

11.2 Analysis of Group and Industry Scale to be Introduced

11.2.1 Analysis of Group

(1) Summary of Potential Investment Demand

Foreign and domestic industries' potential investment demand are estimated in Table 11-1.

The number of firms interested in participating in the IMT are 22 (Japan), 14 (U.S.), and eight (Germany) for a total of 44 firms; firms that reported interest only in southern India are not included.

Investment demand estimates of other foreign countries are based on recent foreign investment trends for the Delhi area. The total number of foreign collaborations with Japanese, United States, and German firms were 71 between 1988 and 1991. Foreign collaborations with firms from other countries for the same period totaled 131, about 185 per cent of the three combined countries. Therefore, it was assumed that the potential demand of the other countries is also 185 per cent of the estimated demand of the three countries or 185 per cent or 185 per cent of 44 firms, that is 81 firms. Industrial types for the period surveyed are assumed to reflect unchanged investment demand trends.

The domestic demand survey in India recorded that 17 firms demonstrated significant interest in the IMT, and 39 firms reported the IMT deserved further study. Thus, potential demand was estimated at 56 firms. It should be noted that during interviews and from the survey questionnaire, many Indian firms did not demonstrate any preference between the northern or southern regions. The same firms indicated a willingness to defer location choice to a partner's location preference. Therefore, the screening of the IMT location for Indian firms was not accomplished.

Estimates of factory site area demand are derived from survey results. If data was not reported by a firm surveyed, an average lot area was derived based on industry types for selected regions in Japan. (Note: Regions were selected with large average lot areas for the estimation.)

The results of the foreign investment demand estimates indicate that about 125 foreign firms would require about 400 ha., domestic demand for 56 firms would require 205

Table 11-1 Foreign and Domestic Industries' Potential Investment Demand

Industry	Factory	Area	U.S.A.	Germany	Other Countries	Investment	India	Total Area Demand
	Area	ha	Factory	Factory	Factory	Factory	(Joint Venture)	ha
Food Product/Beverage	1	18	0	0	1	2	2	23.0
Textile	0		0	0	0	0	0	0.0
Cloth and Other Miscellaneous	0		0	0	1	1	0	0.5
Textile Goods								
Wood and Wood Products	0		0	0	1	1	0	3.9
Furniture	0		0	1	0	1	0	2.0
Pulp and Paper	0		0	0	1	1	2	34.0
Printing and Publishing	1	0.8	0	0	0	1	0	0.8
Chemical (Fertilizer)	0		0		0	0	0	0.0
Chemical Products	1	0.5	2	1	15	19	5	80.5
Oil and Coal Products	0		0	0	0	0	0	0.0
Plastic Products	0		2	0	1	3	0	9.6
Ruber Products	1	5	0	0	0	1	3	11.8
Leather	0		0	0	0	0	0	0.0
Leather Products	0		0	0	1	1	0	2.2
Ceramics	1	10	0	0	0	1	0	10.0
(Others)	2	20	0	0	2	4	0	33.0
Iron and Steel	0		0	0	0	0	0	0.0
Iron and Steel Manufacturing	0		1	0	1	2	4	9.2
Non-ferrous Metals (Refinement)	0		0	0	0	0	0	0.0
Non-ferrous Metals (Wire and Cable)	1	3.5	0	0	0	1	5	10.8
Metal Products	0		0	3	5	8	0	22.4
Machinery	2	6.5	2	1	14	19	10	74.7
Electrical Machinery	4	10	3	0	25	32	8	67.6
Transport Equipment (Car)	2	20	1	1	4	8	16	74.6
Transport Equipment (Others)	0		1	0	0	1	0	5.0
Precision Machinery	0		0	0	0	0	1	0.9
Other Manufacturing	6	6	2	1	9	18	0	26.4
Total	22	100.3	14	8	81	125	56	502.7

Source: Study Team

hectares. Total foreign and domestic investment demands were based on an assumption that 50 per cent of the 400 ha of foreign demand and about 50 per cent of the 205 ha. of domestic demand are counted as joint undertakings, and will require 200 hectares. Thus, total site demand was estimated to be 503 ha based on the following calculation:

(pure foreign demand) + (pure domestic demand) + (pure joint foreign and domestic undertakings) = Total Site demand. Thus, substitution provides the following details:

$$(400 \text{ ha} \times 0.5_{\text{pfd}}) + (205 \text{ ha} \times 0.5_{\text{pdd}}) + (400 \text{ ha} \times 0.5_{\text{pju}}) = 503 \text{ ha TSD.}$$

Further, industries' area shares were based on the simple sum of foreign demand and domestic demand. The number of factories were estimated based on a final estimation of site area for each industry.

(2) Production Targets of Eighth National Five Year Plan

To identify priority industries viz. national policy, production targets for selected industries for 1996-97 from the Eighth National Five Year Plan were analysed.

Industries predicted to achieve high growth rates by the Plan are: (1) thermo plastics and synthetic rubber; (2) basic metals; (3) electronics; (4) transformers; (5) footwear; (6) drugs and pharmaceuticals; (7) domestic refrigerators; (8) construction machinery; (9) rail wagons; and (10) petro-chemical intermediates.

(3) Import Amounts for Principal Commodities

The import amounts for principal commodities were reviewed because a key role of the IMT is import substitution (refer to Table 11-3).

Commodities with large import payments are: (1) non-electrical machinery; (2) petroleum oil and lubricants; (3) iron and steel; (4) pearls and precious stones; (5) electrical machinery; (6) chemical elements and compounds; (7) fertilizer and fertilizer materials; (8) transport equipment; (9) edible oils; and (10) non-ferrous metals.

(4) Industries Welcomed by the Haryana State Government

The Haryana State Government seeks the introduction of many industries (especially pollution free industries, import substitute and export-oriented industries), but does not actively seek the introduction of pulp and paper, oil and coal products, glass and ceramics, iron and steel (refer to Table 11-4).

**Table 11-2 Indicative Targets of Production for Selected Industries for
1996/97 from 1991/92**

Industry	Unit	(a) 1991/92	(b) 1996/97	(b/a)
Mining	MT	327.12	449.50	1.37
Basic Metals#	MT	53.21	79.64	1.50
Basic Metals##	Th.T	3,026.81	7,816.00	2.58
Non-Metallic Mineral Products	MT *	103.21	137.57	1.33
Basic Chemicals	Th.T	2,426.90	3,600.00	1.48
Agricultural Chemicals	Th.T	9,907.00	12,877.00	1.30
Thermo Plastics and Synthetic Rubber	Th.T	472.00	1,370.00	2.90
Petrochemical Intermediates	Th.T	806.00	1,255.00	1.56
Man-Made Fibres	Th.T	221.00	270.00	1.22
Drugs and Pharmaceuticals	Rs.Crs.	4,570.00	7,500.00	1.64
Food Products(Sugar)	Mt	12.00	15.50	1.29
Food Products(Vanaspati)	Th.T	850.00	1,050.00	1.24
Textiles(Yarn)	Mill.Kgs.	1,780.00	2,400.00	1.35
Textiles(Cloth:mill sector)	Mill.Mtres	18,157.00	24,700.00	1.36
Textiles(Jute Manufacture)	Th.T	1,450.00	1,600.00	1.10
Leather and Rubber Goods(Footwear)	Mill.Pair	62.00	102.00	1.65
Leather and Rubber Goods(Tyres)	Mill.Nos	56.00	82.00	1.46
Paper and Paper Products	Th.T	2,395.00	3,200.00	1.34
Soaps and Detergents	Th.T	760.00	980.00	1.29
Industrial Machinery	Rs.Crs.	3,148.00	4,345.00	1.38
Electrical Power Equipment (Turbines)	Th.MW	3.25	4.96	1.53
Electrical Power Equipment(Transformers)	MKVA	34.00	60.00	1.76
Electrical Power Equipment(Eldctric Motors)	MHP	5.50	8.00	1.45
Construction Machinery	Nos	2,600.00	4,200.00	1.62
Agricultural Machinery	Th.Nos	155.00	240.00	1.55
Rail & Water Transport Equipment	Nos	2,165.00	2,990.00	1.38
Rail Wagons	Th.Nos	25.00	40.00	1.60
Ship Building	Th.Dwt	175.00	200.00	1.14
Road Transport Equipment	Th.Nos	2,130.00	2,895.00	1.36
Road Transport Equipment(Bicycles)	Mill.Nos	7.40	9.00	1.22
Mechanical Components & Consumer Goods (Ball & Bearings)	Mill.Nos	95.00	130.00	1.37
Mechanical Components & Consuper Goods (Typewriters)	Th.Nos.	120.00	130.00	1.08
Mechanical Components & Consumer Goods (Sewing Machines)	Th.Nos.	130.00	160.00	1.23
Electric Components Consumer Durables (ACSR & A A Condusters)	Th.T	70.00	100.00	1.43
Electric Components Consumer Durables(Cells & Batteries)	Mill.Nos	1,303.50	2,005.00	1.54
Electric Components Consumer Durables (Domestic Refrigerators)	Th.Nos	1,350.00	2,200.00	1.63
Electronics	Rs.Crs.	15,070.00	36,000.00	2.39

Note: Basic Metal#: Hot Metal, Pig Iron for Sale, Steel Ingots, Saleable Steel & Saleable Steel(Integrated Steel Plant)

Basic Metal ##: Alloy and Special Steels, Sponge Iron, Aluminum, Copper(lister), Copper Refined, Zinc Ingots & Lead Ingots

*: Includes One MT and 2.05 MT from Natural Gas for 91-92 & 96-97 Respectively.

Source: Eighth Five Year Plan, 1992-97, Volume I, Government of India, Planning Commission, New Delhi.

Table 11-3 India's Imports of Principal Commodities

(Value in Ten Million Rupee)				
S1. No.	Commodity	Unit of Quantity	1986-87 Qty Value	
I.	Food and Live Animals chiefly for Food (excl, cashew raw)		-	679
	Of which:			
II.1	Cereals and cereal Preparations	'000 T	212.3	87
II	a Material and Intermediate Manufactures		-	12169
II.1	Cashew nuts (Unprocessed)	'000 T	49.1	71
II.2	Crude Rubber (including synthetic and reclaimed)	'000 T	80.2	107
II.3	Fibres:		-	224
	Of which:			
II.3.1	synthetic and regenerated fibres (man-made fibres)	'000 T	37.8	59
II.3.2	Raw Wool	'000 T	27.9	82
II.3.3	Raw Cotton	'000 T	*	*
II.3.4	Raw Jute	'000 T	8.3	3
II.4	Petroleum Oil and Lubricants	Mill T	18.5	2811
II.5	Animal and Vegetable Oils and fats		-	656
	Of which:			
II.5.1	Edible Oils	'000 T	1473.9	626
II.6	Fertilizers and Chemical Products		-	2982
	Of which:			
II.6.1	Fertilizers and Fertilizer material	'000 T	6958.8	921
II.6.2	Chemical Elements and Compounds		-	1145
II.6.3	Dyeing, Tanning and Colouring material		-	66
II.6.4	Medical and Pharmaceutical products		-	214
II.6.5	Plastic material, regenerated cellulose and artificial resins		-	434
II.7	Pulp and waste paper	'000 T	569.7	244
II.8	Paper, Paper board and manufactures thereof	'000 T	270.6	217
II.9	Non-metallic mineral manufactures		-	1618
	Of which:			
II.9.1	Pearls, Precious and semi-precious stones, untouched or worked		-	1489
II.10	Iron and Steel	'000 T	3136.5	1556
II.11	Non-ferrous Metals		-	517
III	Capital Goods		-	6488
III.1	Manufactures of metals		-	209
III.2	Non-electrical machinery, apparatus and appliances		-	4263
III.3	Electrical Machinery, apparatus and appliances		-	1212
III.4	Transport Equipment		-	804
IV	Others (Unclassified)		-	760
V.	Total			20096

* Negligible

Source: Handbook of Industrial Statistics 1991

Table 11-4 Haryana State Government Preferred Industries

1. Food Processing
-Bakery and confectionery products
-Beverages
-Noodles, ice, frozen food and other food
2. Textile
-Cotton, wool and other yarn, synthetic fiber
-Woven fabrics
-Apparel
-Other miscellaneous textile goods
3. Pulp and paper
-not selected
4. Chemicals
-Medicinal and pharmaceutical products
-Photosensitive materials
-Plastic materials and plastic products
5. Oil/Coal Products
-not selected
6. Rubber and Leather Products
-Leather and leather products
7. Glass and Ceramics
-not selected
8. Iron and Steel
-not selected
9. Non-ferrous Metals
-Metal products (wire, cables, etc)
10. Metal Products
-Cutlery, cans, containers, press working, etc.
11. Machinery
-Farm and garden machinery and equipment
-Construction machinery and mining machinery
-Textile machinery
-Food processing machinery
-Plastic processing machinery
-Elevator, escalator and conveying equipment
-Sewing and knitting machines
-Refrigeration machines and air conditioners
-Bearing
12. Electric and Electronic Equipment
-Apparatus (generator, motor, transformer, lighting fixture, communication equipment, etc)
-Parts (Semiconductor device, IC, electronic tube, wiring accessories, etc)
13. Transport Equipment
-Motor vehicles and motor vehicle parts
-Railroad equipment
-Bicycle and parts
14. Precision Machinery
-Measuring and controlling instruments
-Medical equipment
-Optical Instruments and lenses
-Watches, clocks, clockwork operated devices, etc.
15. Others
-Jewelry, silverware and plated ware
-Musical instruments
-Toys and amusement, sporting and athletic goods
-Office and artists' materials
-Printing and publishing

(5) Local Resources

(a) Agriculture

Agricultural land accounts for 81 to 83 per cent of total land in Haryana State. The agricultural population accounts for 78 per cent of the state's total population. Approximately 46 per cent of the state's total income is agricultural, including livestock which accounts for approximately 33 per cent of GDP. Major crops are wheat, rice, oil seeds, sugarcane, pulse and cotton. The need to increase agricultural output is observed by the growing demand for chemical fertilizers and insecticides.

Major livestock are chickens, cattle, sheep, and water buffaloes. Primary livestock products are dairy products, chicken eggs, and wool.

Forest covers only 3.5 per cent of state lands. There is a need to rehabilitate deforested areas, which could provide timber and fuel supplies.

(b) Mining

In 1981, the mining industry's 3,500 employees accounted for only 0.1 per cent of Haryana state's total employed work force (3,664,000). Mining resources are not utilized except for clay and stones.

