

Fig.4.2 LAYOUT PLAN OF SEWERAGE Collection Pipe

5. LANDSCAPING

5.1 Basic Design Policy.

Basic design policy for KULIM HI-TECH INDUSTRIAL PARK for Landscaping is as follows.

- To emphasize on environmental harmony and scenery harmony integrated each zone with parks and open space.
- To create landscaping with ample greenery to harmonize overall openness of the independent of each zone.
- To carefully consider the co-existence of the development area of Phase I and the development area of phase II>
- To follow environmental protection policy.-To provide recreational and sport activity for the workers as well as neighboring people.

5.2 Basic Design Concept.

Basic design policy of landscaping would be representative of a Science and Research Park with residential community. It will project the "Hi-Tech & Hi-Touch" image, integrated with working, living, and playing.

First, basic Design Concept is set up in according with the character of activities of whole zone. The character of activities are analyzed based on Basic Design Policy.

Second, Major constituent landscape elements will be prospect based on the following concepts:

- (1) The highest hill area is conserved in natural condition as park and open space for recreational purposes, such as strolling enjoyment.
- (2) A peripheral area of each zone is planned as buffer green belt to make continuous green and to avoid interference of each functional
- (3) The classified roads (arterial, collector and local) are planted with trees and shrub at the roadsides and in the mid-section.

- (4) The pedestrian walkway and bikeway are linked with the parks and green areas, and fulfill the role of a Green Network System.
- (5) Each zone is to be allocated enough open space by a low building, and landscaped by plentiful greenery and beautiful plants.
- (6) Street furniture, lighting and public signboards are to be integrated with park, openspace and street layout scenery harmoniously.
- (7) Utilities such as sub-station, water tank, treatment plant etc. are to be landscaped around and partly over by planting trees and plants.
- (8) Religious facility within the project area is to be preserved in existing condition, and landscaped by planting trees around the site.
- (9) Golf Course located at the central zone of whole project area, is to consider as evacuation space for disaster as well as recreational purpose for general public.
- (10) Especially, high density of low cost residential zone is to be designed with continuity of existing housing at Kulim.
- (11) The sloped areas produced by cut and fill land formation, will also be greenified by shrubs and turf to prevent land sliding.

5.3 Design Standard.

The following regulations and standards are applied for landscaping of the Kulim Hi-Tech Industrial Park.

- Environmental quality act, 1974 (Act 129) in Malaysia.
- Basic law for Environmental pollution control in Japan.
- Design standard of Core Industrial Estate(Draft) 1978, Japan.
- Uniformed Building by Laws, 1984 in Malaysia.
- Street, Drainage and building Act, 1974 (ACT 172)
- Town and country planning ACT, 1976 (ACT 172)

5.4 Design Criteria.

(1) Establishment of the environmental standard and Greenification.

The existing condition in the project area is vegetation in the form of palm oil and rubber trees. However, for use of Industrial Park most of area is newly land formed. The proposed openspace is to be allocated adequately at the project area.

The ratio of more than 25-30% on Greenification in general would be taken as the target as the environmental standard except for the water surface area.

The precedent on Industrial Park with New Town in Japan, shows the target of over 20% for Greenification. In Kulim the Park and openspaces of over 20% will be guaranteed, because Golf Course, Natural Park and other openspaces are included in the project area. (refer to Fig. 5-1)

(2) Green Network System.

In line with goal of the landscaping plan to Kulim, Green Network System will provide Recreational amenities for general public as well as the worker.

According to development phase, Green Network System is designed to permit flexible and economical staging.

(3) Staging.

Each zone can be built independent of one another, in whatever sequence is desired. Therefore, it is necessary to establish most of the Green Network in first phase.

Additional GreenNetwork will be established at second phase of Industrial, Residential, and Natural Park Zone. (refer to Fig. 5-2)

(4) Area Characteristics.

1) Natural Park as conservation area zone.

