



SUSTAINABLE STRATEGY

DESIGN

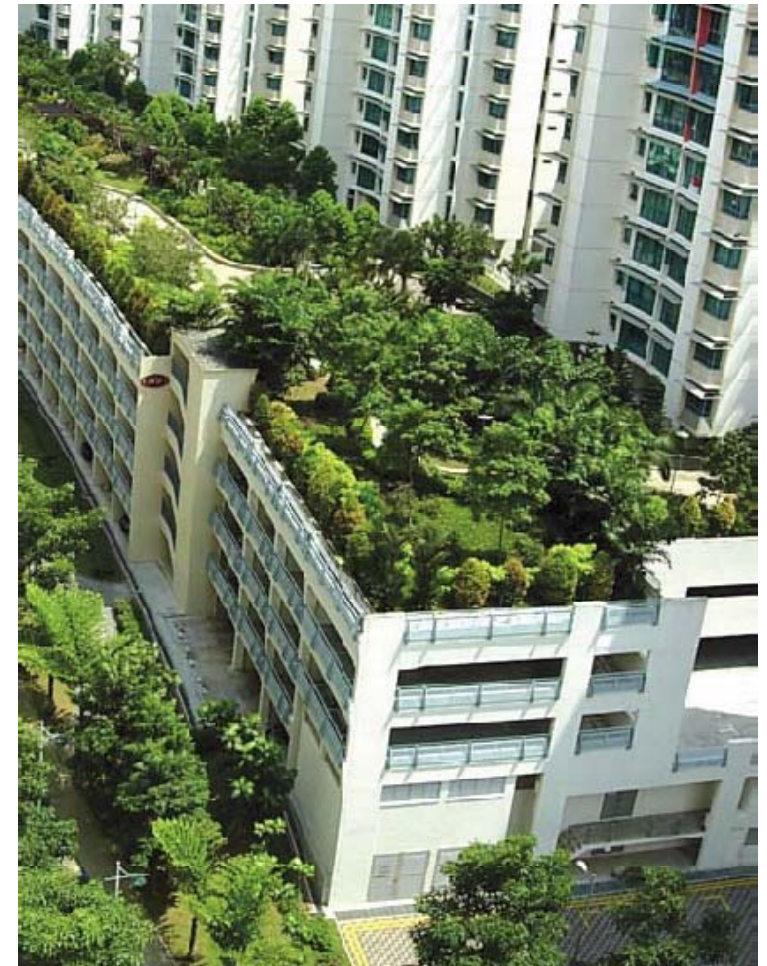
Comfortable and Healthy



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



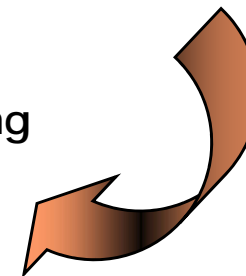
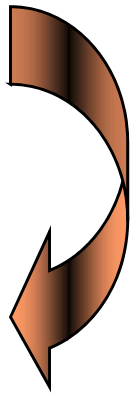
Semi-mechanised mixer