(6) Regional Development Prospects

As a regional development plan, the National Capital Region Plan, 2001, includes the IMT candidate site (Figure 11-2). According to the NCR Plan, in the Delhi Union Territory, growth should decelerate while Gurgaon should develop in a regulated manner as a suburban town of Delhi. The Gurgaon development plan by the Town and Country Planning Department of Haryana, envisages development of 9,372 ha for a 1 million population in the year 2001. In the Plan, 1,536 ha. are assigned to industrial uses whereby 541 ha. are to be developed by the public sectors (such as HUDA) (refer to Figure 11-3). Also, various development projects, such as a city centre with a shopping complex (194 ha), water carrier channel to meet a demand of 1 million persons, a cargo complex (200 ha), and the widening of the Delhi-Jaipur Railway Line, are proceeding.

(7) Regional Industries

In Gurgaon District, industries employing more than 500 workers are: (1) transport equipment and parts; (2) textile products; (3) chemical and chemical products; (4) non-metallic mineral products; (5) machinery and machine tools; (6) cotton textile; (7) metal products and parts; (8) rubber, plastic and petroleum products; (9) basic metal and alloys industries; and, (10) electrical machinery, apparatus and appliances. Also, there are 600 workers involved in repairs.

As a neighbor of Gurgaon, Faridabad is a large industrial agglomeration, where industries with over 10,000 employees are found in the machinery and machine tools, electrical machinery, apparatus and appliances, and the basic metal and alloys industries.

Delhi is also an industrial center, where basic metal and alloys industries, textile products, and chemical and chemical products industries employ more than 5,000 workers in each of the industries described (refer to Table 11-5).

Among the 64 medium and large scale factories in the Gurgaon District, many factories are located in the Gurgaon Sub-District. These factories primarily comprise transport equipment and parts, chemical and chemical products, machinery and machine tools industries, and employ the bulk of the labour force.

Prominent factories include Maruti Udyog Limited with 3,721 employees manufacturing vehicles and vehicle parts, and IDPL with 3,400 employees manufacturing pharmaceuticals.

Among Haryana's industrial estates, the Directorate of Industries administers 25, HSIDC administers 22, and HUDA administers 16 industrial estates. Udyog Vihar Industrial Estate of the HSIDC in Gurgaon, comprises the Maruti Udyog Limited facility, IDPL's facility, Lumax, Hindustan Computer, and other industries which produce electric and electronic items, pharmaceuticals, light engineering items, vehicles and parts, and ready-made garments. Gurgaon is also the location of an HUDA industrial estate.

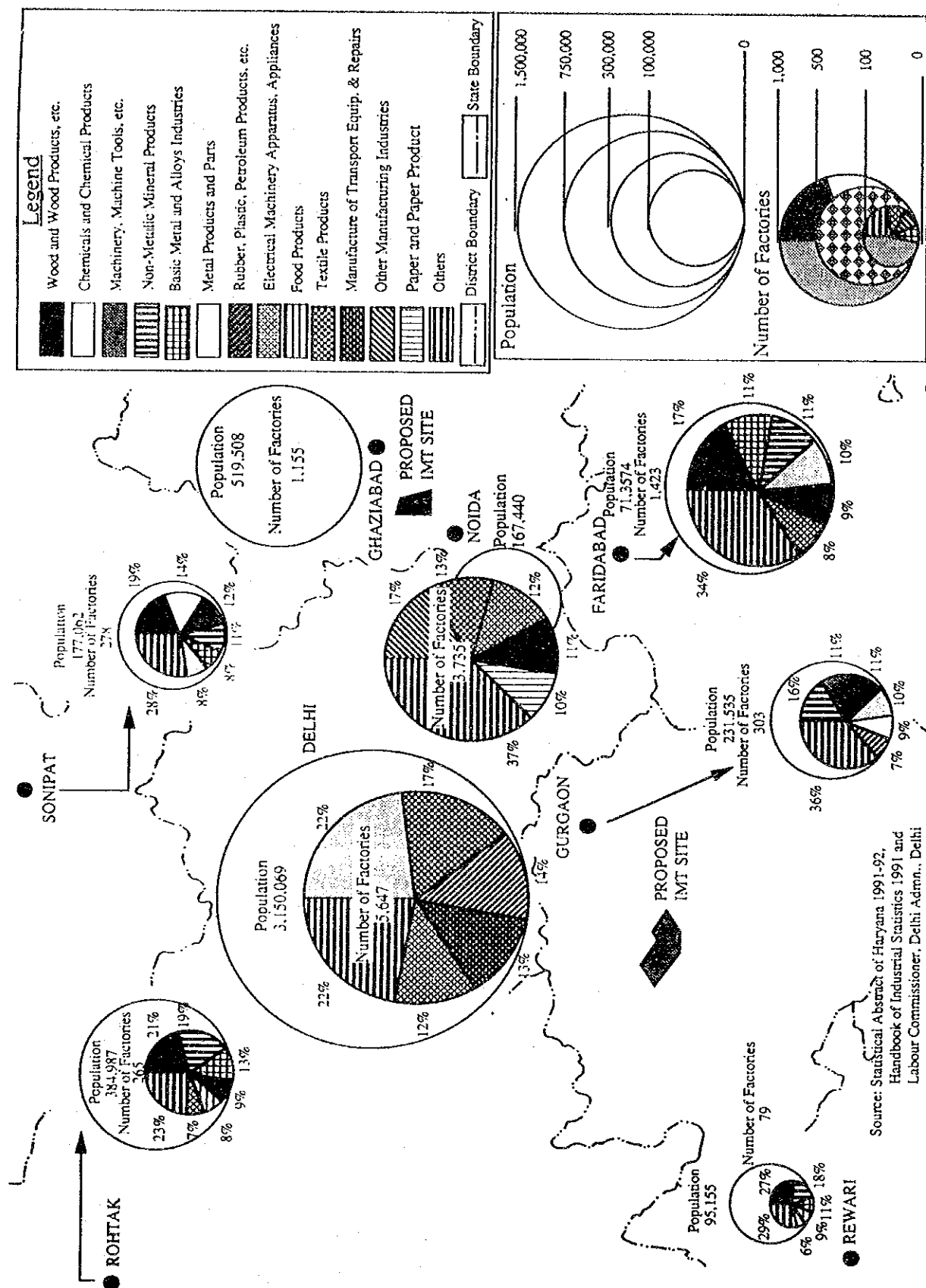


Figure 11-4 Urban Population and Number of Factories in Delhi

Table 11-5 Regional Industries in Gurgaon

Industry	Gurgaon Factories Workers	Mahendragarh Factories Workers	Faridabad Factories Workers	Rohatk Factories Workers	Delhi Factories Workers	Total Factories						
Workers												
Food Product	8	325	1	41	30	2680	19	1920	62	552	120	5518
Beverages, tobacco & tobacco products	2	155	0	0	3	590	1	325	2	15	8	1085
Cotton textile	5	940	0	0	57	4900	14	806	27	198	103	6844
Wool, silk & synthetic fibre	2	102	2	670	16	2175	1	170	84	381	105	3498
Jute, hemp & Mesta textile	0	0	0	0	0	0	0	0	2	8	2	8
Textile products	11	1615	0	0	18	2898	1	18	727	7190	757	11721
Wood & wood products	6	104	0	0	26	845	4	194	107	667	143	1810
Paper & paper products	3	135	0	0	45	5915	2	138	282	1573	332	7761
Leather & leather products	2	120	1	35	11	1405	0	0	119	1183	133	2743
Rubber, plastic & petroleum products	20	788	0	0	73	7362	7	268	655	2796	755	11214
Chemical & chemical products	21	1600	2	184	82	4425	15	386	338	6366	458	12961
Non-metallic mineral products	41	1475	18	1206	113	7235	47	4580	70	375	289	14871
Basic metal & alloys industries	17	585	2	252	154	12174	34	1929	368	8206	575	23146
Metal products & parts	26	820	0	0	125	7488	10	843	309	1785	470	10936
Machinery & machine tools	34	1255	1	198	239	24540	23	694	200	1465	497	28152
Electrical machinery, apparatus & appliances	15	547	2	175	112	19142	19	560	832	4870	980	25294
Transport equipment & parts	19	-	2	-	75	-	0	0	212	1347	308	1347
Other manufacturing industries	11	3805	-	292	17	6864	4	-	248	1172	280	12133
Total	243	14371	31	3053	1196	110638	201	12831	4644	40149	6315	181042

Source: Statistical Abstract of Haryana, 1990-91

Dhli State Industrial Development Corporation Ltd

Note: In Haryana, only factories with 10 or more workers and with aid of power are listed.

Around Gurgaon, the Kundli Industrial Estate which produces general engineering items, bicycles, dairy products, and agro-products, is located near the border of Sonapat and Delhi. The Murthal Industrial Estate, located 50km from Delhi, produces general engineering items, malts, chemical products, bicycles, et cetera. The Faridabad Industrial Estate located in Faridabad District produces light engineering items.

In addition to the above, Haryana's industrial development plan calls for advancement of an electronic city, electronic hardware technology park, and a software technology park in Gurgaon. Also, a science and technology entrepreneurs park in Abala, an agro-electronic industrial estate in Hissar, and an electronic medical instruments industrial estate in Rohtak, are planned.

Haryana state's primary dominant sector is agricultural. But in Gurgaon, agro-based industries are not well linked with Gurgaon industries.

As industrial commodities local market, Delhi's large urban market, and Haryana's local rural market, are in proximity to the IMT candidate site.

(8) The IMT Candidate Site Geographic Conditions

The geographic conditions of the IMT candidate site suggest the following specific industry-related criteria.

(a) Inland Location

- Heavy industries suitable for coastal areas would not locate inland to the IMT
- shipping industries were excluded
- Industries that require large volumes of water are not suitable to the IMT site location.

(b) Proximity to Delhi

- A highly qualified work force and a quality commodity market exist in proximity to the IMT candidate site. Land values are generally costlier than in remote regions.

- High technology and high value added commodities, research and development oriented industries, and consumer goods meeting the needs of the urban market appear adequate.

(c) Access to International and Domestic Airport

- Light, small, and high value added goods can be shipped via Indira Gandhi International Airport.

(9) Competition and Linkage Conditions

One of the more important international comparative advantages of the IMT is the existence of a large domestic market. Compared to southern regions, the candidate site is near to the national capital which is more international, accessible by other countries, and is recognised as an advanced and urbanized area.

In the National Capital Region and Haryana State, agro-industrial centers have located or will be located in various districts outside Gurgaon. The IMT candidate site is in proximity to Delhi and is dominated by transport, pharmaceutical, and machinery industries, with plans for further development of electronics and software industries.

One of the IMT's objectives is to strengthen industrial linkages with local industries and upgrade industrial capabilities. Therefore, in general, technology intensive consumer goods (e.g. domestic electric and electronic appliances, vehicles) are preferable in addition to sophisticated consumer goods, or simple labor-intensive consumer products (e.g. textile products and wood products). Moreover, capital goods such as non-electric machinery, electric and electronic machinery are preferable. Compared to other industrial estates, the IMT is expected to be a higher level undertaking which will produce higher quality and high value added commodities.

The IMT facilities would not be a likely location for a full scale automobile test track or industrial activities that require isolation in order to avoid new product development information leakage. But, factories representing same or similar industries could share common facilities and information networks.

Manufacturing by different industries could help foster information exchanges and stimulate technical or management innovations. However, if the kinds of industries are limited to similar industrial/manufacturing processes, the industries will enjoy the merit of accumulation, but will not benefit from a broader exposure to other forms of manufacturing, management, innovations, et cetera. Also, a homogeneous industrial estate would be vulnerable to economic fluctuations and market changes. It is therefore desirable that the IMT can function as a flexible manufacturing system by locating a variety of industries that can form effective industrial linkages.

Thus, the IMT is expected to include the auto and auto-related industries, electronics, software and inter-connected industries that provide support, sales and services to these industries (refer to Figure 4). It should be noted that the division of production processes and the activities of support industries are important to successful industrial growth. Generally, important production processes are located in the casting, forging, canning, sheet metal, welding, pressing, cutting, grinding, painting, coating, heating, plastic molding, lens polishing, foundries and assembly. Shipping, storage, packing and repair industries are also important as support industries for manufacturers, as well as commercial, financial, and other service industries.

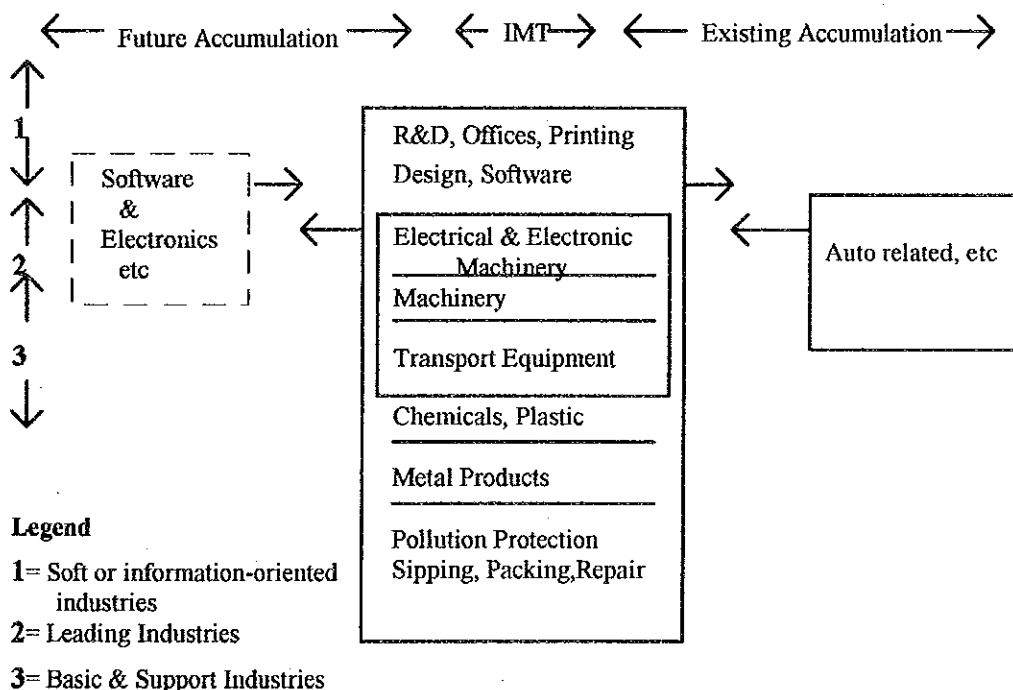


Figure 11-5 Main Industries Comprising IMT

11.2.2 Evaluation of Locational Conditions

Evaluation factors for industrial groups and development scale are listed as follows (refer to Table 11-6).