There is the conservation area set as a natural greenery area, where is existing rubber plantation. It is proposed that rubber trees will first be thinned and

gradually replaced by native plants, and there will become a comprehensive ecological system embracing flora and fauna. And maintaining hilly terrain with conservation of ground surface by vegetation, is inevitably important in terms of erosion control.

Furthermore, the area of flat land can be expected to play sport and playground. The area of the highest level is to be expected to have a rest place and spectator deck as landmark.

2) Open spaces and parks.

Using the planning standards in Malaysia, the parks and open spaces would be identified and designated in conjunction with the overall land use planning process and worker population distribution in the project. This should be the efficient process of provision of the facilities, as well as their accessibility to the people.

The recreational parks and open spaces shall be planned and provided according to several levels. The hierarchy of parks and open spaces will be as per Table 5-1 and 5-2.

3) Industrial Zone.

Most of industrial lot would appear in an independent manner. According to the environmental policy, greenery coverage ratio of lot, are to be allowed in accordance with regulation control. So that industrial zone will be greenfied adequately.

4) Plazas in Town Center and Sub Center.

Several paved spaces would be created with integration of some urban sense and would surround both the center complex and sport complex adjacent to Residential Zone. It is one of the major gathering place for people for social events and multiple activities.

5) Corner Parks and Pocket Plaza.

The corner parks have a role of linkage between different parts functionally, together with a liner mall with row of trees. Pocket plazas will be allocated the necessary place where are related to Bus Bay of Bus Stop.

6) Green Belts, Promenades and Green Malls.

Green Belts, promenades and Green Malls these liner elements serving as pedestrian walkway, will be allocated to the whole project area to connect both parks and openspaces with planting of trees and flowers, and Bikeway also will be provided and become in a part of Green Network System.

7) Arterial RD, Collector RD, Local RD.

On bases of the quality of the road environment, the greenery of the road affects the overall Industrial Park scenery. The greenery has dignity and identity in accordance with classified function.

The space along the primary access road shall be reserved for the Green Best as buffer space where is adjusted by adjacent zone.

8) Outdoor furnitures and sport facilities.

The outdoor furnitures, like shade, litter basket, benches, guide information, etc., must be provided, it being particularly important that people be able to easily seat, rest and determine the direction in which they should approach. These furniture and paving Design are to be designed after setting up the size and are of parks, open spaces and Green Belts.

The proposed sports facilities should be grouped according to the intended hierarchy of use, such as State level, Municipal level and community level facilities.

Sport facilities for Community level such as field, tennis court, Sepak raga court, etc., treat as integral part of the park, and openspaces.

9) Theme Park, with ample parking space is to be tied together the Natural Park. So that the activity for people will be more attractive, but there is a buffer zone between Theme park and Residential zone in terms of noise and security measure.

A gentle slope site will have potential of variety of views and vistas toward the waterfront and the park.

10) Others.

- The parking as point of access to the each zone will be connected with Arterial road and Collector road in terms of security control.

- Hawkers complex or place will be planned in the Town Center or Sub Center.

5.5 Planting.

Major greenification areas for the Industrial Park are parks, openspaces, Golf Course, green belt and street. These areas should be greenified by habitable trees, shrubs, grand cover and turf.

- (1) Selection of species has to be considered from the stand point of scenic components, park utilization, recreational activities, ecological aspects, operation and maintenance, and long time span of tree grow and life. Tropical species which dominate in Malaysia, and Malaysian native species such as "meranti and jati" should be introduced.
- (2) The number of trees to be planted per unit of area will be depend on the planted area and the species planted in it. In terms of vertical composition, there can be different composition of high, medium, and low trees, and viewed from above, the crown will overlap.
- (3) Other important aspects of planting are as follows:
 - spacial occupanty of species and arrangement,
 - site condition and micro climate,
 - suitable planting period time within the development, schedule,
 - soil condition after land formation.
- (4) Charactor of planting.
 - 1) At Natural Park and conservation Area, the thinning ratio ranged from 70% to 30% in accordance with the different use, will occur where the existing rubber trees are cut down at conservation openspace area, where a tropical natural forest is to be created gradually, the native tropical plants will be introduced instead of the rubber trees.
 - 2) Comparatively high planting density will be required for buffer greenery, edge greenery and screening greenery. On the community park and town park is characterized by low density, with priority being given basically to

high trees. In mall and promenade greenery, high trees are planted comparatively density.

