VIII. PROPOSED FACILITIES

8.1 Center Facilities

1) SMART Center

The SMART Center has a principal function in the Diyagama Technopark. The Center will not only serve the Diyagama Technopark but will also respond to the increasing demands of IT-related technology education and IT-related entrepreneur enhancement in Sri Lanka. The Center will be developed in Phase 1 and equipped with the following facilities;

(i) Common Facilities

The SMART Center will have common areas such as reception, lounge, rest rooms, security area, exhibition area, two meeting rooms, two restaurants and an all-in-one convenience store. The management of these common areas will come under the Management Division of the Technopark Management Unit. The common facilities for different units of the SMART Center will include air conditioning, access panel flooring with underfloor trunking for telecommunications and networking connections.

(ii) Technopark Management Unit

The facilities provided in the Technopark Management Unit will consist of separate rooms for one director and three divisional heads. Staff of three divisions will be located in three office areas and will have access to computer terminals. Common areas will consist of reception, conference room and rest rooms.

(iii) Network Operation Unit

An office area with computer hardware will be provided in the SMART Center for the Network Operation Unit. A joint strategy will be adopted for the administration of the overall network and the Data Center, recognizing the influence that the underlying network can have on database acceleration and scalability (The Data Center will therefore be administered by the Network Operation Unit). The Network Operation Unit will interconnect groups of servers, workstations and terminals in other units and buildings into a Local Area Network. A safe and secure environment will be created to protect the entire network and the servers attached to it. The Network Operation Unit will have protection systems such as a power management

system (comprising of a UPS, backup power generator, AC and /or DC power control facility and automatic transfer control logic system transformers), an environmental control system and a fire suppression and control system. The SMART Center and the buildings of the software and hardware industry lots will be connected via fiber.

(iv) Data Center

An office area will be provided in the SMART Center for the Data Center with high capacity servers, data storage hardware and other computer hardware. It will be a part of the Network Operation Unit and will be developed as an Internet data center capable of delivering content, software and services to a broad Internet base. The network architecture and the data center will be modeled on the lines of those that are typically engineered by Internet Service Providers. The data center will be connected to multiple ISPs that will provide for redundancy in case of a single circuit failure. The internal architecture of the data center will be designed to avoid network congestion due to under-engineered Local Area Networks and ensure sufficient redundancy to allow for failures and upgrades of network equipment.

(v) Virtual University

Facilities at the Virtual University Unit of the SMART Center will include an office room for each stakeholder in the consortium, a meeting room, a computer center with 100 terminals that could be used by students, instructors or professionals registered with the virtual university, and the related computer hardware.

(vi) Training and Retraining Unit

Facilities at the Training and Retraining Unit will consist of three seminar rooms, each with a seating capacity of 100 persons and equipped with audio visual equipment and presentation aids.

(vii) Research and Development Unit

The Research and Development Unit will have modular research units which will be leased bare, so that companies can fit it with the equipment they require. A customized configuration can also be provided at an additional cost. The size of units will range from 100 to 200 square meters.

(viii) Incubation Unit

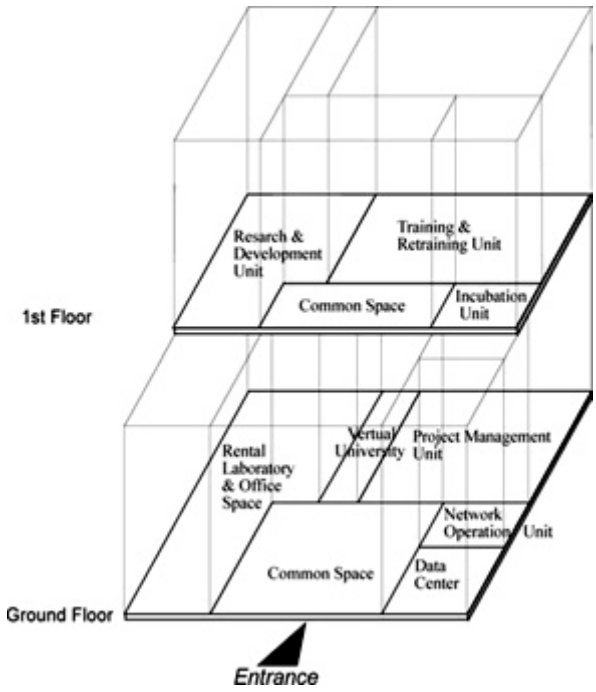
The Incubation Unit will have fully fitted units ranging from 20 to100 square meters for 25 fledgling companies. Features of these units include facilities for networking, individually

controlled air-conditioning, lighting, false ceiling, carpeting and power points. There will be rooms for members of the partnership, a meeting room, a business center, office area, and reception. Leasing arrangements of the Incubation Units will be flexible. The maximum period of leasing will be 3 years. The Incubation Unit will overlook a well-landscaped garden to create an environment conducive to innovation.

(ix) Rental Laboratory or Office Spaces

Rental laboratory or office spaces will consist of modular units that would be leased to start-up companies which have completed their lease period in the Incubation Unit but are not in a position yet to set-up buildings in the land allocated for software enterprises. These units may also be leased to other companies who wish to use them. Flexible lease arrangements could be negotiated. The units will be leased bare so that companies can fit equipment as required. Customization can also be undertaken at additional costs. The size of units will range from 100 to 200 square meters.

The Floor arrangement of the SMART Center and IT facility/equipment for the Center and virtual university are proposed in Tables 8.1 and 8.2, and Figure 8.1.