(1) Evaluation of potential Investment Demand.

As mentioned previously, and based on the investment demand survey results, the total site area of the potential demand is estimated to be 503 ha., and comprises estimated factories for foreign firms, Indian firms, and joint ventures of foreign and Indian enterprises.

(2) Evaluation by Eighth National Five Year Plan's Targets

Each industrial category was given points according to the ratio of the 1996-1997 production targets to the 1991-1992 production amounts of the categories.

Ratio of 1996/97 target to 1991/92 amount	Points
1.0 ~ 1.2	1
1.2 ~ 1.4	2
1.4 ~ 1.6	3
1.6 ~ 1.8	4
1.8 ~ 2.0	5
2.0 ~ 2.2	6
2.2 ~ 2.4	7
2.4 ~ 2.6	8
2.6 ~ 2.8	9
2.8 ~ 3.0	10

(3) Evaluation by Import Value of Industrial Products

Based on the import value of principal commodities in 1986/87, for which detailed data are available, each industrial category was given points.

Table 11-6 Evaluation of Locational Conditions

Industry	(1) Total Area Demand ha	(2) Target Indices	(3) Import Value	(4) State Gov. Preference	(5) Local Resources	(6) Industrial Trends	(7) Geographic, Competition and Linage Conditions	Average Weight	Revised Weight	Estimated Area ha
Food Product/Beverage	23.0	2	2	5	5	3	0	2.83	2.83	8.1
Textile	0.0	2	1	10	5	4	0	3.67	3.67	0.0
Cloth and other Miscellaneous Textile Goods	0.5	0	0	10	5	7	0	3.67	3.67	0.2
Wood and Wood Products	3.9	0	0	0	0	2	0	0.33	0.33	0.2
Furniture	2.0	0	0	0	0	2	0	0.33	0.33	0.1
Pulp and Paper	34.0	2	1	0	0	3	0	1.00	1.00	4.2
Printing and Publishing	0.8	0	0	10	0	0	5	2.50	10.00	1.0
Chemical (Fertilizer)	0.0	3	3	0	0	7	0	2.17	2.17	0.0
Chemical Products	80.5	4	1	5	0	7	5	3.67	3.67	36.7
Oil and Coal Products	0.0	3	6	0	0	5	0	2.33	2.33	0.0
Plastic Products	9.6	10	1	10	0	5	5	5.17	5.17	6.2
Rubber Products	11.8	3	1	0	0	5	5	2.33	4.00	5.8
Leather	0.0	0	0	10	0	2	0	2.00	2.00	0.0
Leather Products	2.2	4	0	10	0	2	5	3.50	3.50	1.0
Ceramics	10.0	2	0	0	5	6	0	2.17	8.00	10.0
(Others)	33.0	2	0	0	5	6	5	3.00	1.00	4.1
Iron and Steel	0.0	3	4	0	0	7	0	2.33	2.33	0.0
Iron and Steel Manufacturing	9.2	0	4	0	0	7	5	2.67	2.67	3.1
Non-ferrous Metals (Refinement)	0.0	8	2	0	0	7	0	2.83	2.83	0.0
Non-ferrous Metals (Wire and Cable)	10.8	0	2	10	0	7	5	4.00	4.00	5.3
Metal Products	22.4	2	1	10	0	5	10	4.67	4.67	13.0
Machinery	74.7	4	9	10	0	8	10	6.83	6.83	63.5
Electrical Machinery	67.6	7	3	10	0	10	10	6.67	6.67	56.1
Transport Equipment (Car)	74.6	2	2	10	0	10	10	5.67	5.67	52.6
Transport Equipment (Others)	5.0	4	2	5	0	6	5	3.67	3.67	2.3
Precision Machinery	0.9	1	0	10	0	0	10	3.50	10.00	1.1
Other Manufacturing	26.4	0	3	10	0	7	5	4.17	4.17	13.7
Total	502.7									288.1

Source: Study Team

Import value of principal commodities in Rs. 10 million	Points
0 ~ 500	1
500 ~ 1000	2
1000 ~ 1500	3
1500 ~ 2000	4
2000 ~ 2500	5
2500 ~ 3000	6
3000 ~ 3500	7
3500 ~ 4000	8
4000 ~ 4500	9
4500 ~ 5000	10

(4) Evaluation by Haryana State Government Preference

Industrial categories in which all, or almost all sub-categories are preferred by the state government, were scored as 10 points and categories in which some of the sub-categories are preferred were scored 5 points.

(5) Evaluation by Local Resources

Industrial categories which can possibly utilize resources in the region's primary sector were scored 5 points.

(6) Evaluation by Regional Industries Trends

Points were awarded according to the existing accumulation and future prospects of each industrial category in the region. Points according to industrial accumulation in Gurgaon District and those according to the accumulation in the neighboring four areas (Mahendragarh District, Faridabad District, Rohtak District and Delhi), were added. Electrical machinery received three additional points because of future development plans. Transport equipment manufactures' employee data was not available, but the category received 10 points due to the industry's existing large accumulation.

Factory Employees in Gurgaon District in 1991	Points	Factory Employees in Neighboring 4 Areas in 1991	Points
0 ~ 500	1	0 ~ 5000	1
500 ~ 1000	2	5000 ~ 10000	2
1000 ~ 1500	3	10000 ~ 15000	3
1500 ~ 2000	4	15000 ~ 20000	4
2000 ~	5	20000 ~	5

(7) Evaluation by Geographic, Competition and Linkage Conditions

According to the development concept of the IMT, industrial categories most suitable based on geographic conditions, competition, and linkage, were scored 10 points; industries suitable for the IMT were awarded 5 points.

11.2.3 Industry Scale

(1) Estimate for Site Area by Industrial Category

An average score for the above (1) to (7) was calculated for each industrial category. Following an examination of ambiguities for the demand survey's industrial categories and for other documents, and also considering the typical factory lot area for each industry, averages were adjusted. The results were divided by machinery group with highest score before adjustments, and the quotient was regarded as the category's weight which was to be multiplied by the potential site area demand. Considering also the site conditions, 85 per cent of the calculated area for each category was regarded as the site area demand for the IMT category.

The total area of the factory plots was calculated to be 288 hectares. The IMT primary industrial groups are as follows.

Machinery group (machinery and precision machinery) = 65 ha. (22%)

Transport equipment group (transport equipment, rubber products) = 61 ha. (21%)

Electrical and electronic group (electrical machinery) = 56 ha. (20%)

Chemical group (light oil products, soap, detergents, pharmaceutical, plastic and non-metallic mineral products) = 57 ha. (20%)

Metal group (metal products, non-ferrous metals such as castings and cables, iron and steel such as forging and castings) = 21 ha. (7%)

Others (urban industries such as printing and design, software, R&D, production support industries such as shipping/storage, packing and repair, offices and agro-industries) = 28 ha. (10%)

(2) Number of Factories by Plot Area

Based on site area calculations, the number of factory lots by area for each category, were estimated. Shares of foreign participation and Indian-owned factories were assumed. The total number of factories was estimated at 57.

Table 11-7 Number of Factories by Plot Area

Type	over 20ha	around 10ha	around 5ha	small scale	Total
Food and Beverages		1			1
Textiles					0
Wearing Apparel				1	1
Wood and Wood Products				1	1
Furniture and Fixtures				1	1
Paper and Paper Products			1		1
Printing and Publishing				1	1
Industrial Chemicals and Fertilizers					0
Light Chemicals (light oil products, soap, detergents, pharmaceutical)	1	1	1	2	5
Petroleum and Coal Products					0
Plastic Products			1		1
Rubber Products			1		1
Leather and Fur					0
Leather Products				1	1
Non-Metallic Mineral Products (ceramics)		1			1
Non-Metallic Mineral Products (except ceramics)			1		1
Iron and Steel (primary products)					0
Iron and Steel (casting and forging)			1		1
Non-Ferrous Metals (primary products)					0
Non-Ferrous Metals (castings and cables)			1		1
Metal Products			3		3
Machinery except electrical	1	2	4	3	10
Electrical machinery and supplies	1	2	3	1	7
Transport Equipment (vehicles and parts)	1	2	2	1	6
Transport Equipment (except vehicles)				1	1
Precision Machinery and instruments				1	1
Other Manufacture and Related Industries			1	10	11
Total	4	9	20	24	57
Foreign and JV	4	6	12	12	34
Domestic	0	3	8	12	23

(3) Employees and Water Demand of Factories

Based on the calculated site area by industrial category, the number of employees and fresh water demand for the factories were estimated (Refer to Table 11-8).

The number of employees is approximately 17 thousand. The fresh water demand is approximately 42,000 m³/day, assuming that five foreigners work for a foreign or foreign collaborated factory. The number of foreign workers is estimated at 170 for all IMT factories, which is about 1 per cent of the total factory work force.

(4) Industries of Gurgaon District and IMT in Haryana State

In 1991, there were 269,000 employees in the formal manufacturing sector that accounted for 1.7 per cent of Haryana's total population. Among the state's work force, Gurgaon District posted 15,952 employees, or about 5.9 per cent of the total state employment.

It is estimated that the number of manufacturing employees in the state in the year 2001, will be approximately 1 million, and account for 5.0 per cent of the state population. In Gurgaon District, there are predictions that approximately 100,000 workers will be employed in the manufacturing sector, about 10 per cent of the state's total work force.

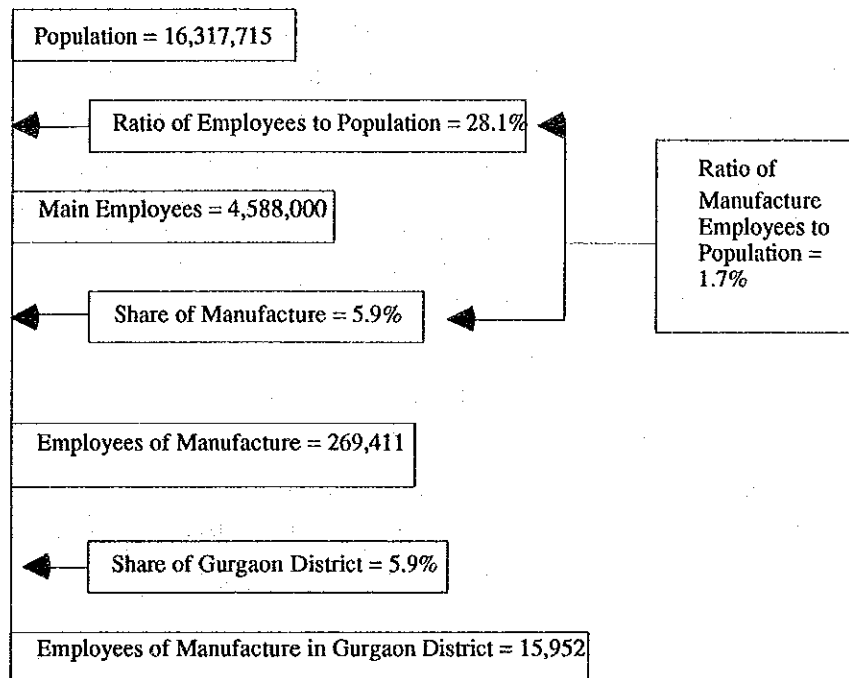
Table 11-8 Employees and Water Demand of Factories

Industry	Employee /ha	Number of Employee	Water Demands /ha	Water Demands /day
Food Product/Beverage	34	276	323	2618
Textile		0		0
Cloth and Other Miscellaneous Textile Goods	124	28	32	7
Wood and Wood Products	17	3	14	2
Furniture	40	3	45	4
Pulp and Paper	62	262	56	237
Printing and Publishing	154	153	65	65
Chemical (Fertilizer)		0		0
Chemical Products	40	1468	300	11008
Oil and Coal Products		0		0
Plastic Products	38	234	315	1943
Rubber Products	46	269	155	906
Leather		0		0
Leather Products	150	144	25	24
Ceramics	62	617	61	607
Others	13	53	87	357
Iron and Steel		0		0
Iron and Steel Manufacturing	40	122	98	299
Non-ferrous Metals (Refinement)		0	83	0
Non-ferrous Metals (Wire and Cable)	40	214	70	374
Metal Products	34	442	63	819
Machinery	31	1968	185	11747
Electrical Machinery	109	6110	103	5774
Transport Equipment (Car)	66	3471	75	3944
Transport Equipment (Others)	78	178	76	173
Precision Machinery	47	50	6	6
Other Manufacturing	79	1081	87	1190
Total		17146		42106

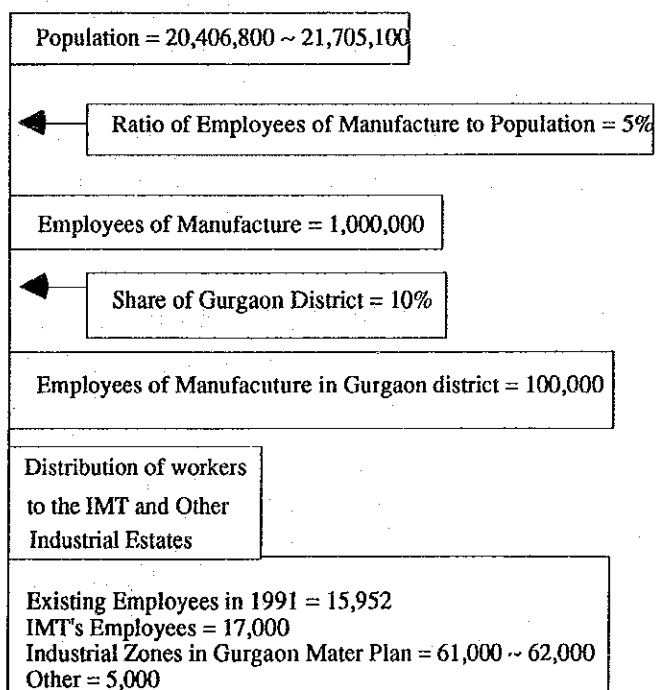
Source: Study Team

Summary of Selected Employment and Population Characteristics for the Gurgaon Area: 1991 and 2001.

In 1991



In 2001 (Estimation)



Note: Estimates based on statistical data from the State of Haryana.

11.3 Promotional Functions and Organisations

11.3.1 Promotional Functions

As described and discussed in the preceding sections, the IMT has two interrelated general purposes: to become a vehicle by which foreign investors are encouraged to invest in India, and to provide opportunities that can enhance domestic industries. For this to occur however, will require that the IMT integrates the functions that are observed in the activities and management of India's current industrial estates, NOIDA, and export processing zones. Specifically, the IMT should have a single window service agency for enterprises looking to establish production in the IMT, and provide internationally acceptable and adequate infrastructure, facilities, civil, and public services.