In the plaza, corner park, and neighborhood park, there is some accentual planting of medium and low trees with shrub and flower.

Although the overall density of each zone greenery will be somewhat lower, where some high density planting of medium and low trees, will be expected by each zone character.

- 3) In the case of turf greenery, there is covered by long grass, and the density of turf greenery will be relatively high except Golf Course.
- 4) Nursery Greenery or Nursery Site consist of a variety of seedings, samplings and other nursery plants for park use, including flowers. It is recommendable that Nursery Greenery is to be located at the conservation open space area in other to ensure the supplying capacity.
- 5) Native species would be the desirable plants at the ecological standpoint. Followings are list of recommendable natives species in both common and botanical name. (Table 5-4)

Table 5.1).1 Classification and Standards of Parks and Open Spaces at District Level (Ex. Penang Island)

Category of Open Spaces	Density Standard	Size of Site	Population Served	Maximum Distance Travelled	Facilities & Activities
Neighbourhood Park & Open Space	1 ha. per 2,500 pop. (1 ac. per 1,000 pop.)	0.2-2 ha. (0.5-5 ac.)	500-5,000	0.4 km (1/4 mile)	Children's play equipment, open space for children and informal games, shade and outdoor furnitures for adults.
Town Park	1 ha. per 2,500 pop. (1 ac. per 1,000 pop.)	4-20 ha. (10-50 ac.)	10,000-50,000	3 km (2 miles)	As above plus picnic areas, gardens, jogging tracks.
Community Park	1 ha. per 2,500 pop. (1 ac. per 1,000 pop.)	20-40 ha. (50-100 ac.)	50,000-100,000	10 km (6 miles)	As above plus camping sites, walking trails and natural areas.
Regional Park	1 ha. per 2,500 pop. (1 ac. per 1,000 pop.)	> 80 ha. (>200 ac.)	200,000	30 km (20 miles)	As above plus hiking trails and forest preservation areas.

Source : Municipal Council of Penang Island Structure plan 1987

Table 5.20.2 Planning Standards at National Level

TYPES OF DEVELOPMENT	FUNCTIONS	ACREAGE	REMARKS
0 OPEN SPACE			
1 HOUSING AREA		10% of the gross development areas.	<p>i) This includes 30% of area for LLN lines, river and canals reserves, school and oxidation pond.</p> <p>ii) This include 100% of the incidental open space, sport complex and recreational areas in multi storey buildings with condition the use is stated in the strata title.</p>

2 GUIDELINES FOR DISTRIBUTION AND SITING

2.1	Play lot	Playing lots for non-school going children.	660m ² -4,000m ² (0.16ac-1.0ac.)	Requirements for areas with 500-2,000 pop.
2.2	Play ground	For promoting organised or informal	8,000m ² -32,000m ² (2.0ac-8.0ac)	Requirements for areas with 2,000-5,000 pop.
2.3	Neighbourhood playground.	Passive recreational activities. Playgrounds and sports complex with parks for shades, picnic & beautification.	32,000m ² -120,000m ² (8.0ac-30.0ac)	Requirements for areas with 5,000-20,000 pop.
2.4	Community Open Space	Passive recreation and organised sports activities for local residents. Suitable for sports meet & other physical activities. Center for intergration of social and cultural at all times.	120,000m ² -400,000m ² (30ac-100ac)	Requirements for areas with 20,000-50,000 pop.
2.5	Town Parks/ Open Space	Centre for organised sports activity. Centre for recreational gathering for town folks & occasional sports meets. Centre that facilitates for appreciation of natural beauty & its value.	400,000m ² -1 km ² (100ac-247ac)	Requirements for areas with 50,000-100,000 pop.
2.6	Regional Parks & Open Space	Centre where people from town, out-skirts, and other parts of the district, where organised seasonal sports competitions are promoted for enjoyment of its natural beauty. Enhance the natural environment and the use for research purposes.	1km ² -2km ² (247ac-494ac)	
2.7	National Park/Open	A unique area of beautiful landscape, existance of wild life and resources for science & geology research. National heritage and important resources for research.	Not specified.	