(Source) JICA Study Team

Figure 8.1 Floor Arrangement for SMART Center

Table 8.1 Floor Arrangement for SMART Center

Facility	Floor Area (m^2)	Remarks
1 Project management unit	500	For administration and operation
2 Network operation unit	200	
3 Data center	300	
4 Virtual university	200	
5 Training & retraining unit	1,000	
6 Research & development unit	800	
7 Incubation unit	200	12 incubatees
8 Rental laboratory & office space	2,000	Approximately 25 offices
9 Common space	1,200	
Total	6,400	
Plot area:26,000 m^2, Building area: 4,000m^2, (2 Storey building), Building ratio:15%, Floor ratio:25%		

(Source) JICA Study Team

Table 8.2 Facilities for SMART Center and Virtual University

Item	Q'ty	Remarks
1 SMART Center		
Equipment		
1) Optical fiber cable network	1	inclusive of router, servers
2) Computer	50	
3) Multi-media computer	20	
4) Audio visual system	1	
5) Authoring system	1	
6) Sound system	1	
7) Presentation equipment	1	
8) Lecture support system	1	
9) Electric library	1	
10) Digital printing system	1	
11) CD pre-mastering system	1	
12) Desk & chair	100	Desk with microphone
13) Decorations	1	
14) Office materials	1	
2 Peradenia, Colombo, Moratuwa Universities		
(1) Facility		
1) Broadcasting room	60	Soundproof room
2) Virtual university classroom	600	Inclusive of UPS
(2) Equipment		
1) Optical fiber cable network	3	inclusive of router, servers
2) Audio visual system	3	
3) Sound system	3	
4) Presentation equipment	3	
5) Lecture support system	3	
6) Desk & chair	150	Desk with microphone
7) Decorations	3	
(3) Access optical fiber cable		
1) Peradenia -Kandy	9,000	
2) ColomboUn-City	3,000	
3) Moratuwa-Ratmarana	3,000	

(Source) JICA Study Team

2) Electronic Technology Center

The site of the electronic technology center is planned for Phase 2 development, as explained previously. When the hardware industries begin production activities in the Technopark, the Electronic Technology Center can provide services such as calibration, testing, retraining of technicians and engineers, etc. to the established hardware industries. The establishment of the electronic technology center should include plans to integrate the existing and planned calibration/testing facilities under the Ministry of Science and Technology.

A plot with 8.4 acres (2.6 ha) is designated for the Electronic Technology Center in the land use plan, although the construction cost of the Electronic Technology Center has not been estimated at this moment.

8.2 External/Internal Infrastructure

1) Roads

Kottawa - Horana Road, which runs through the Diyagama Technopark from east to west, should be improved as the main access road to the site. After the Southern Highway is completed, it is also planned to construct an interchange directly connecting the Diyagama Technopark with the highway. Since the proposed improvements will also serve the public, they can be categorized as external infrastructure.

(External Road)

Phase 1: Improvement of Kottawa - Horana Road in the Diyagama Technopark

Phase 2: Development of an Interchange on the Southern Highway directly connecting the highway to the Diyagama Technopark

The following roads will be required as internal infrastructure for the Diyagama Technopark:

Table 8.3 Internal Roads for the Diyagama Technopark

	Specification	Phase1	Phase 2	Total
Main Road	16 m width (3 m sidewalk for each side)	750m 12,000m^2	550 m 8,800 m^2	1,300 m 20,800 m^2
Sub Main Road	10 m Width (2 m sidewalk for one side)	-	1,320 m 13,200 m^2	1,320 m 13,200 m^2

(Source) JICA Study Team

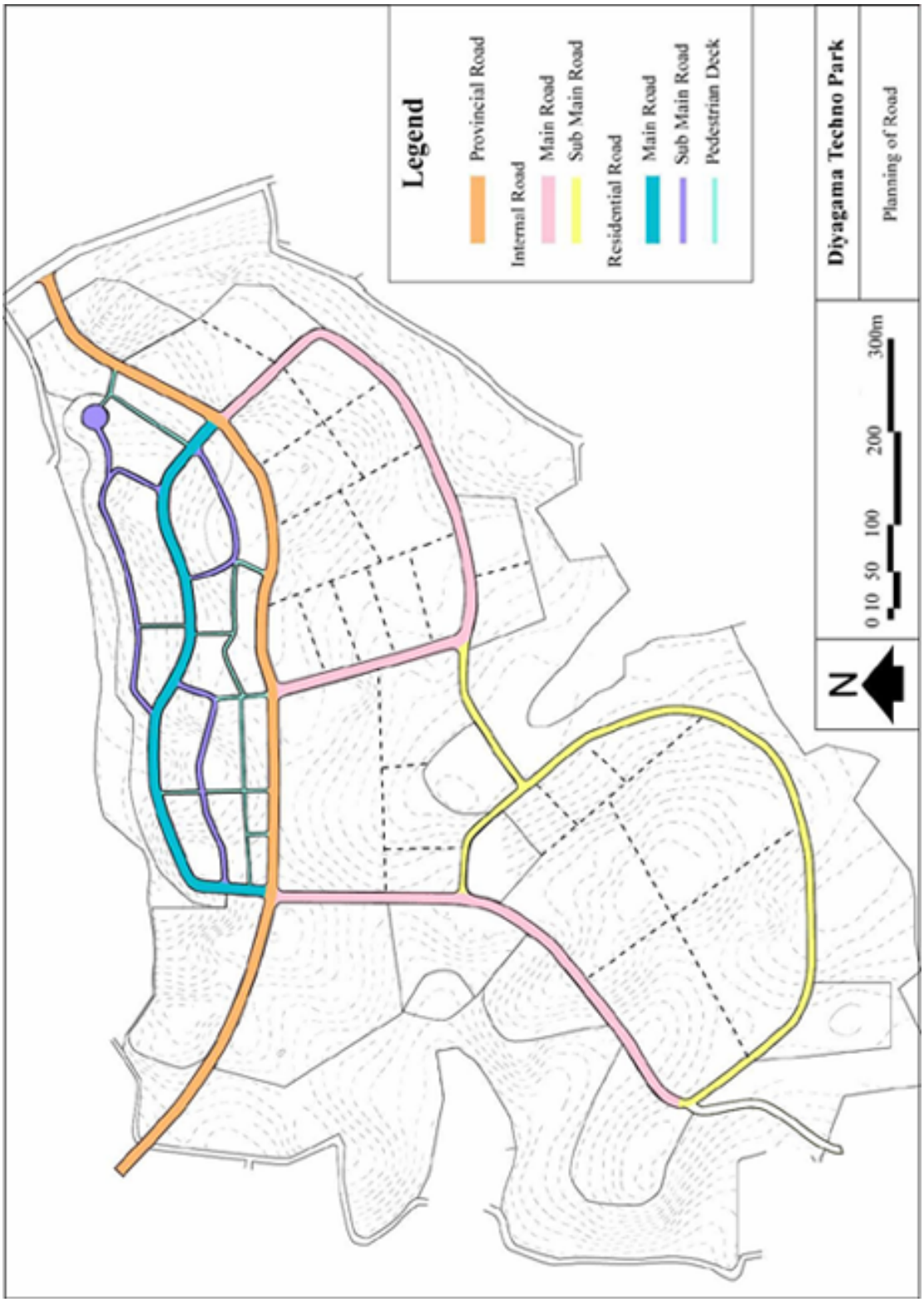
The internal roads in the residential area will also be developed, as shown below.