However, prior to the IMT's production activities, investment promotion is essential to attract in a timely fashion foreign and domestic entrepreneurs to the IMT. Once investors initiate actions to locate production facilities within the IMT, management services should be in place that can provide assistance to the new companies. In addition to the above, the IMT should have technical services to improve technology for the production of quality products that can meet the needs of the IMT's domestic enterprises.

Closely related to technical services is the need to provide adequate manpower training and human resources that can meet a company's production needs in the form of well-trained technicians, managers, and engineers. And, the IMT should provide a functional network within the IMT's operating industries that also promotes the development of beneficial relationships (such as intercultural relations, technical exchanges, and information exchange) with domestic/foreign enterprises located outside the boundaries of the industrial model town.

In addition to the above, public services are required for auxiliary facilities of the IMT. Also, the IMT's organisational structure should comprise the following six functions below and is illustrated in Figure 11-6.

- | | |
|--------------------------------------|---|
| -- investment promotion | -- management services |
| -- technical services assistance | -- manpower development |
| -- information services coordination | -- civil and public coordination services |

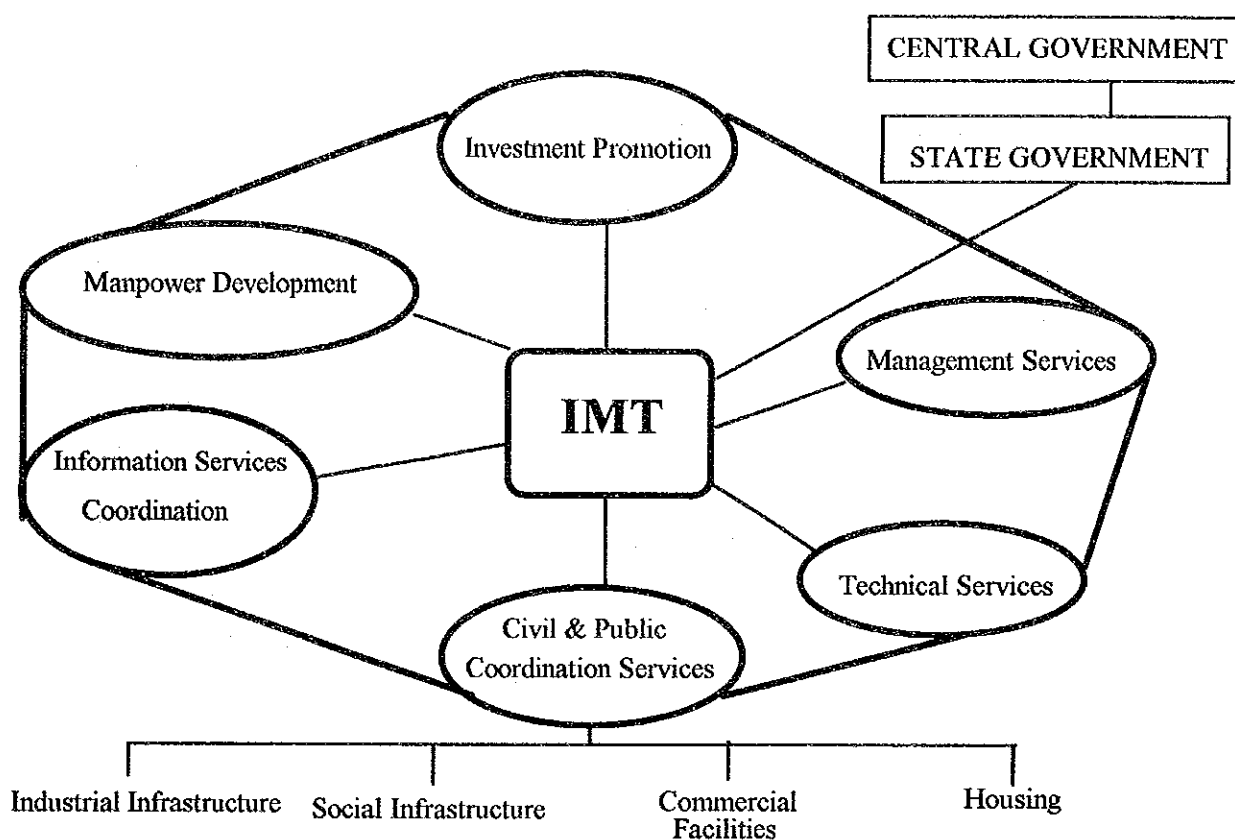


Figure 11-6 IMT Functional Network

(1) Investment Promotion Functions

Investment promotion activities should include public relations, advertising campaigns, and delegations traveling abroad as representatives of the IMT facilities to foreign investors. Details related to India's investment environment (incentives and investment policies), documentation and customs procedures, and labour relations/work force characteristics are examples of the types of information made available to potential investors.

(2) Management Services Functions

Management services will provide important functional assistance and administrative help for new businesses locating to the IMT. For example, effective management services would provide assistance related to investment applications and approvals, financial sources, market research, and management consultancy needs. Specifically, the management services provided should act as liaison between domestic industries and foreign enterprises, and a library comprised of current research data sources, documentation, and access to databases/services.

(3) Technical Services Functions

Technical services will provide product testing laboratories that meet international guidelines and standards. Also, technical consultancy services in the form of technical instruction, shared expertise, and methods for properly utilizing product testing equipment should especially benefit domestic small- and medium-scale industries.

(4) Manpower Development

Companies locating to the IMT will require manpower development services, i.e., training facilities and associated visual media accessories. The IMT should provide an area utilised for training activities to meet the various training needs of the IMT enterprises. In addition to the former, the IMT facility will be utilised for various vocational curriculum to meet semi-skilled to management level needs in the various enterprises; especially management technology and orientation programs for the IMT work force.

(5) Information Services Coordination

Essentially, information services coordination will act as a functionary in facilitating exchanges between IMT companies and support services (R&D institutes, universities and colleges) located outside the IMT. Also, the information services coordination activities should promote and arrange business-related seminars, provide a product exhibition hall for the promotion of IMT products/technologies to interested parties and the general public.

(6) Civil and Public Coordination Services

Civil and public coordination services activities should provide guidance and assist in determining civil and public services related to the general maintenance needs (parking areas, restaurants, sports facilities, parks, etc.) of the IMT.

11.3.2 Organisations

Construction of industrial model towns throughout India was discussed in previous sections in relation to the IMT's basic concepts. Therefore, to meet management needs, a national-level, IMT promotion organisation should be established to guide the functional requirements that may arise in the future as well as state level organisations. Figure 11-3 illustrates the IMT promotion organisational system and reflects central and state government organisational relationships.

(1) IMT Promotion Organisation (IMTPO: Tentatively named) System

Provisionally termed the IMT Promotional Organisation, will have a system similar to the organisational system utilised by the EPZs under the Ministry of Commerce. The IMTPO system will allow the Ministry of Industry to effectively carry out and administer the IMT development policies and planning. The Ministry of Industry's national-level management body will utilise a central government advisory committee and a state-level implementation board for addressing relevant issues.

(2) The Advisory Committee (central government level)

The advisory committee will be responsible for advising the Ministry of Industry regarding basic policy questions, legalities, and foreign affairs for all industrial model towns that are developed. The committee's members should at the least consist of the Foreign Investment Promotion Board¹ members and/or appointed representatives from the Ministry of Industry, other related central government ministries, the private sector, research scientists, scholars from academia, et cetera.

¹The Foreign Investment Promotion Board (FIPB) is located in the Prime Minister's Office. The board is comprised of the principle secretary to the Prime Minister (chairman), Finance Secretary, Commerce Secretary, and the Secretary, Industrial Development. The board acts to invite and facilitate investment in India by international companies in projects which are considered beneficial to the domestic economy and do not fall within the parameters of existing policies for foreign investment clearance. Guide to New Industrial Policy: 1992-93:171-172. Second Edition. 1992. Jain, Rajiv. India Investment Publication. Delhi.

(3) Implementation Board (state government level)

A state-level implementation board should be established in each state and will be responsible for the practical development of an IMT within the state's boundaries. The board's members should consist of representatives from state-level ministries of industries, industrial development corporations, and related state government agencies such as those responsible for urban development, finance, public health, and environmental issues.

(4) IMT Promotion Centre (IMTPC: Tentatively named)

The IMTPC should be established as the on-site IMT management organisation responsible for administering the IMT's day-to-day "single window services" and business requirements.

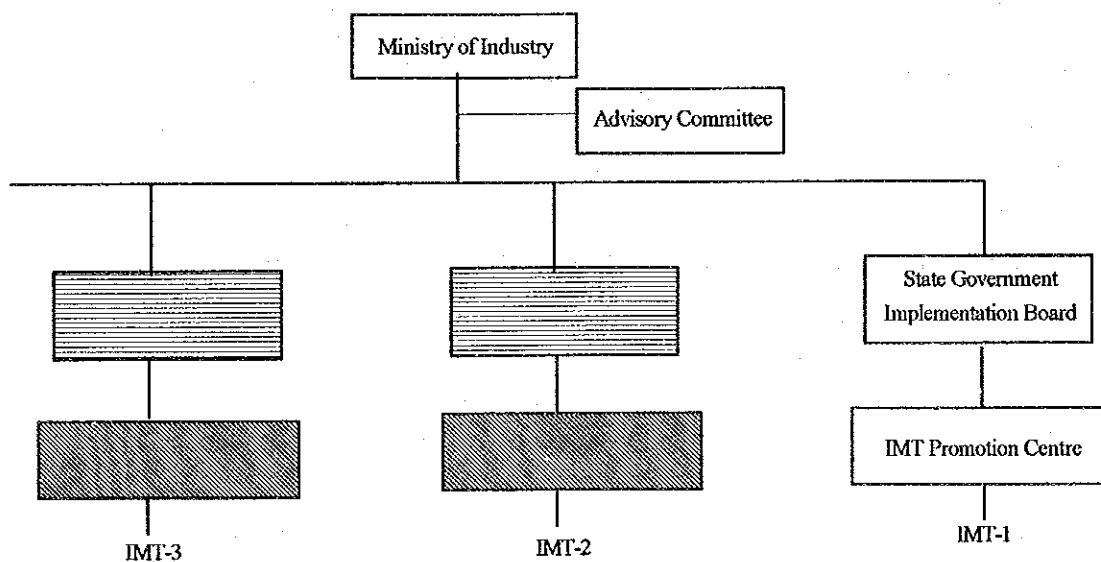


Figure 11-7 IMT Promotion Organisation System Structure

11.4 IMT: Conceptual Design

11.4.1 Township Scale and Functions

(1) Population Plan

The IMT is estimated to provide residences for 17,000 employees in section 11.2.3. In this section, 6,000 employees are estimated to reside in the IMT, about 35 per cent of the total number of people working in the IMT because Gurgaon New Town under development will be available for housing. The average household size is estimated to be five persons. Of the 170 foreign employees, average household size for 50 employees is estimated at three, with the remaining residing alone. About 20 per cent of the employees who are engaged in commercial activities will also have residences in the IMT.

Estimated Population for the IMT

IMT Employees	Number of Residents
Factory Employees	$6,000 \times 5 \text{ persons/household} = 30,000 \text{ persons}$
Foreign Employees	$50 \times 3 \text{ persons/household} + 120 = 270 \text{ persons}$
Others	$30,000 \times 0.2 = 6,000$
Total Employees	36,270

(2) Types of Housing

Housing types for the IMT residential zone will be arranged according to the residential classifications. Based on experiences observed from NOIDA, the IMT's population density in the industrial area will be about 350 persons per hectare. Foreign worker housing is generally a detached or terraced house structure.

In this study, factory workers are classified into the high density residential area (350 persons per hectare) and medium density residential area (250 persons per hectare). Workers engaged in commercial activities are also classified into the medium density

residential area. Foreign employees are classified into detached houses of approximately 1,000 m² per plot and terraced houses of 100 m² per plot.

Type of Housing and Area

Residential Density	Persons per hectare.
High density	350 persons/ha.; approximately 57 ha.
Medium density	250 persons/ha.; approximately 40 ha.
Low density (1)	Detached house; approximately 13 ha.
Low density (2)	Terraced house; approximately 15 ha.

(3) Public Facilities

Public facilities should be constructed to adequately reflect the demographic changes of the IMT site and adjoining residential zones. The IMT will play a significant industrial role in India, and its public facilities must enhance the function of the industrial area. Accordingly, the public facilities are introduced as follows.

- * Administration Centre
- * Promotion Centre
- * International Seminar Centre
- * IMT Town Centre
- * Primary School (including foreign students class)
- * Hospital
- * Sports Centre
- * Sports Club for Foreign workers
- * Culture Centre

(4) Scale of Public Facilities

The scale of the schools, commercial, and administrative facilities, etc., can be estimated from the projected population. The scale of other facilities for the extended area are based on others including Japan at this stage of conception. Therefore, it can be supposed 48 hectares multiplying the area excluding industrial area by an estimate rate.

Centre area of industrial zone = 10 ha.

Centre area of residential zone = 30 ha.

Recreational Centre = 08 ha.

Total = 48 ha.

$(600 \text{ ha.} - 288 \text{ ha.}) \times 15 \% = \text{approximately } 48 \text{ ha.}$

11.4.2 Planning Preconditions

The land use plan for a 600 ha. IMT project area proposed in Manesar is based on the following conditions:

- * The project area is allocated along the sides of National Highway No. 8.
- * detached from existing towns in the surrounding area of the site.
- * In order to improve the environment, the industrial zone is surrounded by an approximately 30 m. wide green belt.
- * The residential zone and the centre zone are allocated along National Highway No. 8 for clarification of land use.
- * Each landuse zone is facing the center zone.
- * The high density residential area will be arranged on the north side of national Highway No. 8; the low density residential area will be arranged on the other side.
- * As to the industrial zone, large scale factories will be arranged on the north side, and the small scale factories will be arranged adjacent to the centre zone.