Table 5.3 Recreation and Open Space Standard

TYPE OF FACILITY	DESIRABLE ON-SITE FACILITIES	MINIMUM SITE SIZE	SERVICE AREA RANGE	REMARKS
Play Lots	1. Tot apparatus, swings, teeters, sand box, etc. Creative play pieces. 2. A paved play area 3. A fountain or bubbler 4. Benches 5. Grass area, trees and shrubs	500m ² (660-4000)	100m walking distance	1-5 age Except special cases, play areas will not be provided as separate facilities but will be contained within other facilities and buffered from the activities of other groups.
Play-ground	1. Junior-size playground equipment, including creative apparatus 2. One volleyball court 3. One basketball goal on paved area 4. Area for lawn net games 5. Open area for general game activity 6. Bubbler and water supply	2500m ² (8000-32000)	250m walking distance	1-14 age Park areas should not be located adjacent to non-residential land use, preferably adjacent to elementary school.
Neighborhood	1. All age play apparatus 2. One soccer field with backstop 3. Aesthetic open area-including plantings 4. Tennis, sepak raga, badminton courts 5. Picnic equipment 6. Passive recreation area-natural areas 7. Parking area 8. Bubblers and water supply 9. Open shelter with toilet facilities	2.0 ha (0.2-2) (3.2-12)	500m(400) walking distance	All ages Well centered in residential planning, planning district when possible.
Play-field (Town Park)	1. Basketball, volleyball courts 2. Practice pool (swimming pool) 3. Tennis, sepak raga courts 4. Area for field games-hockey, soccer, football 5. Sufficient parking area (rugby, etc.) 6. Bubblers and water supply 7. Toilet facilities (track) 8. Area for outdoor stadium (400m training)	4-10 ha (4-20)	1-1.5km (3)	Age 10 & over With junior or senior high schools where possible.
Major Park (Community Park)	Requirements from areas	over 10 ha (20-40) (12-40)	5-10km (10)	All ages Considerations of suitability and availability of land take precedence.
Reservations & special uses, landscaped areas, natural areas, parkways, golf courses, Conservation lands, Cemeteries, water courses, arboretums.				There are public 'open spaces' which have no minimum areas or service area standards.