Table 8.4 Internal Roads in the Residential Area

	Specification	Phase1	Phase 2
Main Road	15 m width (2.5 m sidewalk for each side)	610m 9,900m^2	-
Sub Main Road	10 m Width (2 m sidewalk for one side)	840m 8,400m^2	-
Pedestrian Deck	3.5 m width	730m 2,600 m^2	

(Source) JICA Study Team

The alignment of roads is planned as shown in Figure 8.2.



(Source) Study Team

Figure 8.2 Planning of Road

2) Water Supply

Water Demand of the Diyagama Technopark is estimated to be approximately 950 m^3 per day, as shown below.

Table 8.5 Water Demand of The Diyagama Technopark

Name of Area	Phase1	Phase2	Total
1. Center Area			
Net Area	2.6	2.6	
Daytime Population	100	100	
Unit Rate(lit/cap.day)	90	90	
Water Demand(m^3/day)	9	9	18
2.Software Industry Area			
Net Area	3.63	4.29	
Daytime Population	545	644	
Unit Rate(lit/cap.day)	90	90	
Water Demand(m^3/day)	49	58	107
3.Hardware Industrial Area			
Net Area	4.24	7.25	
Daytime Population	848	1,450	
Unit Rate(m3/ha.day)	50	50	
Water Demand(m^3/day)	212	363	575
4.Residential Area(housing lot)			
Net Area	3.69	0	
Resident population	1000		
Unit Rate(lit/cap.day)	200	200	
Water Demand(m^3/day)	200	0	200
5.Residential Area(commercial Area)			
Net Area	0.37		
Daytime Population	148		
Unit Rate(lit/cap.day)	100	100	
Water Demand(m^3/day)	15	0	15
6.Residential Area(School)			
Net Area	0.6		
Daytime Population	400		
Unit Rate(lit/cap.day)	50	50	
Water Demand(m^3/day)	20	0	20
7. Infrastructure			
Net Area			
Daytime Population	30		
Unit Rate(lit/cap.day)	200	200	
Water Demand(m^3/day)	6	0	6
8.Total (m^3/day)	511	429	940

(Source) JICA Study Team

Two alternative resources are considered.

Alternative 1: Groundwater (Deep well) in the Technopark

Alternative 2: Water supply from Horana Purification Plant to be constructed by NWSDB.

The results of groundwater yield and testing are unsatisfactory so far, and Alternative 1 is not considered dependable at this stage. However it is recommended that deep well exploration be conducted at the design stage, because results of the hydrogeological and geophysical investigation indicate that this land has some potential of groundwater to cater for the expected water requirement. Alternative 2 (Horana purification plant) will be planned at the moment to ensure stable water supply. The following facilities will be necessary to supply water to the Technopark.

Table 8.6 Water Supply Facilities in the Diyagama Technopark

Items	Specification	Phase 1	Phase 2	Total
Water Tower	15m height above ground	$25m^3$	$20m^3$	$45m^3$
Distribution System		1,430m	2,190m	3,620m

(Source) JICA Study Team

A conveyance pipeline from Horana purification plant (Approximately 15 km in length) should be constructed by NWSDB as external infrastructure. The proposed water supply system is shown on Figure 8.3.

3) Storm Water Drainage

Separate systems for wastewater and rainfall collection should be introduced in the Diyagama Technopark. A storm water drainage system includes drain ditches, box culverts, pipe culverts, retention pond, sand trap pond, etc., as shown below.