11.4.3 Land Use Plan

Given the IMT frame work and preconditions mentioned in section 11.4.2, the land use plan is as follows:

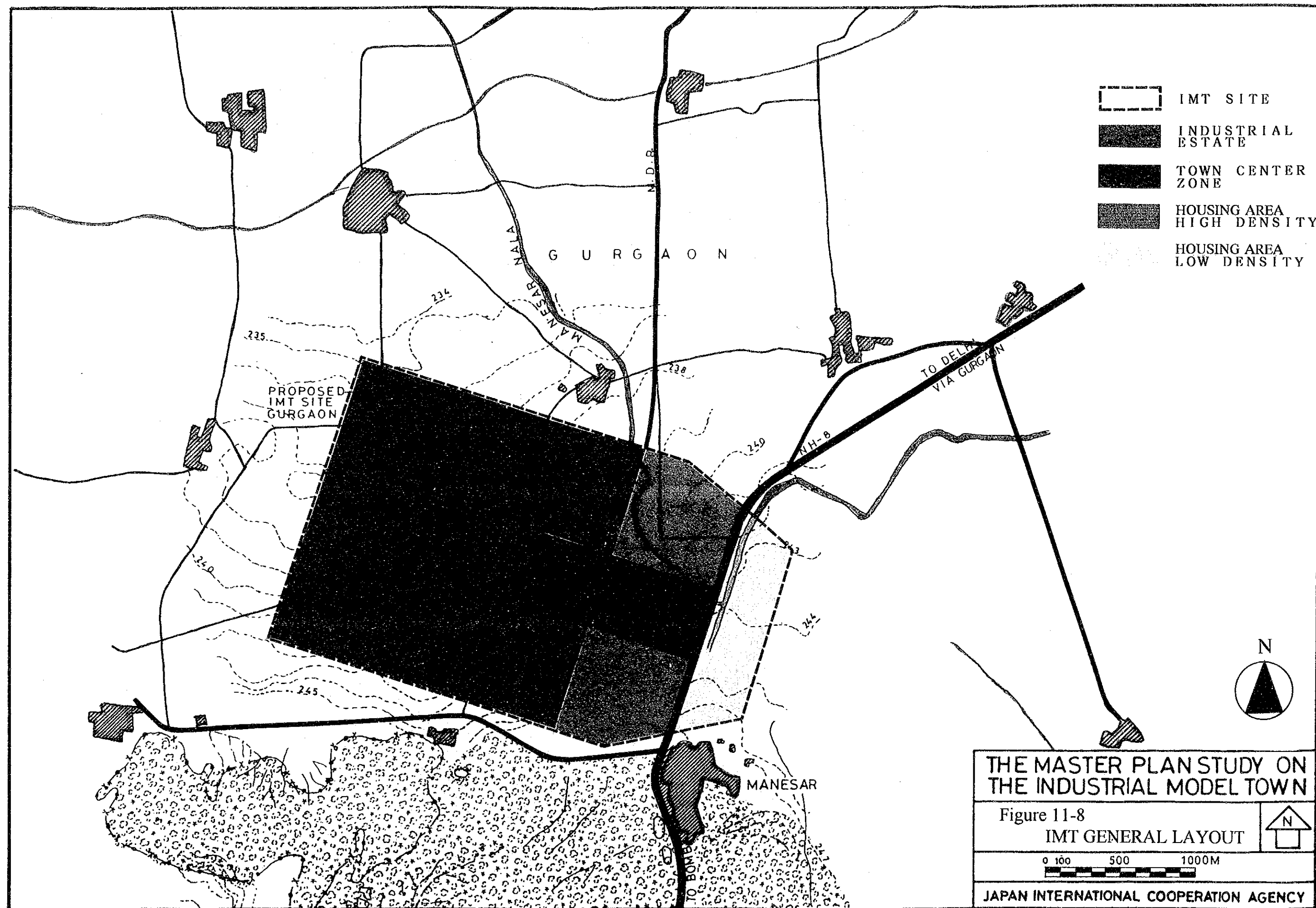
Table 11-9 Land Use Plan

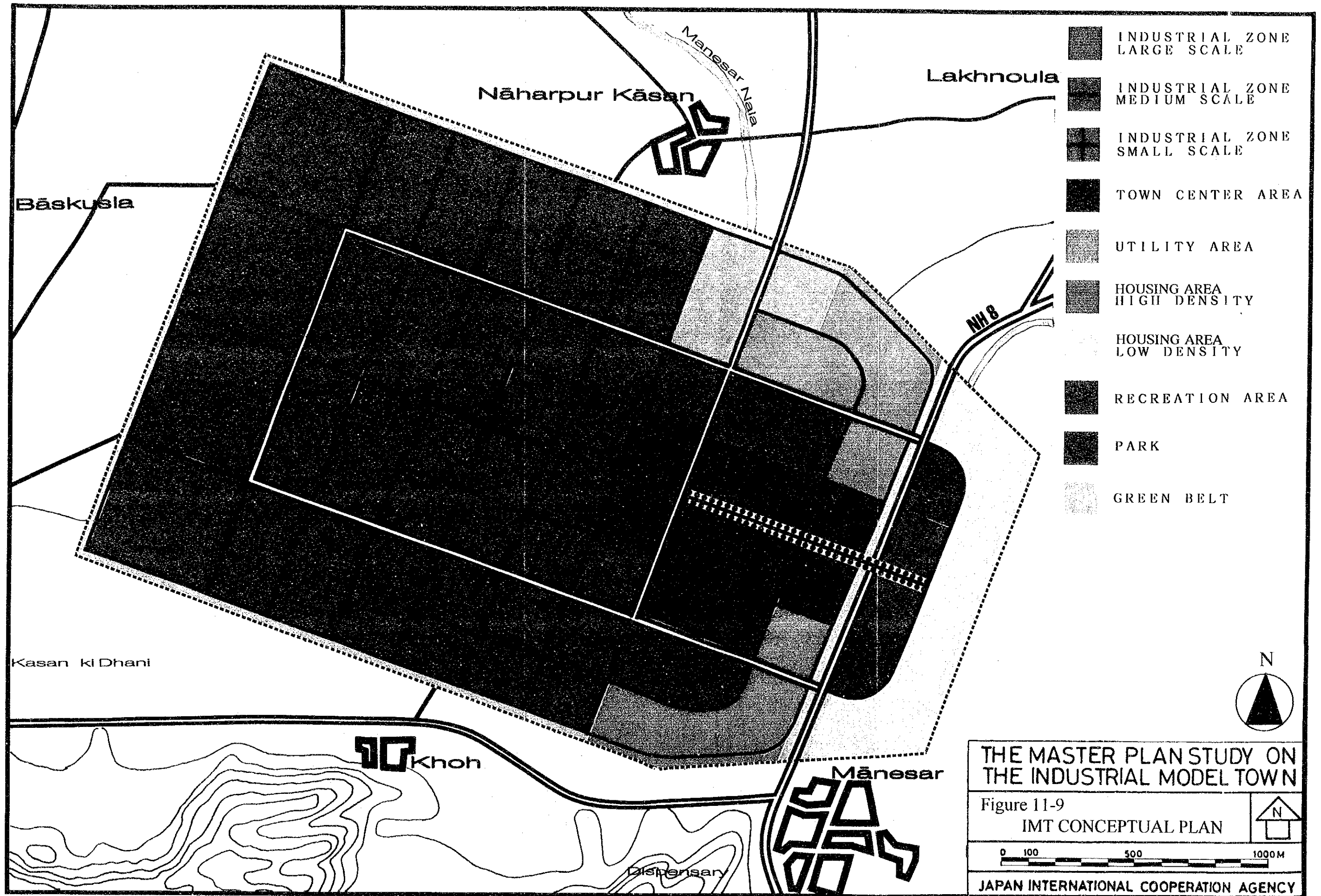
Land Use Category	Industrial Zone (ha)	Residential Zone (ha)	IMT	
			Total Hectares	Ratio (%)
Factory	288	--	288	47
Residential				
Low Density	--	28	28	05
Medium Density	--	30	30	05
High Density	--	42	42	07
Sub total	--	100	100	17
Center	10 ¹	30 ²	40	07
Recreation	--	08 ³	08	01
Utility	10	07	17	03
Park & Open Space	28	23	51	09
Roads	64	32	96	16
Total	400	200	600	100

note: ¹ Promotion Centre, et cetera.

note: ² Town Centre

note: ³ Sports Club for Foreign Workers





11.4.4 Traffic Plan

The road hierarchy in the project area is as follows (refer to Fig. 11-10 and 11-11):

Road Hierarchy	Width (meters)	No. of Lanes
V ⁰ : National Highway No. 8	30	04
V ¹ : Arterial Road	30	04
V ² : Distribution Road	20	04
V ³ : Access Road	16	02
VB: Boulevard	50	4 + 2

11.4.5 Park and Green Zone

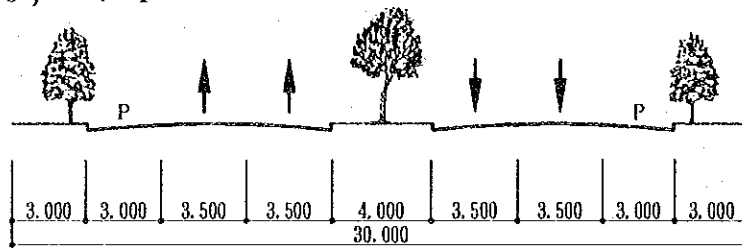
There are towns adjacent to the IMT candidate site so that the environment has to be sufficiently considered, particularly in proximity to the industrial area. Along the road which surrounds the industrial area, a green belt with 30 meters outside outer roadway be constructed to act as a buffer zone. Parks (approximately 10 ha. total) are arranged adjacent to the centre zone. The residential zone (including low medium, and high density areas) is apart from National Highway No. 8 due to the arrangements for a green belt. The boulevard which crosses two levels National Highway No. 8 at the centre zone and low density zone will have 15 meters open space on both sides of the main road, and a four-lane road used as a service road and pedestrian crossing.

11.4.6 Land Reclamation

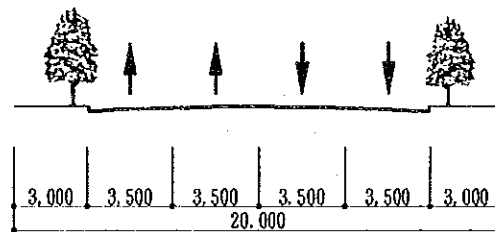
The topography of the project area of the IMT is fairly flat agricultural land, and the Manesar Nala waterway passes through the area. The reclamation plan has to be carefully considered and minimize the impact on these surroundings; particular attention should be paid to assessing the present topography and watershed. Therefore the land reclamation will be based on the following:

- * Design level on the project area should minimize effects on the present topography, particularly along National Highway No. 8.
- * Design levels follow the present watershed.
- * Balance of excavation and filling should be adequate. In order to consider the landscape, surplus soils are used to mound industrial area lots as the lots will not be in easily seen from the road.
- * Parks and green belt are mounded by surplus soil for adding landscape variety to the naturally flat topography.