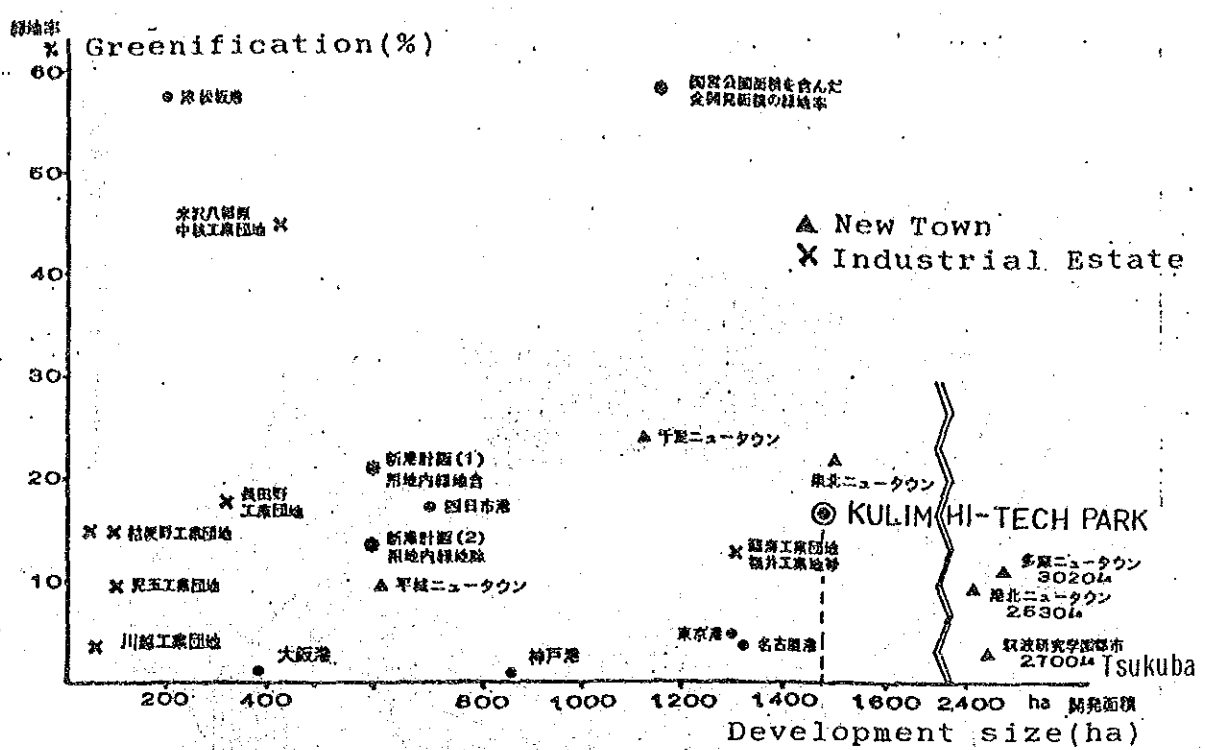
(.) indicates Malaysia Standard.