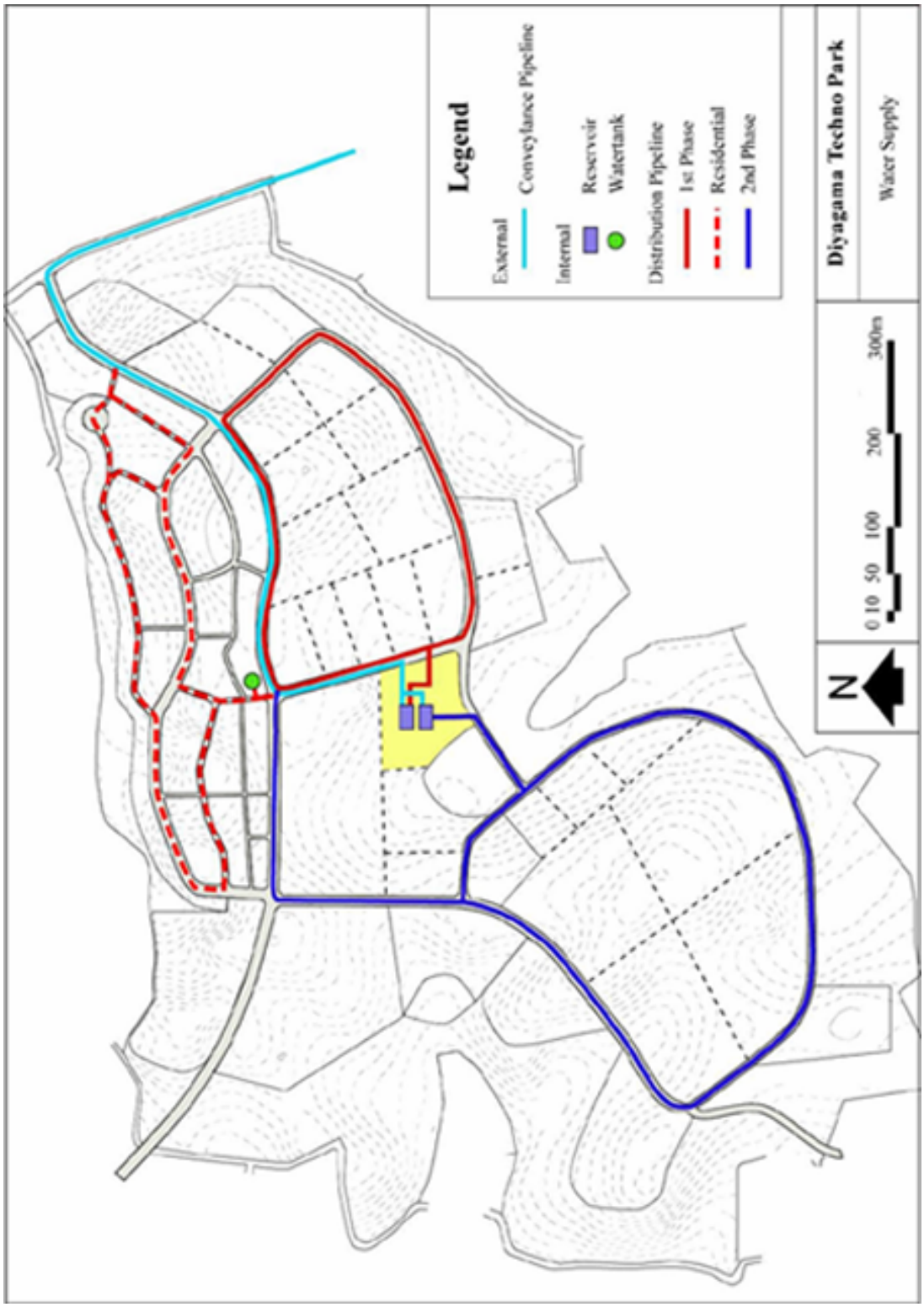
Table 8.7 Drainage Facility for the Diyagama Technopark

Items	Phase 1	Phase 2	Total
Retention Pond	$9,000m^3$	$9,500m^3$	$18,500m^3$
Sand Trap pond	$2,200m^3$	$2,300m^3$	$4,500m^3$
Open Ditches	Along Road	Along Road	