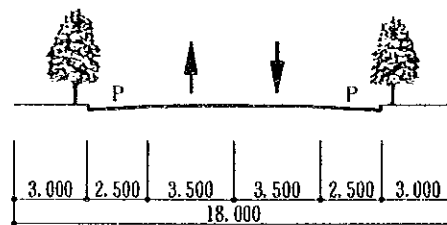
V₀, V₁



V₂



V₃



V B

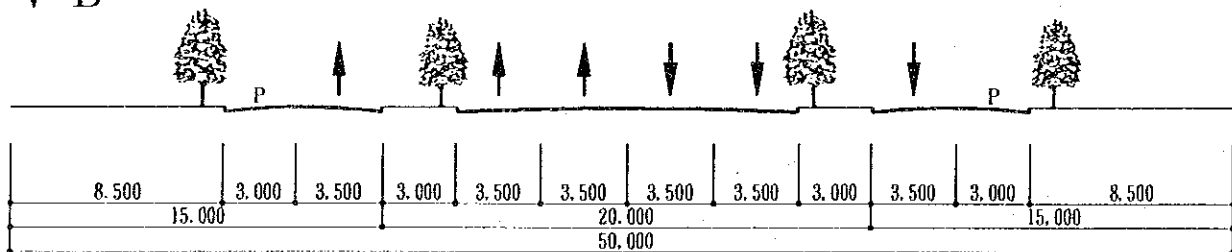


Figure 11-10 Road Standards

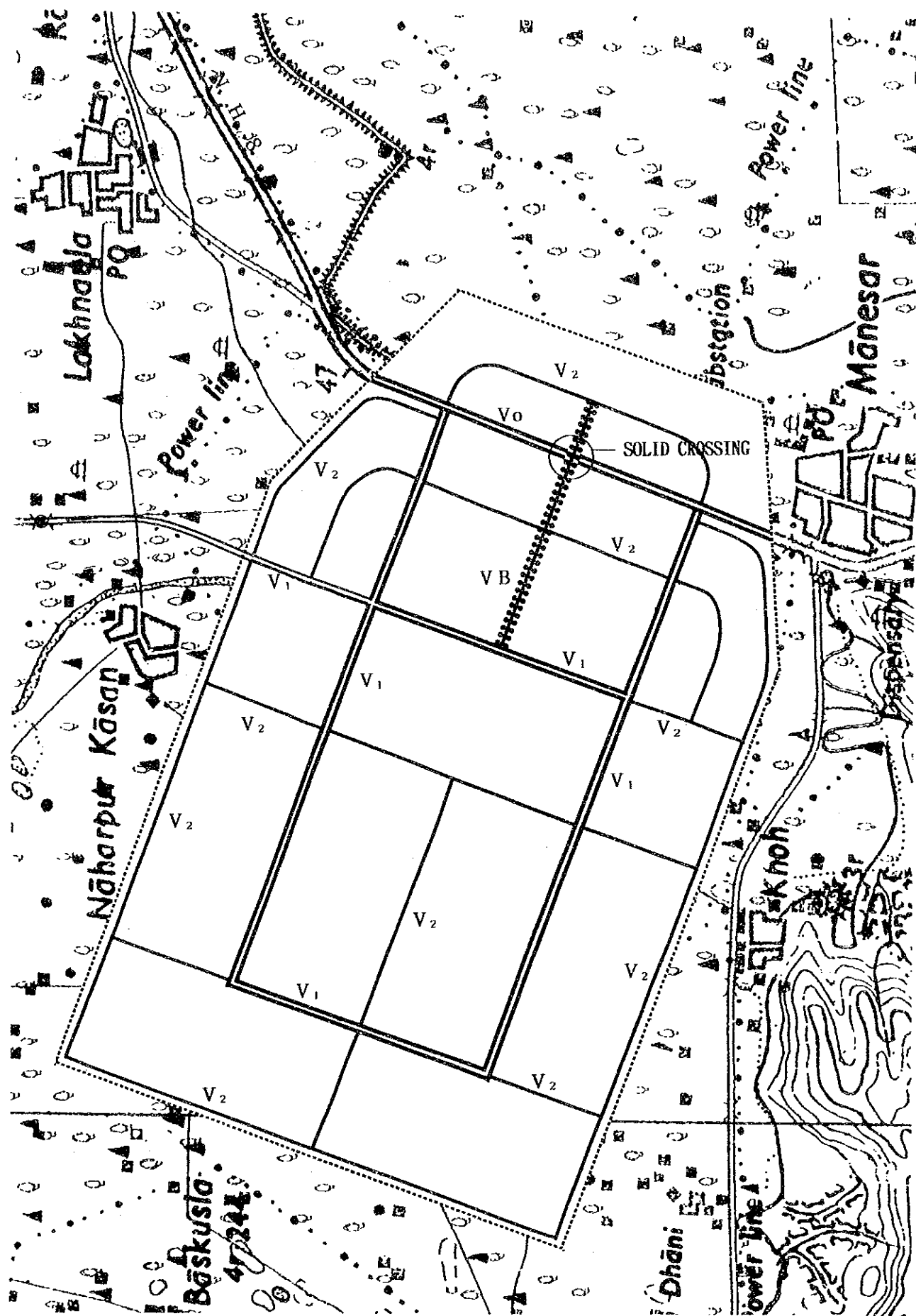


Figure 11-11 Road Networks

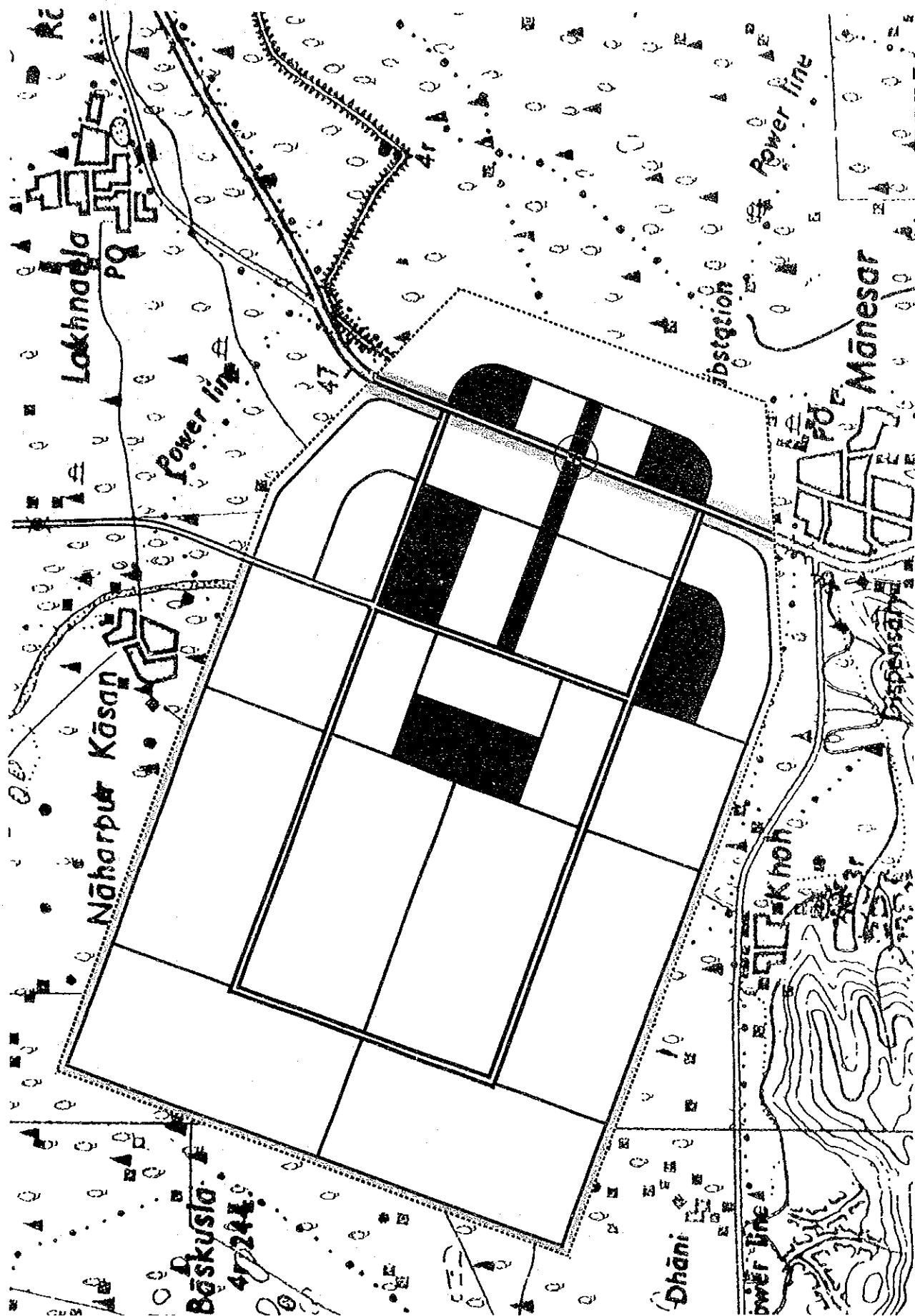


Figure 11-12 GREEN ZONING

11.4.7 Water Supply

(1) Service area

The service area of this water supply scheme is defined based on land utilization as shown below.

Industrial area	: 400 ha
(Factory/Plant area)	: (288 ha)
(Public area)	: (112 ha)
Residential area	:200 ha
<hr/>	
Total area	:600 ha

(2) Design volume of water supply

Design water volume is summarized.

Industrial use	: 42,000 m ³ /day
Domestic use	: 5,500 m ³ /day
<hr/>	
Uncounted for water	: 4,800 m ³ /day
Total requirement	: 52,300 m ³ /day

(a) Water demand for industrial use

The daily supply volume of water for industrial area is estimated at 42,000 m³ based on the Evaluation of Locational Conditions. The breakdown is shown below.

Type of Process	Area (ha)	Unit Volume (m ³ /ha)	supply volume (m ³)
Machinery / Precision machinery	65	182	11,729
Electric / Electronics	56	103	5,784
Transportation machinery	61	83	5,021
Chemical	57	244	13,844
Metalworking	21	70	1,510
Others	28	146	4,115
Total	288		42,003

(b) Water demand for domestic use

A population of 36,000 is projected for the IMT. Assuming that an average family has five members, then one person will consume about 150 liters per day. Therefore, water demand for domestic use is estimated at 5,500 m³ per day.

(3) Water supply facilities

The following facilities are required for the project's execution.

(a) Outside the IMT

As described in the Comparisons of Candidate Sites, treated water will be received through facilities under the Water Supply Scheme of the Haryana Urban Development Authority. The main feature of the scheme is as follows below.

Water resource	: Najaf Garh Drain
Take off point	: Karori Head Works in Sonapat District.
Canal	
Capacity of Canal	: 135 cusecs
Length of Canal	: 70km.
Treatment Plant	
•Location	: Village Basai
•Ultimate capacity	: 27,000 m ³
•Capacity of treatment	
•Plant under construction	: 90,000 m ³
•Treatment method	: Rapid sand filtration
•Sterilization	: Chlorination
Storage tank	
•Raw water	: 175,000 m ³
•Treated water	: 6,500 m ³
•Size of Rising main	: 600 mm dia. parallel C.I. pipes 16.5 kms. length C.I. pipes
Pumping station	
Staff quarter	

According to the Haryana PWD, the Public Health Department, a water treatment plant of 90 MLD capacity under construction is expected to be completed and commissioned in March 1994.

(b) Inside the IMT

The IMT site is proposed to be divided into six sectors of 100 ha each for the water supply system. The following facilities are proposed for construction in each sector.

RCC underground storage tank	: 9,000 m ³
Overhead tank	: 600 m ³
Piping network	: 80mm ~ 600mm CI pipe
Boosting station	
Staff quarter	

11.4.8 Sewerage and Drainage

(1) Sewerage and storm water drainage system

The sewerage and storm water drainage system covers the industrial and residential area. The treated effluent will be discharged into Manesar Nala, the proposed carrier channel as shown in Figure 7-19. The treated effluent will be used for irrigation near the IMT site. The storm water will be collected and discharged into the Manesa Nara mentioned above.

(2) Sewerage quantity and quality

The volume of waste water is assumed to be 90 per cent of the water demand volume for industrial and domestic use. It is assumed that ground water of which volume is 10 per cent of waste water infiltrates into the sewer pipes. Sewerage quantity is summarized below.

Waste water from industry	: 37,800 m ³ / day
Waste water from domestic	: 5,000 m ³ / day
<hr/>	
Infiltration of ground water	: 4,300 m ³ / day
Total quantity of sewerage	: 47,100 m ³ / day

Discharged water after treatment will be used for irrigation to the surrounding farms without dilution. Tolerance limits for effluents in India are generally consistent with Japan's. The sewerage qualities follow the Indian standard of Tolerance Limits

discharged on Lands, and are the most restrictive. The Activated Sludge method is proposed for the IMT.

(3) Storm water

The following design conditions are calculated based on the data submitted by PWD.

Total covering area	: 600 ha
Assuming rain fall intensity	: 3 mm / hour
Total quantity of storm water	: 5m^3 / sec
Add discharge for area along drain @ 10 per cent	: 0.5m^3 / sec
Total discharge quality	: 6.0m^3 / sec

(4) Facilities

The following facilities are proposed for sewerage and drainage.

Network system	: Separation pipeline system
Sewerage water	: Pumping out
Storm water	: Gravity
Treatment works	
Treatment method	: Activated sludge method
Capacity	: $47,100\text{m}^3$ / day
Treatment of sludge	: Disposed as solid waste after drying
Pumping station	
Balancing reservoir	
Staff quarters	

11.4.9 Energy

(1) Estimate of Electric Power Demand

Based on the assumptions of electric power demand per unit area and total area of factories, power demand for the IMT is estimated as detailed below.

$$\begin{aligned} \text{- Power Demand} &= U_e \times D \times a = 741 \times 0.5 \times 288 \\ &= 106,704 \text{ (kVA)} = (85\text{MW Approx.}) \end{aligned}$$

Where,

- U_e : Power demand per unit area according to the requirement of DSIDC for IE, 741 kVA/ha
- D : Demand factor of Electric power, 50%
- A : Total area of factories, 288ha(Approx.70% of IMT total area, 400ha)

(2) Electric Power Supply

Electric power shall be supplied from two sources, i.e., commercial power supply from the Haryana State Electricity Board (HSEB), and from independent power generation plant. In other words, 60 MW of power (approximately 70 per cent of total power demand) will be provided by HSEB, and the IMT's independent power generation plant will provide the remaining of 25 MW (30 per cent).

(3) Scheme and General Arrangement of Power Supply System

The scheme and general arrangement of the power supply system are shown on Figure 11-13 and 11-14, respectively. The power supply system primarily consists of a power plant, substation ,and fuel oil storage tanks.

(4) Coordination Between Concerned Parties and Management Organisation

(a) Coordination between concerned parties for the power supply system are as follows:

- Gas Pipe Line (Gas Authority in India: GAI)
- 66KV Power Transmission Line (HSEB)

-
- The diagram illustrates the power system configuration for the HSEB system. It features a 11KV BUS connected to two Gas Turbine Generator Sets (G) through Gas Pressure Reduction Equipment. The bus is also connected to an IMT Road. The IMT Road is connected to the HSEB system via a 66/11KV Transform (represented by two overlapping circles). The HSEB system is connected to the IMT Road via a 66/11KV Transform. The diagram includes labels for GAI, INT, Gas Pressure Reduction Equipment, 11KV BUS, IMT Road, From HSEB System, and Legend.
- Legend**
- (G) : Gas Turbine Generator Set
 - (Two overlapping circles) : 66/11KV Transform
 - (Square with a diagonal line) : Circuit Breaker

A schematic diagram of the power plant layout, showing a rectangular area divided into three main sections. The top section is labeled 'Approx. 100m' and contains a transformer labeled '変電所' (transformer) and two tall, narrow structures. The bottom left section is labeled 'Fuel Oil Storage Tank Area' and contains two large circles. The bottom right section is labeled 'Gas Turbine Power Plant' and contains two tall, narrow structures. A dashed line connects the transformer to the power plant structures.

- 11.47 -

(5) Operation Modes of Power Supply System

(a) Commercial power supply

- 66kV power will be received through double transmission lines. If a line fails, the line will be separated from the system and power will be received through the other line.
- If both lines fail, the lines will be separated from the system and power will be received from the generator. For this case, the load connected to the system should be limited accordingly.

(b) Power Generator

- If there are any problems with a generator unit, the unit will be replaced by a stand-by unit.
- If both generator units are experiencing problems, the feeders from the generator will be separated from the system and power will be received from the commercial power supply. For this case, the load connected to the system should be limited accordingly.

(c) Fuel Gas Supply

- Natural gas fuel will be received through double gas pipe lines. If a line fails, the line will be switched to the other line.
- If both lines fail, the fuel supply will be switched and fuel oil will be transferred from the storage tanks.

(6) Construction of Power Generation Plant

- (a) The IMT's power generation plant will supply stable electric power separate from commercial power sources which were observed to have frequent power interruption. To meet the IMT's power supply demand, a stand-by unit having 100 per cent duty capacity of the unit will be installed. Increasing total installed capacity to 50MW.

The primary fuel will be natural gas supplied from the GAI source, and back-up fuel for emergency uses will be oil stored in tanks near the power plant.

(b) The power generation plant should be a package-type gas turbine driven power generation plant based on the following merits:

- Minimal time required to begin generation
- Low noise level
- Low cost (natural gas is inexpensive and available in the Gurgaon area) and additional benefits: It is possible at some later date to provide a supply of inexpensive steam to the IMT factories by future expansion to a co-generation plant with a waste heat recovery steam generator.

(c) Space required for future expansion to a co-generation plant should be considered.

11.4.10 Telecommunication

(1) Estimate of Telecommunication Lines

Based on the number and scale of factories' assumptions, telecommunication lines for the IMT are estimated as follows:

- Number of Telecommunication Lines

$$\begin{aligned} &= (U_b \times N_b) + (U_s \times N_s) = (5 \times 33) + (3 \times 24) \\ &= 165 + 72 = 237 \text{ (Lines)} \end{aligned}$$

Where,

- U_b : Assumed number of lines per large scale factory: 5 lines
- N_b : Number of large scale factories in IMT: 33 factories
- U_s : Assumed number of lines per small scale factory: 3 lines
- N_s : Number of small scale factories in the IMT: 24 factories

(2) Telecommunication Facilities in the IMT: Basic Concept

Inter-linkage between the DOT and the IMT is based on the DOT's exclusive management telecommunication business in India. In principle, the large scale factories will have an independent PBX (Private Branch Exchange), and telecommunication

lines from the factories will be connected to the DOT public telephone system network through which factory installation of the PBX occurs. A common PBX will be installed in the centre so that telecommunication lines from the small scale factories can be connected to DOT's public telephone network system.