Table 5.4.4.4. List of Recommendable Plants

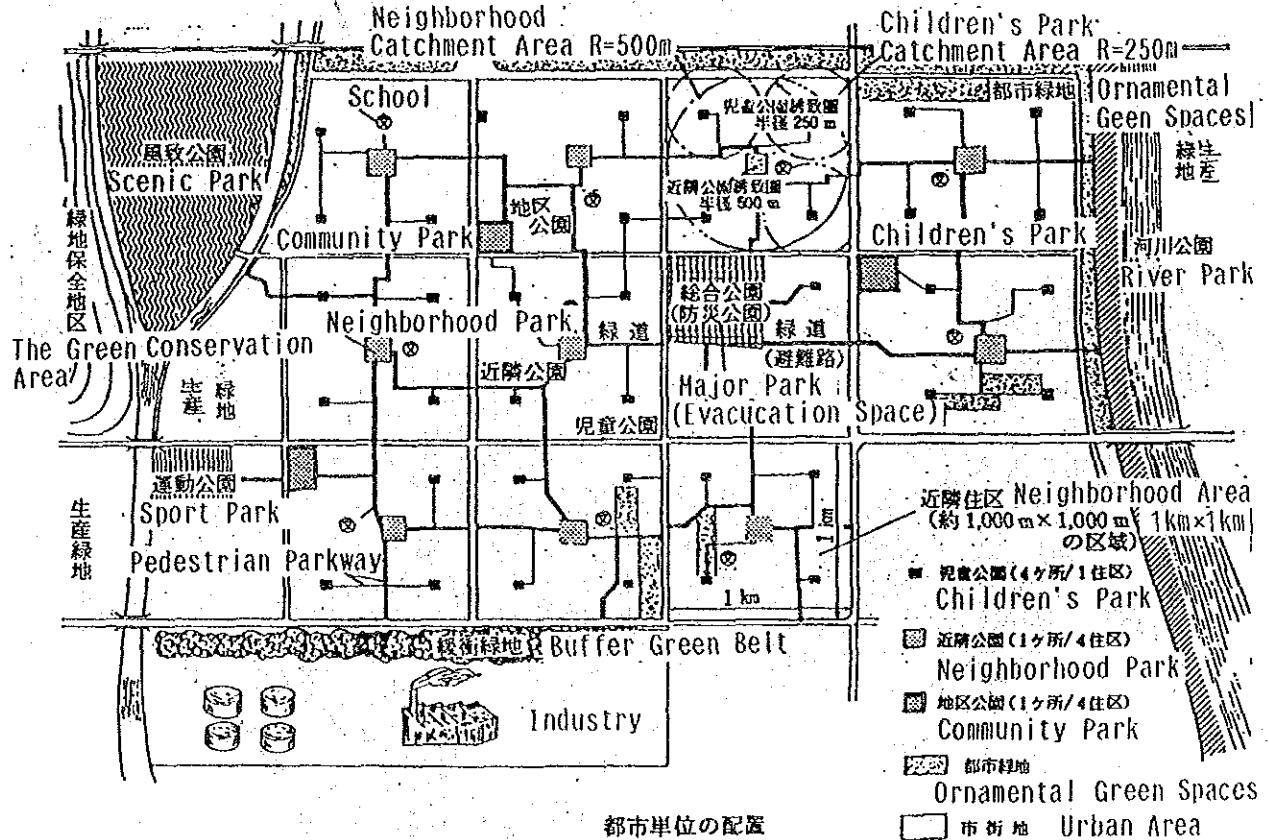
AREA	COMMON NAME	BOTANICAL NAME
CONSERVATION OPENSACE	NATIVE TREES Meranti Pipit Kayu Jati, Teak Kapur, Borneo Camphor Tree	(shorea assamica) (tectona grandis) (dryobalanops aromatica)
PARK & OPENSACE	TALL TREES Tembusu Jambu Laut, Sea Apple Jelutong Kayu Manis, Wild Cinnamon Tanjung Ru Gelam, Cajeput FLOWERY TREES Rajah Kayu, Indian Laburnum Kemboja, Frangipanni Jambul? SHRUBS - - -	(fagraea fragrans) (eugenia grandis) (dyera costulata) (cinnamomum iners) (mimusops elengi) (casuarina) (melaleuca leucadendron) (cassia fistula) (plumeria obtusa) (jacaranda ovalifolia) (acalypha wilkesiana) (codiaecum variegatum) (ficus roxburghii)
PARK, PLAZA, CORNERPARK, & PARKING SPACE	TALL TREES - Jeneris Dedap? Randa Bunger, Rosa of India Purai Mempat MIDDLE TREES kemboja Frangipanni Pride of Burma Katapang, Sea Almond Mambu, Nim Tree PALMS Kelapa, Coconut Royal Palm Pinang, Betel Nut Palm Pinang Raja, Sealing Wax Palm Palas? Talipot Palm Traveller's SHRUBS - - - - - CLIMBERS AND GROUND COVERS - - - - - -	(filicium decipiens) (millettia atropurpurea) (erythrina glauca) (gardenia carinata) (lagerstroemia speciosa) (alstonia augustifolia) (cratoxylon formosum) (plumeria obtusa) (amherstia nobilis) (terminalia catappa) (melia indica) (cocos nucifera) (roystonea regia) (areca catechu) (cyrtostachys lakka) (licuala peltata) (corypha umbracaulifera) (ravenala madagascariensis) (hibiscus rosa-chinensis) (gardenia florida) (Ixora spp) (vinca rosea) (lantana spp) (ficus pumila) (phyllanthus spp) (ohiopogon) (pandanus spp) (turf) (fern)