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

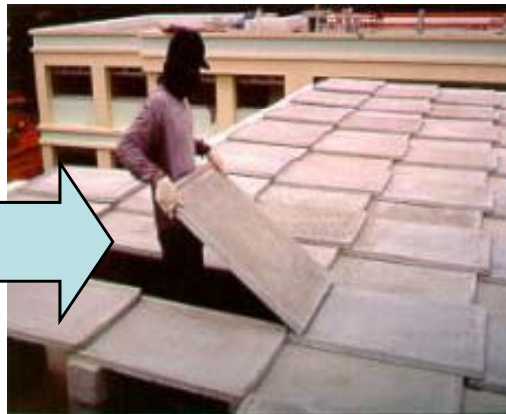
Maintain

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



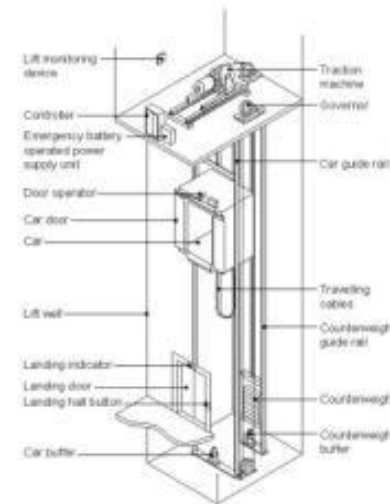
Energy Efficient Light Fittings



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

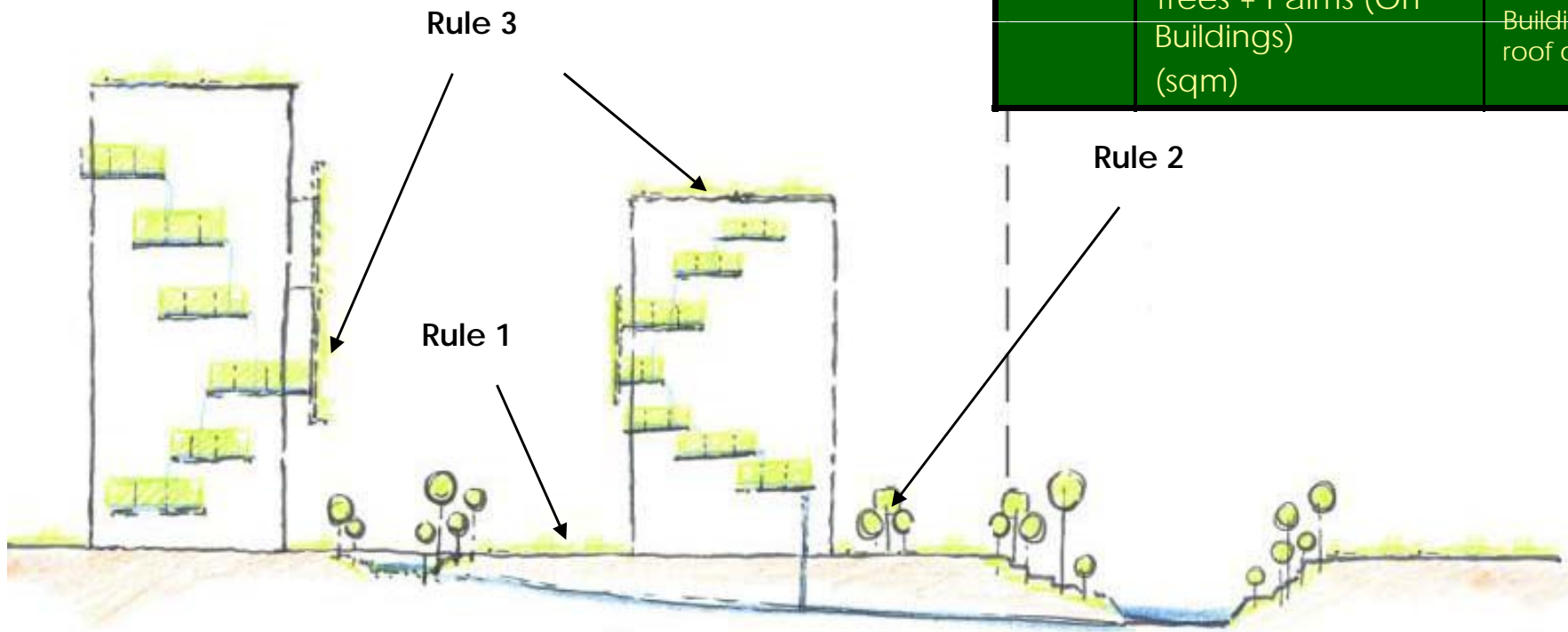
Greenery Provision

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

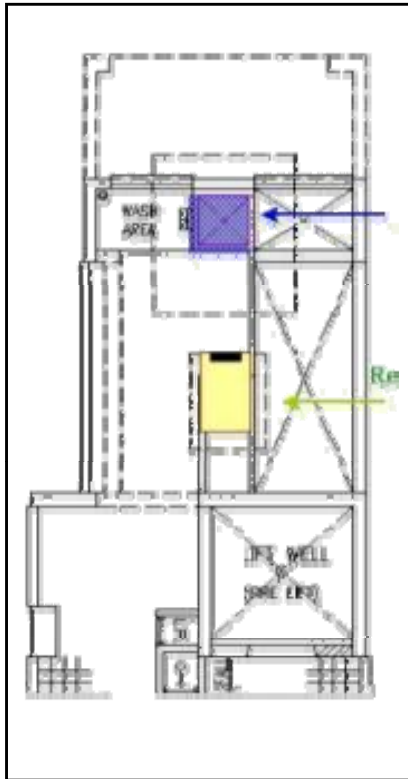


No.	Component / Units	Based On
Rule 1	Grass / Ground Cover (sqm)	Green Area of Ground Cover / Grass (Thru Ground)
Rule 2	Shrubs + Trees + Palms (sqm)	Green Area of Shrubs + Trees + Palms (Thru Ground)
Rule 3	Grass + Shrubs + Trees + Palms (On Buildings) (sqm)	Green Area of Grass + Shrubs + Trees + Palms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



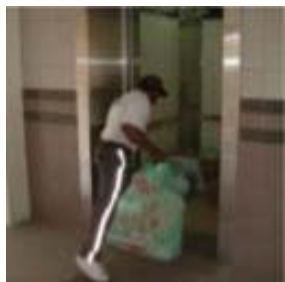
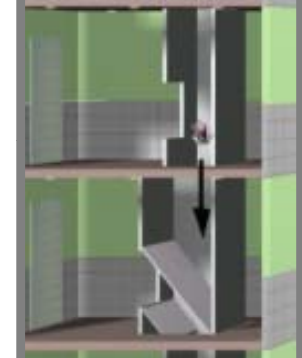
R&D EFFORTS

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!