A digital PBX should be installed for the IMT, and it is considered that data telecommunication can be accomplished by minor modifications.

Cables from small scale factories to the center should be glass-fiber optical cables to meet future growth in demand for telecommunications.

(3) Telecommunication System Scheme

The Telecommunication System Scheme is shown in Figure 11-15.

(4) Coordination Between The Department of Telecommunications (DOT) and Management Organisation

(a) Digital multiplex equipment (MUX), will be utilised when the public telephone network system upgrades to the Integrated Services Digital Network (ISDN). The MDF (Main Distribution Frame) is as per Figure 11-15.

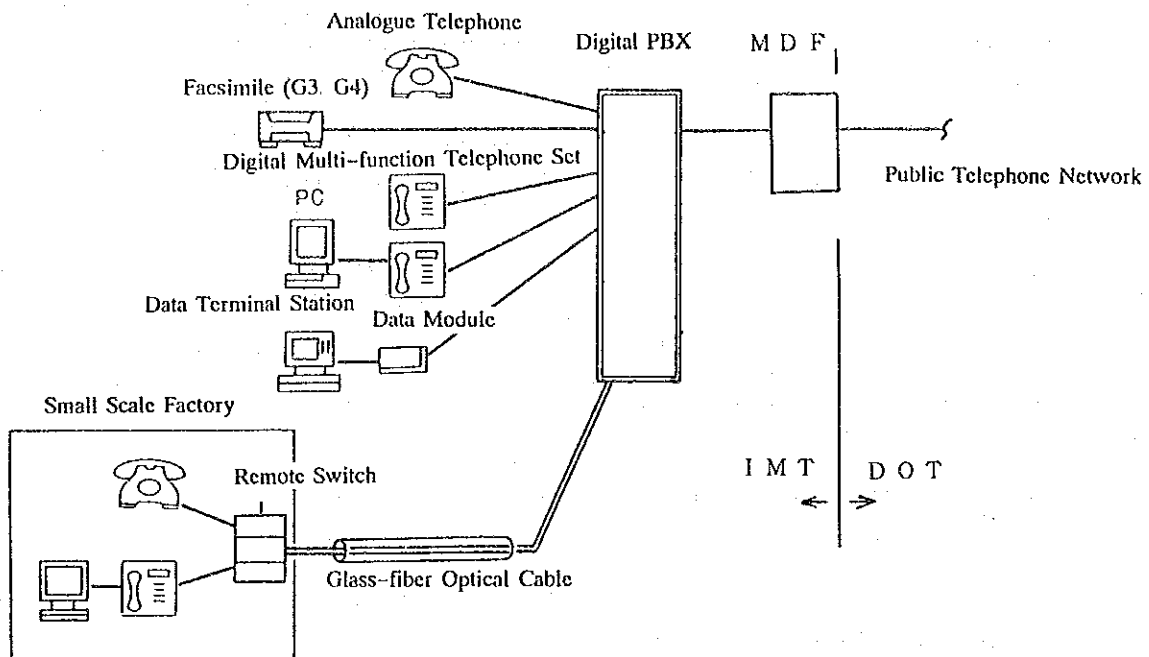
(b) The DOT and IMT will manage everything including procurement, operation, maintenance, etc., for each facility from this point.

(5) Function of Telecommunication Facilities

Digital PBX in this scheme should have interface matching with the following terminal devices:

- Ordinal analog telephone set
- Digital multi-function telephone set
- Facsimile (G3, G4)
- Personal computer (PC)
- Data terminal station

Figure 11-15 Scheme of Telecommunication Facilities



11.5 Pollution Control

Gurgaon suffers from severe environmental conditions due to its location 13 km from New Delhi. The situation at the industrial estates there is as described in Chapter 9, section 9.5. The management agency of the site (HSIDC), has established some environmental protection measures. The IMT's environmental conservation policy must to a certain extent make use of the existing system, but as the tenants will be from international enterprises, the need arises for more stringent environmental control targets and more careful facility planning.

The chief environmental protection measures currently undertaken at Gurgaon are as follows:

- Quantitative and qualitative improvements in water supply, with the target date for completion of a water treatment plant set for the year 2001
- Installation of separated sewerage piping
- Planning of sewage treatment plant (680,000 kl, activated sludge process)
- Planning and execution of waste collection and disposal facilities

These facilities will all be available for the IMT's use, but thorough management level consultations will be required during implementation in order to identify how the IMT's plans should be combined with those already in place for industrial estates, and whether this is possible in terms of capacity.

India has enacted fairly detailed environmental conservation legislation, and thus the first step will be to ensure these provisions are observed. However, environmental quality standards similar to Japan's do not exist and would require adopting from Japan's regulations supplemental environmental protection measures to further protect the country's environment.

(1) Basic Data on the IMT Plan

(a) Area of the Site

The site, which will be provided by Gurgaon Industrial Estate, has an area of 600 hectare. Provisional figures for area by type of land use at the site are given in Table 11-10.

Table 11-10 Area by Type of Land Use

Land Use	%	Area (ha)
Residential	33.3	200
Industrial	66.7	400
(Shared facilities)	(18.7)	(112)
(Factory sites)	(48.0)	(288)
Total	100	600

(b) Type of Factories and Planning Conditions

Using statistical data from the Japan Industrial Location Centre, calculations were made of what amount of the 288 ha. would be occupied by each factory, and the amounts of fresh water supply, number of employees, etc. were then extrapolated from the resulting figures for the area. The results are shown in Table 11-11. The base units used in making these calculations are appended in Table 11-12.

(c) Quantity and Quality of Industrial Waste Water

On the basis of the figures for water supply and number of employees obtained in the preceding section, estimates were then made of the industrial and domestic waste water volumes, concentrations, and load for BOD, COD, and SS. In estimating loads, Japan's Sewerage Plant Construction Standards were utilized.

Calculations were based on the following assumptions:

- i) Industrial waste water was set at 1.1 times the volume of water supply, taking into account increases from ground water.
- ii) The amount of water used for domestic purposes was set at 100 liter per one employee.
- iii) Domestic waste water was set at 1.1 times the amount of water used for domestic purposes.
- iv) BOD and SS concentrations.

Table 11-11 Detail of Requirements of Each Industry

Type of Industry	(1) Area of Site (ha)	(2) Area Percentage of Each Industry (%)	(3) Suppliable Water Volume per Unit Area (Kl/Day/ha)	(4) Volume of Suppliable Water (Kl/Day) (1)×(3)	(5) Number of Employ per Unit Area (Person/ha)	(6) Number of Employee (Person) (1)×(5)
1 Food and Beverage Ind.	8.1	2.8	323	2,616	34	275
2 Cloth and Textile Ind.	0.2	0.1	32	6	124	25
3 Wood and Wood Products Ind.	0.2	0.1	14	3	17	3
4 Furniture and Equipment Ind.	0.1	0.0	45	5	40	4
5 Pulp, Paper and Paper Product Ind.	4.2	1.5	56	235	62	260
6 Publications, Printing and Concerned Ind.	1.0	0.3	65	65	154	154
7 Chemical Ind. (Oil, Soap, Detergent, Medicine)	36.7	12.7	300	11,010	40	1,468
8 Plastics and Their Products Ind.	6.2	2.2	315	1,953	38	236
9 Rubber and that P/Products Ind.	5.8	2.0	155	899	46	267
10 Leather Processing and Finishing Ind.	1.0	0.3	25	25	150	150
11 Ceramic Ind. (China Ware)	10.0	3.5	61	610	62	620
12 Ceramic Ind. (Without China Ware)	4.1	1.4	87	357	13	53
13 Steel Ind. (Forged Steel, Metal Product, Casting, PigIron)	3.1	1.1	98	304	40	124
14 Nonferrous Metals Ind. (Casting, Electric Wire, Cable)	5.3	1.8	70	371	40	212
15 Ferrous Metal Ind.	13.0	4.5	63	819	34	442
16 Machine and Tool Ind.	63.5	22.0	135	8,573	31	1,969
17 Electrical Machine and Tool Ind.	56.1	19.5	103	5,778	109	6,115
18 Transport Machine and Tool Ind. (Vehicle and Its Accessories)	52.6	18.2	75	3,945	66	3,472
19 Transport Machine and Tool Ind. (Without Vehicle)	2.3	0.8	76	175	78	179
20 Precision Machine Tool Ind.	1.1	0.4	6	7	47	52
21 Other Products Ind.	13.7	4.8	87	1,192	79	1,082
Total	288.3	100.0		38,947		17,162

• The Japan Industrial Location Center "Kougyouritti Gentani Chousa Houkokusho 1992"

Table 11-12 Basic Unit of All Industries in Japan (1989 more than 30 Employees)

Type of Industry	Per Factory			Per Unit Area	
	Number of Employees (Persons)	Site Area (m ²)	Volume of Supplyable Water (Kl/Days)	Number of Employees (persons)	Number of Supplyable Water (Kl/Days/1000m ²)
Beverage, Food, Cigarette	101	33,657	906	2.8	25.4
Clothes, Textile fabric	70	3,428	17	20.4	4.9
Publication, Printed matter	101	3,336	35	30.4	10.6
Chemical	164	73,843	3,989	2.2	54.0
Plastic, Plastic products	93	15,818	332	5.9	21.0
Rubber, Rubber products	146	19,384	307	7.5	15.8
Leather processing, Leather products	73	5,554	133	13.1	23.9
Ceramic products	88	36,865	327	2.4	8.9
Steel	199	127,702	2,696	1.6	21.1
Nonferrous metal	160	58,235	1,124	2.7	19.3
Steel or Metal products	87	15,669	126	5.6	8.0
Machines, Tools	129	20,328	95	6.4	4.7
Electrical machine, Electrical tools	165	12,614	146	13.1	11.6
Transport machine and Tools	240	41,345	268	5.8	6.5
Precision machine and tools	140	10,667	102	13.1	9.5
Other products	88	10,165	67	8.7	6.6

For industrial waste water, actual figures from sites in Japan were used. (Note: Where the level of concentration was in excess of India's public sewerage discharge standards, it was assumed that the waste would be pre-treated to record the value shown in brackets before discharge. (Refer to Table 11-13.)

In the case of domestic waste water, the level of concentration was set at 200 mg/l for both BOD and SS.

The concentrations of BOD and SS in waste water from the six types of industrial plants shown in Table 11-15, are too high for the water to be discharged without treatment. For this reason, waste may be released into the sewerage system only after it has been treated in the factories, the pH level has been adjusted, and hazardous substances have been removed as per the following table.

Discharge	Total Volume of Waste Water	Average BOD Concentration	Average SS Concentration
Sewerage System	19,371m ³ /D	330mg/l	190 mg/l
Drainage System	28,832 M ³ /D	24mg/l	70 mg/l

Table 11-13 Quantity and Quality of Industrial and Domestic Waste water

Type of Industry	(1) Estimated Volume of Supplyable Water (KJ/Day)	(2) Estimated Number of Employee (Person)	(3) Volume of Industrial Waste Water (KJ/Day) (1)×1.1	(4) Vol. of Supplyable Water for Domestic Use (KJ/Day) (2)×0.1	(5) Volume of Domestic Waste Water (KJ/Day) (4)×1.1	(6) BOD of Inflow (mg/Day)	(7) SS of Inflow (mg/Day)	(8) BOD Load (kg/Day) (3)×(6)×0.001	(9) SS Load (kg/Day) (3)×(7)×0.001
1 Food and Beverage Ind.	2,618	276	2,880	27.6	30.4	513 (350)	132	1,477.34	380.13
2 Cloth and Textile Ind.	7	28	8	2.8	3.1	10	30	0.08	0.23
3 Wood and Wood Products Ind.	2	3	2	0.3	0.3	10	30	0.02	0.07
4 Furniture and Equipment Ind.	4	3	4	0.3	0.3	10	30	0.04	0.13
5 Pulp, Paper and Paper product Ind.	237	262	261	26.2	28.8	300	180	78.21	46.93
6 Publications, Printing and Concerned Ind.	65	133	72	15.3	16.8	200	45	14.30	3.22
7 Chemical Ind.									
8 (Oil, Soap, Detergent, Medicine)	11,008	1,468	12,109	146.8	161.5	515 (350)*	125	6,236.03	1,513.60
9 Plastics and Their Products Ind.	1,943	234	2,137	23.4	25.7	300	874 (600)*	641.19	1,868.00
10 Rubber and that Products Ind.	906	264	997	26.4	29.0	10	50	9.97	49.83
11 Leather Processing and Finishing Ind.	24	144	26	14.4	15.8	500 (350)*	1,000 (600)*	13.20	26.40
12 Ceramic Ind.	607	617	668	61.7	67.9	10	200	6.68	133.54
13 Ceramic Ind.	357	53	393	5.3	5.8	10	200	3.93	78.54
14 Steel ind. (Forged Steel, Metal Product, Casting, Pigiron)	299	122	329	12.2	13.4	20	20	6.58	6.58
15 Nonferrous Metals Ind.	374	214	411	21.4	23.5	50	30	20.57	12.34
16 Ferrous Metal Ind.	819	442	901	44.2	48.6	10	100	9.01	90.90
17 Machine and Tool Ind.	11,747	1,968	12,922	196.8	216.5	40	30	516.87	387.65
18 Electrical Machine and Tool Ind.	5,774	6,110	6,351	611.0	672.1	10	100	63.51	635.14
19 Transport Machine and Tool Ind. (Vehicle and Its Accessories)	3,994	3,472	4,338	347.2	381.9	10	100	43.38	433.84
20 Transport Machine and Tool Ind. (Without Vehicle)	173	178	190	17.8	19.6	10	100	1.90	19.03
21 Precision Machine Tool Ind.	7	50	8	5.0	5.5	10	100	0.08	0.77
22 Other Products Ind.	1,190	1,031	1,309	103.1	113.4	10	100	13.09	130.90
Total	42,105	17,092	46,316	1,709.2	1,880.1			9,155.98	5,816.96

• () * Sewer Discharging Standard.