to be continued

AREA	COMMON NAME	BOTANICAL NAME
POCKET PLAZA	MIDDLE TREES Pride of Burma Rajah Kayu, Indian Laburnum Tapak Kuda, Kupu Orchid Tree? Dedap? Kemboja Frangipanni	(amherstia nobilis) (cassia fistula) (bauhinia purpurea) (erythrina glauca) (plumeria obtusa)
ARTERIAL RD (PIPE UNDER RD)	TALL TREES FOR MEDIAN Pinang, Betel Nut Palm Pinang Raja, Sealing Wax Palm SHRUBS FOR MEDIAN - - Juniper	(areca catechu) (cyrtostachys lakka) (chrysalidocarpus lutescens) (draceana) (heliconia) (juniperus)
ARTERIAL, COLLECTOR LOCAL RD	TALL TREES FOR SIDEWAY (5m in Spacing) - Tanjung Jeneris - Penaga, Ironwood Tree Batai, Yellow Frame Tree Semarak Api, Frame of Forest	(filicium decipiens) (mimusops elengi) (millettia atropurpurea) (andira surinamensis) (mesua ferrea) (peltophorum pterocarpum) (delonix regia)
	MIDDLE TREES FOR SIDEWAY (10m in Spacing) Dedap? Tapak Kuda, Kupu Orchid Tree Jambul Merak? Kemboja, Frangipanni? - Randa Mempari SHRUBS FOR SIDEWAY (as Hedge) - - - - GROUND COVER FOR SIDEWAY - - - PAVEMENT AND TURF FOR SIDEWAY PC Block, 450x450 Turf Grass	(erythrina glauca) (bauhinia blakeana) (jacaranda ovalifolia) (plumeria acuminata) (cassia spectabilis) (gardenia carinata) (pongamia pinnata) (acalypha wilkesiana) (acalypha siamensis) (hibiscus rosa-sinensis) (ficus benjaminina) (phyllanthus spp) (ophiopogon spp) (pandanus spp)
MALL & GREEN BELT	TALL AND MIDDLE TREES Pukul Lima, Rain Tree Kelapa Sawit, Oil Palm Bunger, Rosa of India Pride of Burma Kemboja Frangipanni Sena Angsana	(samanea saman) (elaeis guineensis) (lagerstroemia speciosa) (amherstia) (plumeria obtusa) (pterocarpus indicus)
SCREEN GREENERY	TALL, MIDDLE TREES AND SHRUBS Kayu Manis, Indian Cinnamon Tree	(cinnamomum zeylanicum) (bahia nitida)