(Source) JICA Study Team

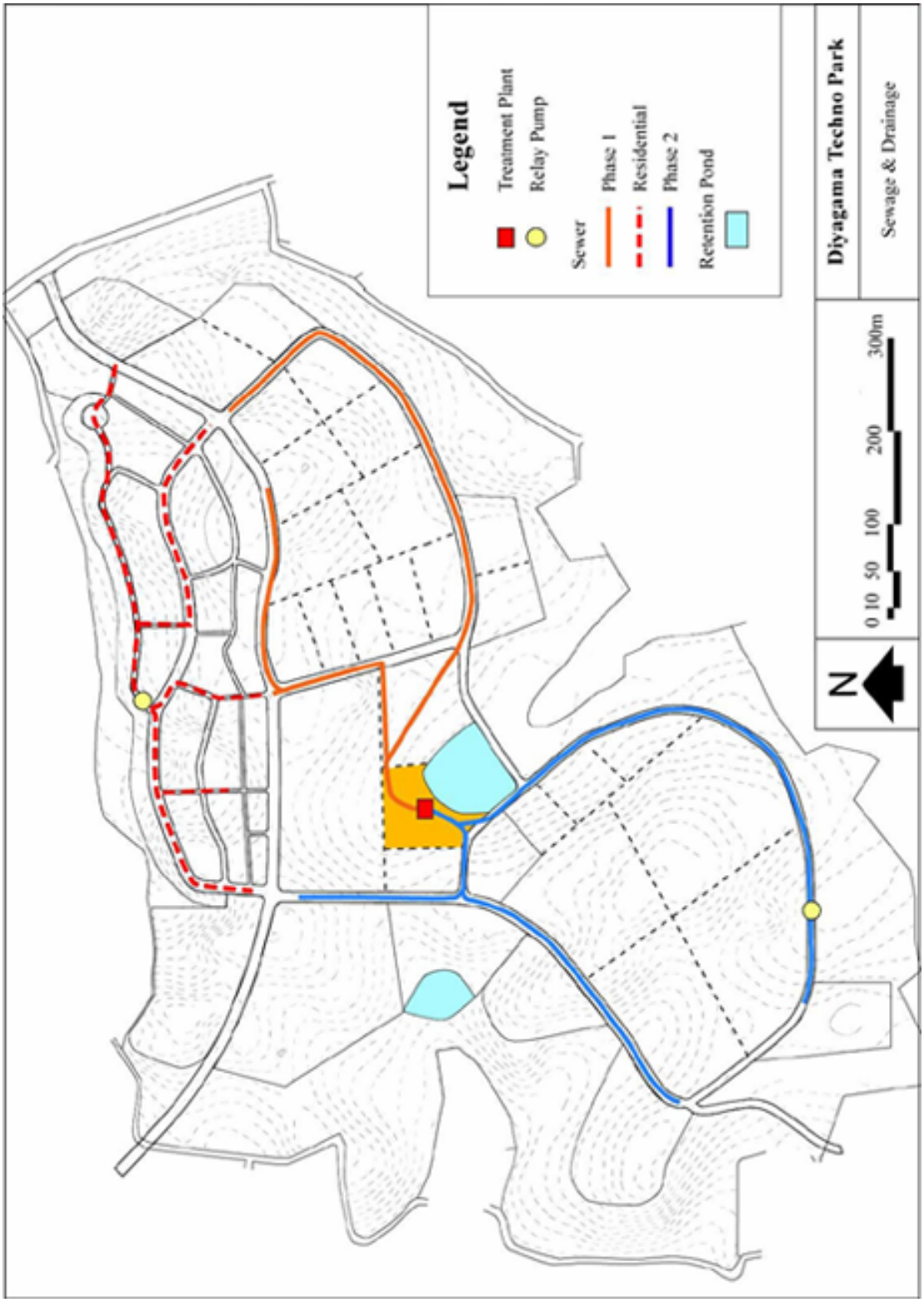
4) Wastewater Treatment

A wastewater treatment system is essential for the Diyagama Technopark to secure the water environment in the downstream area. Sewer pipes and a sewage treatment plant will be constructed. The wastewater will be treated in accordance with the Sri Lanka Environmental Protection Law and then discharged to a branch of the Athu Oya Kelani Ganga.



(Source) Study Team

Figure 8.3 Planning of Water Supply



(Source) Study Team

Figure 8.4 Planning of Sewerage and Drainage

Wastewater discharged from the Diyagama Technopark is assumed to be equal to the daily water demand. The wastewater volume will be increased by the infiltration of groundwater, which is assumed to be 10% of wastewater volume. The total wastewater volume is estimated as shown below.

Table 8.8 Waste Water Volume of the Diyagama Technopark

	Phase1	Phase 2	Total
Volume of wastewater (m^3/day)	550	450	1,000
Infiltration Volume (m^3/day)	55	45	100
Total waste water volume (m^3/day)	605	495	1,100

(Source) JICA Study Team

The following facilities will be necessary to treat wastewater in the Diyagama Technopark. The alignment of the sewerage system is shown on Figure 8.4.

Table 8.9 Waste Water Treatment Facilities of the Diyagama Technopark

	Phase1	Phase 2	Total
Sewerage Treatment Plant	550 m^3	450 m^3	1050 m^3
Sewer	1,430m	2,190m	3,620m

(Source) JICA Study Team

5) Power Supply

The estimated power demand of the Diyagama Technopark is summarized below.

Table 8.10 Power Demand of the Diyagama Technopark

(MW)

No.	Zone	Phase 1	Phase 2	Total
1	Center Area	0.40	0.40	0.80
2	Software Industry Area	0.36	0.43	0.79
3	Hardware Industry Area	1.78	3.21	4.99
4	Residential Area	0.86		0.86
5	Infrastructure	0.60		0.60
TOTAL		**4.00**	**4.04**	**8.04**

(Source) JICA Study Team

The following facilities will be necessary for the power supply system in the Diyagama Technopark:

- Expansion of the CEB 132/33kV Pannipitiya substation (including cubicle)
- 33kV transmission line (10.0 km in length) to connect the Diyagama Technopark with Pannipitiya substation
- Stand-by Generator to cope with blackouts; and
- Distribution line, transformer and road lighting in the Technopark.

Two alternative power generation systems are envisaged as stand-by generators: one is hydrogen generation and the other is conventional diesel or gas turbine generation. It is desirable that hydrogen power generation be introduced in the Diyagama Technopark as an innovative system. The basic principles of hydrogen power generation are shown as Figure 8.5. During peak-times, power is generated by oxygen and hydrogen, which is produced and stored through electrolysis of water by using electricity in the off-peak period. Hydrogen power generation facilities (solid polymer or proton exchange membrane fuel cells) of several hundred KW in capacity are already in commercial use and larger capacity generators are being developed. An alternative countermeasure to blackouts is to equip a hydrogen generator for each enterprise, since the power demand of individual software and hardware enterprises is estimated to be 50 to 200 kW. The investment cost for hydrogen power generators is similar to diesel power generators. Running cost is estimated to be 4Rs/kWh using off-peak electricity, or lower than diesel power running costs of about 5Rs/kWh. The waste heat of hydrogen power can be used for cooling. The environmental impact, such as air pollution and noise, of hydrogen power generation is much smaller than that of conventional power generation.

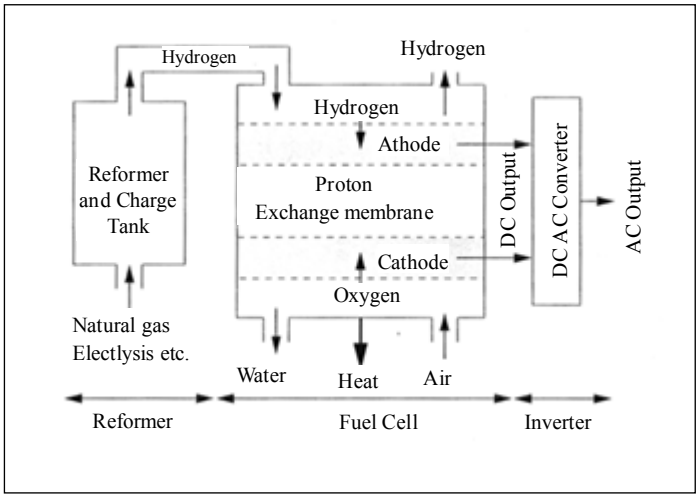
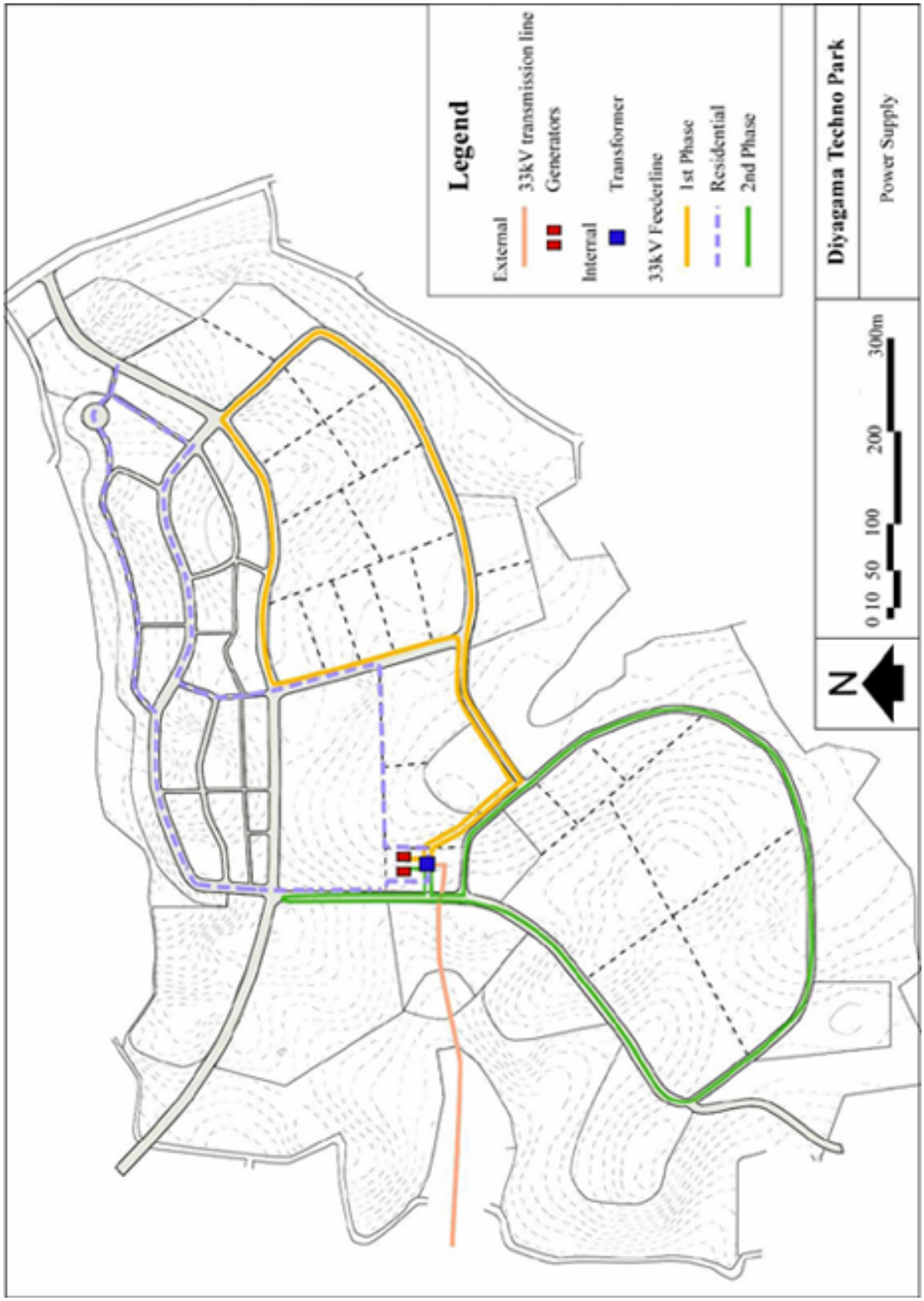