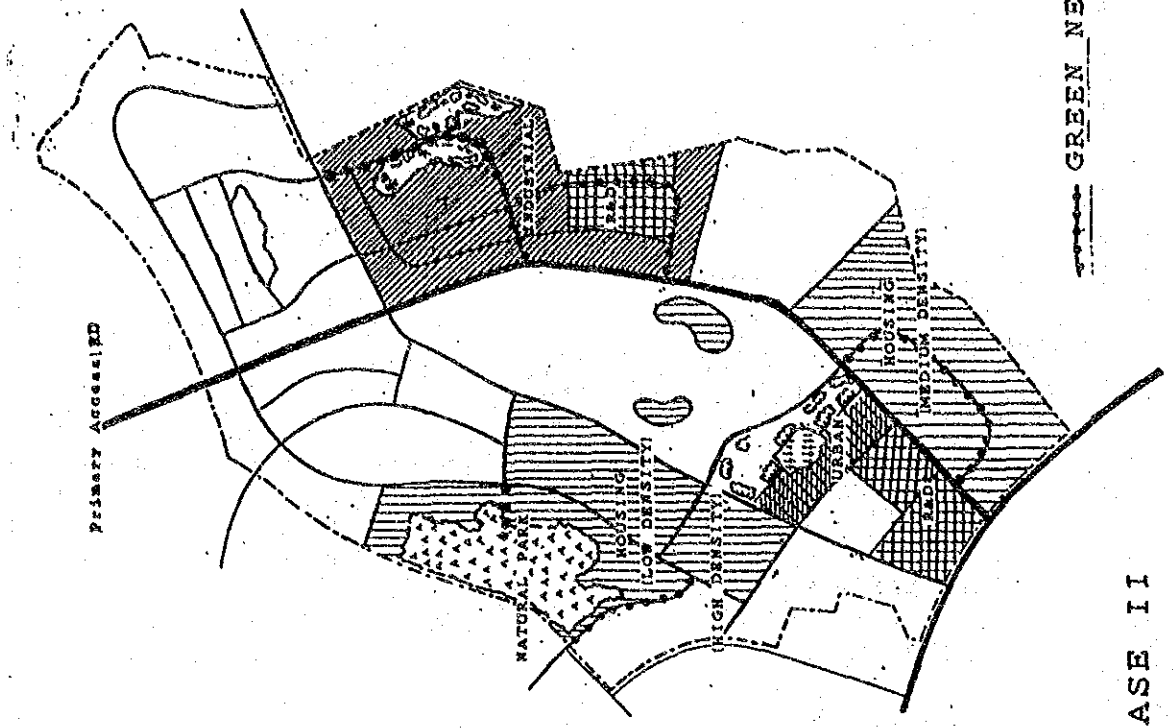


大規模開発の緑地率と、開発面積における比較図
 Comparison for Greenification and Development size
 Source: 茨城新港緑地計画調査 in Japan.

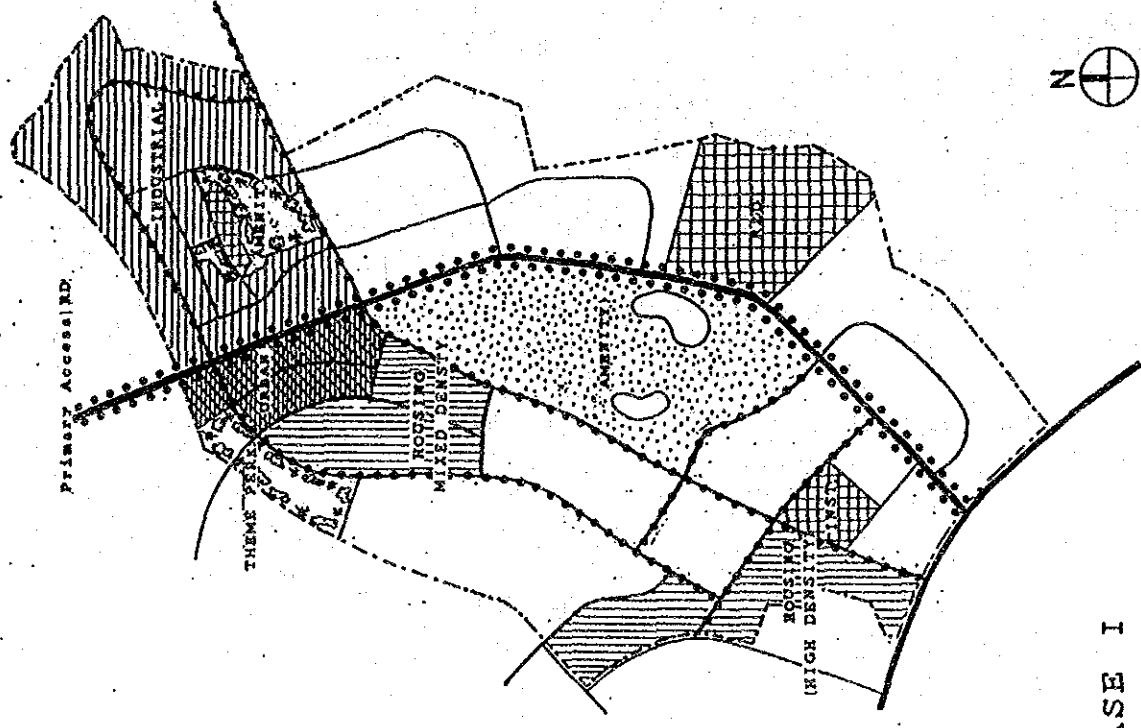


都市単位の配置
 Model Pattern of City Parks Location in Japan.
 Source: Ministry of Construction

THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK	TITLE Greenification, Model Pattern of Parks
	JAPAN INTERNATIONAL COOPERATION AGENCY	



PHASE II



PHASE I



0 0.1 0.2 Km

THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT TITLE OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	Green Network System
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