Figure 8.5 Principle of Hydrogen Power Generation



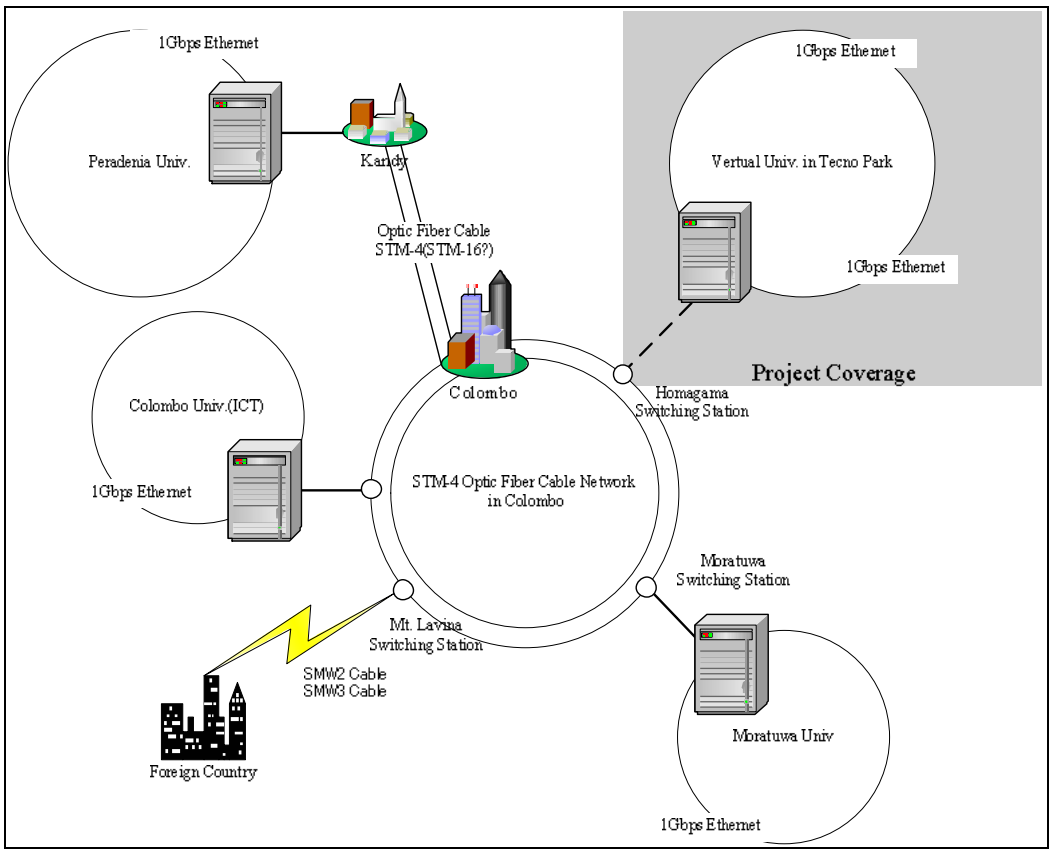
(Source) Study Team

Figure 8.6 Planning of Power Supply

6) Telecommunications Network

The most practical plan is to connect the Diyagama Technopark with the optic fiber ring of the South Colombo Area at the SLT Homagama exchange station. The distance to the exchange station is approximately 6 km. This optic fiber cable of STM-1 (15Mbs) could be developed as external infrastructure.

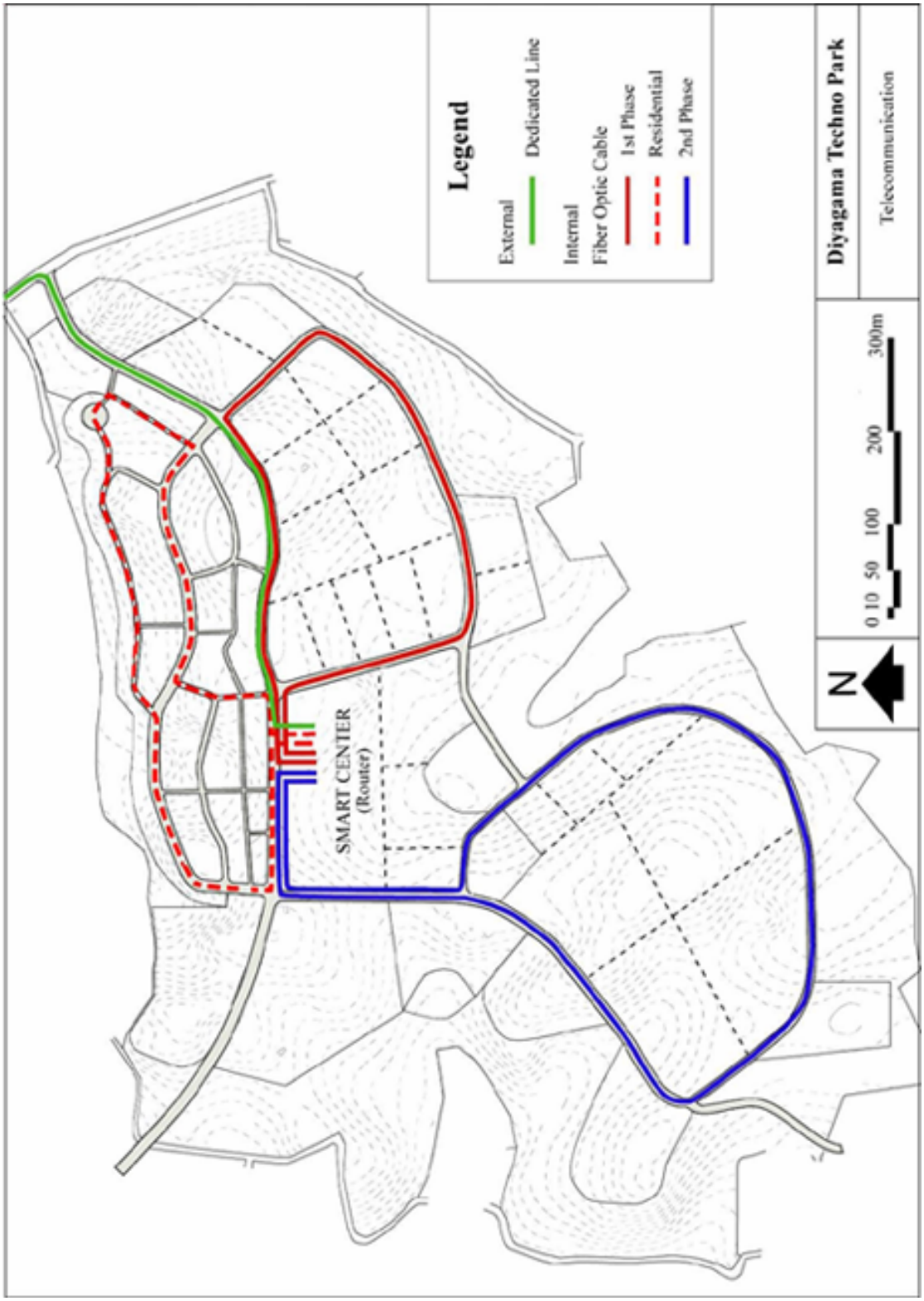
A conceptual telecommunications network for the proposed virtual university between the Diyagama Technopark and other institutes/universities is schematically shown in Figure 8.7.



(Source) Study Team

Figure 8.7 Telecommunications Network for Virtual University

An internal optic fiber cable with router and IP system should be developed in the Technopark, as an internal telecommunications facility. Alignment of the telecommunications system is shown in Figure 8.8.



(Source) Study Team

Figure 8.8 Planning of Telecommunications

7) Demarcation of External and Internal Infrastructure

External infrastructure may be developed by the public sector, while internal infrastructure will be implemented by private initiative. Its demarcation is proposed in Table 8.11.

Table 8.11 Demarcation of External and Internal Infrastructure

Items	Unit	Phase1 Quantity	Phase2 Quantity
1 External Infrastructure			
(1)Center Facility			
SMART Center	LS	1	
(2) Road			
Provincial road	m^2	10,500	7,500
Interchange	LS		1
(3)Water Supply Facility			
Distribution pipeline	m	15,000	
(4)Sewerage Facility			
Sewerage treatment plant	LS	1	
(5)Electric Facility			
Substation (Expansion of Pannipitiya SS)	LS	1	
Standby generator	LS	1	1
External power line	m	10,000	
(6)Telecommunication Facility			
External OFC	m	6,000	
2 Internal Infrastructure			
(1)Road			
Main road	m^2	16,800	8,800
Submain road		12,000	5,120
(2)Park	m^2		13,200
(3)Water Supply Facility			
Distribution pipeline	m	1,050	1,620
Reservoir	LS	1	1
Water Tower	LS	1	1
(4)Sewerage Facility			
Sewer	m	1,070	1,530
(5)Electric Facility			
Power line	m	1,270	1,650
(6)Telecommunication Facility			
Internal OFC,Router, Server	m	1,210	2,100
(7)Retention Pond	LS	1	1
3 Residential Area (Internal Infrastructure)			
(1)Park	m^2	6,000	
(2)Road			
Main Road	m^2	20,900	
Collector	m^2	9,900	
Pedestrian Deck	m^2	8,400	
(3)Water Supply Facility			
Distribution Pipeline	m	1,080	
Distribution Tank	LS	1	
(4)Sewerage Facility			
Sewer	m	1,380	
(5)Electric Facility			
Power Line	m	1,130	
(6)Telecommunications			
Internal OFC,router,server	m	930	

8.3 Estimated Cost

For development of the Diyagama Technopark, it is estimated that the total investment will amount to US$ 37.8 million as shown in Table 8.12. The Phase 1 development cost is estimated to be US$ 28.7 million. Of the total estimated cost, US$5.6 million are required for internal infrastructure and US$17.1 for external infrastructure. The SMART Center will require US$14.2 million for investment in buildings and equipment.

Table 8.12 Estimated Cost of Diyagama Technopark

		Development Cost (US$ 1,000)			Remarks
		Phase 1	Phase 2	Total	
I	Internal Infrastructure	2,200	3,300	5,500	
1	Construction Cost	1,800	2,600	4,400	
2	Administration Cost	0	100	100	2 % of 1
3	Engineering Cost	200	300	500	10 % of 1
4	Physical Contingency	200	300	500	10% of 1,2,3
II	External Infrastructure	11,300	5,800	17,100	
1	Construction Cost	9,200	4,700	13,900	
2	Administration Cost	200	100	300	2 % of 1
3	Engineering Cost	900	500	1,400	10 % of 1
4	Physical Contingency	1,000	500	1,500	10% of 1,2,3
III	Center Facility	14,200	0	14,200	
1	Construction Cost	11,500	0	11,500	
2	Administration Cost	200	0	200	2 % of 1
3	Engineering Cost	1,200	0	1,200	10 % of 1
4	Physical Contingency	1,300	0	1,300	10% of 1,2,3
IV	Residential Area	900	0	900	
1	Construction Cost	700	0	700	
2	Administration Cost	0	0	0	2 % of 1
3	Engineering Cost	100	0	100	10 % of 1
4	Physical Contingency	100	0	100	10% of 1,2,3
V	Total	28,600	9,100	37,700	
1	Construction Cost	23,200	7,300	30,500	
2	Administration Cost	400	200	600	
3	Engineering Cost	2,400	800	3,200	
4	Physical Contingency	2,600	800	3,400	

Note: Price contingency and land acquisition cost are not included.
US$1.0=135Yen=Rs.93 as of March 2002

A breakdown of the estimated construction cost of the Diyagama Technopark is presented in Table 8.13.

Table 8.13 Detailed Construction Cost of Diyagama Technopark

Unit: 1,000$

Item	Phase 1	Phase 2	Total	Remarks
1 Land clearance	**177**	**153**	**330**	
2 Cut and fill of the earth	**38**	**56**	**94**	
3 Center Facility	**11,525**	**0**	**11,525**	
(1) Buildings				
a Smart Center	6,785		6,785	
(2) Equipment	4,740		4,740	Inclusive of equipment in Peradenia, Colombo, Moratuwa Universities
4 Infrastructure & Facility	**10,851**	**7,169**	**18,020**	
(1) Road				
a Provincial road	630	450	1,080	External infrastructure
b Interchange		800	800	External infrastructure
c Main road	548	443	991	
d Submain road		333	333	
(2) Park	36	71	107	
(3) Water Supply Facility				
a Distribution pipeline	215	329	544	
b Reservoir	78	78	156	
c Water Tower	10	10	20	
d Deep well	0	0	0	
e Conveyance pipeline	4,500		4,500	External infrastructure
(4) Sewerage Facility				
a Sewer	107	164	271	
b Sewage treatment plant	330	330	660	External infrastructure
(5) Electric Facility			0	
a Substation (Expansion of Pannipitiya SS)	150	150	300	External infrastructure
b Stand-by generator	2,150	3,000	5,150	External infrastructure
c Power line	64	99	163	
d External power line	825		825	External infrastructure
(6) Telecommunication Facility				
a External OFC	600	0	600	External infrastructure
b Internal OFC, router, server	572	876	1,448	
(7) Retention Pond	36	36	72	
5 Residential Area	**663**		**663**	House cost is exclusive.
(1) Park	23		23	
(2) Road				
a Main Road	198		198	
b Collector	126		126	
c Pedestrian deck	26		26	
(3) Water Supply Facility				
a Distribution pipeline	58		58	
b Distribution tank	1		1	
(4) Sewerage Facility				
a Sewer	43		43	
(5) Electric Facility				
a Power line	43		43	
(6) Telecommunication Facility				
a Internal OFC, router, server	145		145	
Total	**23,254**	**7,378**	**30,632**	

Note: US$1.0=135Yen=93Rs. As of March 2002
Land Acquisition cost is not included