Table 11-14

Directly Discharged Waste Water for Irrigation with Rain Water

Type of Industry	(1) BOD load (Kg/Day)	(2) SS Load (Kg/Day)	(3) Volume of Waste Water (Kl/Day)	Note
1 Food and Beverage Ind.	*	*	*	
2 Cloth and Textile Ind.	0.08	0.24	8	
3 Wood and Wood Products Ind.	0.02	0.06	2	
4 Furniture and Equipment Ind.	0.04	0.12	4	
5 Pulp, Paper and Paper product Ind.	*	*	*	
6 Publications, Printing and Concerned Ind.	*	*	*	
7 Chemical Ind. (Oil, Soap, Detergent, Medicine)	*	*	*	
8 Plastics and Their Products Ind.	*	*	*	
9 Rubber and that Products Ind.	10.00	49.9	997	
10 Leather Processing and Finishing Ind.	*	*	1	
11 Ceramic Ind. (China Ware)	6.70	133.60	668	
12 Ceramic Ind. (Without China Ware)	3.90	78.60	393	
13 Steel ind. (Forged Steel, Metal Product, Casting, Pigiron)	6.60	6.60	329	Zn remove pH control
14 Nonferrous Metals Ind. (Casting, Electric Wire, Cable)	20.60	12.30	411	
15 Ferrous Metal Ind.	9.00	90.10	901	
16 Machine and Tool Ind.	516.90	387.70	12,922	
17 Electrical Machine and Tool Ind.	63.50	635.10	6,351	Heavy Metal remove pH control
18 Transport Machine and Tool Ind. (Vehicle and Its Accessories)	43.40	433.80	4,338	
19 Transport Machine and Tool Ind. (Without Vehicle)	1.90	19.00	190	
20 Precision Machine Tool Ind.	0.08	0.80	8	
21 Other Products Ind.	13.10	130.90	1,309	
Total	695.82	1,978.82	28,832	

Table 11-15

Industrial Waste Water Discharged to the Sewer System

Type of Industry	(1) BOD load (Kg/Day)	(2) SS Load (Kg/Day)	(3) Volume of Waste Water (Kl/Day)	Note
1	1008	380	2880	pH control
2	*	*	*	
3	*	*	*	
4	*	*	*	pH control
5	78	47	261	
6	14	3	72	Heavy Metal remove pH control
7	4238	1514	12109	
8	641	1282	2137	Chromie remove Sulfide remove
9	*	*	*	
10	9	16	26	
11	*	*	*	
12	*	*	*	
13	*	*	*	
14	*	*	*	
15	*	*	*	
16	*	*	*	
17	*	*	*	
18	*	*	*	
19	*	*	*	
20	*	*	*	
21	*	*	*	
Total	5,988	3,242	17,465	

Table 11-16(1) General standards for discharge of effluents

SL No.	Parameter	Standards			
		Inland surface water	Public sewers	Land for irrigation	Marine coastal areas
1	2			3	
		(a)	(b)	(c)	(d)
1.	Colour and Odour	See Note I	--	See Note I	See Note I
2.	Suspended solids, mg/l, Max	100	600	200	(a) for process waste water-100 (b) For cooling water effluent-10 percent above total suspended matter of effluent cooling water.
3.	Particle size of suspended solids	Shall pass 850 micron IS Sieve	--	--	(a) Floatable solids, Max 3mm. (b) Settleable Solids, Max 850 microns.
4.	Dissolved solids (organic) mg/a, Max	2100	2100	2100	--
5.	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
6.	Temperature, °C, Max	Shall not exceed 40 in any section of the stream within 15 metres down stream from the effluent outlet	45 at the point of discharge	--	45 at the point of discharge
7.	Oil and grease mg/l, Max	1.0	20	10	20
8.	Total residual chlorine, mg/l, Max.	1.0	--	--	1.0
9.	Ammonical nitrogen (as N), mg/l, Max	50	50	--	50
10.	Total Kjeldahl nitrogen (as N) mg/l, Max	100	--	--	100
11.	Free ammonia (as NH ₃), mg/l, Max.	5.0	--	--	5.0

Table 11-16 (2)

1	2	3		4	
		a	b	c	d
12.	Biochemical oxygen demand (5 days at 20°C)	30	350	100	100
13.	Chemical oxygen demand, mg/l, Max.	250	--	--	250
14.	Arsenic (as As), mg/l, Max	0.2	0.2	0.2	0.2
15.	Mercury (As Hg), mg/l, Max	0.01	0.01	--	0.01
16.	Lead (as Pb.) mg/l, Max	0.1	1.0	--	1.0
17.	Cadmium (as Cd), mg/l, Max	2.0	1.0	--	2.0
18.	Hexavalent chromium (as Cr + 6), mg/l, Max	0.1	2.0	--	1.0
19.	Total Chromium (as Cr), mg/l, Max	2.0	2.0	--	2.0
20.	Copper (as Cu), mg/l, Max	2.0	3.0	--	3.0
21.	Zinc (as Zn), mg/l, Max	5.0	15	--	15
22.	Selenium (as Se), mg/l, Max	0.05	0.05	--	0.05
23.	Nickel (as Ni), mg/l, Max	3.0	3.0	--	5.0
24.	Boron as (B), mg/l, Max	2.0	2.0	2.0	--
25.	Per cent Sodium, Max	--	60	60	--
26.	Residual sodium carbonate, mg/l, Max	--	--	5.0	--
27.	Cyanide (as CN), mg/l, Max	0.2	2.0	0.2	0.2
28.	Chloride (as Cl), mg/l, Max	1000	1000	600	--
29.	Fluoride (as F), mg/l, Max	2.0	15	--	15
30.	Dissolved Phosphates (asP), mg/l, Max	5.0	--	--	--
31.	Sulphate (as SO), mg/l, Max	1000	1000	1000	--
32.	Sulphide (as S), mg/l, Max	2.0	--	--	5.0
33.	Pesticides	Absent	Absent	Absent	Absent
34.	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	1.0	5.0	--	5.0
35.	Radioactive materials:				
	(a) Alpha emitters MC/ml, Max	10 ⁻⁷	10 ⁻⁷	10 ⁻⁸	10 ⁻⁷
	(b) Beta Emitters MC/ml, Max	10 ⁻⁶	10 ⁻⁸	10 ⁻⁷	10 ⁻⁸

Note 1: All efforts should be made to remove colour and unpleasant odour as far as is practical

Note 2: The standards mentioned in this notification shall apply to all the effluents discharged, such as industrial mining and mineral processing activities, municipal sewerage, etc.

Note 3: This notification shall not apply to those industries for which standards have been notified by the Central Government vide S.O. 844 (E), dated the 19th November, 1986, S.O. 393 (E) dated 16th April, 1987, S.O. 443 (E), dated the 28th April, 1987 and S.O. 64 (E), dated the 18th January, 1988. This notification shall cease to apply with regard to a particular industry when specific standards are notified for that industry.

(d) Other Forms of Pollution Control

i) Air pollution controls

Air pollution may be an issue for the pulp, paper, iron and steel industries on site. Standards for dust emissions, etc., for these industries follows.) For details refer to Table 11-17.)

Industry	Standards
Iron and steel (coke ovens)	Dust: 50 mg/Nm ³
(refractory material plants)	Dust: 150 mg/Nm ³
Pulp and paper	Dust: 250 mg/Nm ³
	H ₂ S: 10 mg/Nm ³

ii) Noise

India does not regulate noise levels by type of industry, but has standards by Zones, and measures must be taken to ensure standards are followed (refer to Table 11-18).

iii) Solid and Liquid Waste

India does not have set standards for the disposal of solid and liquid wastes. Nor are there any standards in place in Japan that could be applied to the quantity and quality of waste discharged by tenant factories. Therefore, waste treatment and disposal methods inside and outside the factory site will need to be evaluated for the various types of plants after a survey determines the IMT site waste quality and quantity of discharge characteristics.

Table 11-17 Industrial Emissions Dust Standards (1)

No.	Nomenclature	Dust Standards (mg/N m ³)
1.	Cement Plants	
	200 tonnes per day	400
	>200 tonnes per day	250
2.	Stone-Crusher Unit	600 (suspended particulates)
3.	Aluminum	
	Calcination	250
	Smelting	150
4.	Calcium Carbide	
	Kiln	250
	Arc Furnace	150
5.	Carbon Black	150
6.	Copper, Lead and Zinc Smelting	150 < 0.4 % oxides of sulphur of tonne stock
7.	Nitric Acid	< 3 kg NOx/tonne weak acid
8.	Sulphuric Acid	< 4 kg SOx/tonne of acid produced
9.	Iron and Steel	
	Sintering Plant Steel Making	150
	During Normal Operation	150
	During Oxygen Lancing	400
	Rolling Mill	150
	Cake oven	< 3 kg/tonne of coke produced
10.	Thermal Power Plants	
	capacity > 210 MW	150
	capacity < 210 MW	350
11.	Asbestos Manufacture	pure asbestos material 4 fiber/00 total dust 2 mg/m ³ (normal)
12.	Color Alkali	
	(a) Mercury Cell	0.2 mg/Nm ³
	(b) all process	15 mg/Nm ³
	(c) All Process	350 mg/Nm ³ H cl
13.	Large pulp and paper	250 H ₂ S 10 mg/Nm ³
14.	Integrated Iron and Steel Plants	
	(a) coke oven	50
	(b) Refractory material plant	150
15.	Reverberatory	150 Sensitive Area 450 other area

Table 11-18 Ambient Air Quality Standards for Noise

Category of Areas	Limits in dB(A)	
	Daylight Hours	Evening Hours
	(6:00 ~ 21:00)	(21:00 ~ 6:00)
(A) Industrial Area	75	70
(B) Commercial Area	65	55
(C) Residential Area	55	45
(D) Quiet Zone	50	40
Mixed Category	Fixed by each administrative body	

Note-1: Day light is reckoned between 6 a.m. and 9 p.m.

Note -2: Evening hours are reckoned between 9 p.m. and 6 a.m.

Note-3 :The quiet zone is defined as areas upto 100 metres around such premises as hospitals, educational institutions, and courts. The Quiet Zones are to be declared by the competent Authority. Use of vehicular horns, loudspeakers, and bursting of crackers shall be banned in these zones.

Note-4: Mixed categories of areas be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply

India does have restrictions on the amounts of different hazardous waste types generated by factories. Factories in the 18 industries that discharge hazardous wastes must observe these standards. (Refer to Table 11-19).

One method employed by Japan to tackle the issue of industrial waste is through sustained efforts at the reduction of wastes. This is an issue that urgently needs to be addressed in India as well, as there too a shortage of waste disposal sites in the vicinity of major metropolitan areas can be expected in the future.

- iv) In India, 21 industry classifications are defined as polluting industries as listed in Table 11-20, and are required to submit environmental impact assessments. Seven such industries are represented among the proposed tenants on the IMT site, and these companies will need to submit environmental impact assessments with details of intended pollution control measures.

(2) Waste Treatment and Disposal System

The waste treatment and disposal system will be outlined in Fig. 11-16.

Table 11-19 Categories of Hazardous Wastes

Waste Categories	Types of Wastes	Regulatory Quantities
1	2	3
Waste Category No. 1	Cyanide Wastes	1 kilogramme per year calculated as cyanide.
Waste Category No. 2	Metal Finishing Wastes	10 kilogrammes per year the sum of the specified substance calculated as pure metal.
Waste Category No. 3	Waste containing water soluble chemical compounds of lead, copper, zinc, chromium, nickel, selenium, barium and antimony.	10 kilograms per year the sum of the specified substance calculated as pure metal.
Waste Category No. 4	Mercury, Arsenic, Thallium, and Cadmium bearing wastes.	5 kilogrammes per year the sum of the specified substance calculated as pure metal.
Waste Category No. 5	Non-halogenated hydrocarbons including solvents.	200 kilogrammes per year calculated as non-halogenated hydrocarbons.
Waste Category No. 6	Halogenated Hydrocarbons including solvents.	50 kilogrammes per year calculated as halogenated hydrocarbons.
Waste Category No. 7	Wastes from paints, pigments, glue, varnish, and printing ink.	250 kilogrammes per year calculated as oil or oil emulsions.
Waste Category No. 8	Wastes from Dyes and Dye intermediates containing inorganic chemical compounds.	200 kilogrammes per year calculated as inorganic chemicals.
Waste Category No. 9	Wastes from Dyes and Dye intermediates containing organic chemical compounds.	50 kilogrammes per year calculated as organic chemicals.
Waste Category No. 10	Waste oil and oil emulsions	1000 kilogrammes per year calculated as oil and oil emulsions.
Waste Category No. 11	Tarry wastes from refining and tar residues from distillation or pyrolytic treatment.	200 kilogrammes per year calculated as tar.
Waste Category No. 12	Sludges arising from treatment of waste waters containing heavy metals, toxic organics, oils, emulsions, and spent chemicals and incineration ash.	Irrespective of any quantity.
Waste Category No. 13	Phenols	5 kilogrammes per year calculated as phenols.
Waste Category No. 14	Asbestos	200 kilogrammes per year calculated as Asbestos.
Waste Category No. 15	Wastes from manufacturing of pesticides and herbicides and residues from pesticides and herbicides formulation units.	5 kilogrammes per year calculated as pesticides and their intermediate products.
Waste Category No. 16	Acid/Alkaline/Slurry	200 kilogrammes per year calculated as Acids/Alkalines.
Waste category No. 17	Off-specification and discarded products.	Irrespective of any quantity.
Waste Category No. 18	Discarded containers and containers liners of hazardous and toxic chemicals and wastes.	Irrespective of any quantity.

Source: The Hazardous Wastes (Management and Handling) Rules, 1989.

Table 11-20 List of Polluting Industries

No. 1*	Ferrous Metallurgical Industries	-- integrated iron and steel (metal) -- ferro-alloys -- special steels -- iron and steel castings and forgings
No. 2*	Non-Ferrous Metallurgical Industries	-- primary metallurgical producing industries, namely zinc, lead, copper and aluminum -- non-ferrous castings and forgings
No. 3	Mining Industries	-- coal washeries -- hydraulic mining -- hydraulic transport
No. 4	Ores/Mineral Processing Industries	-- Beneficiation and/or pelletization
No. 5	Coal (including coke) Industries	-- coal, lignite, coke, etc. -- fuel gases (coal gas, producer gas, water gas, etc.)
No. 6	Power Generating Industries	
No. 7*	Paper and Pulp (including paper products) Industries	-- paper: writing, printing, wrapping -- newsprint -- paperboard, strawboard -- pulp -- paper for packaging (corrugated papers, crafts paper, paper bags, etc.) -- wood pulp, mechanical, chemical (including dissolving pulp) -- sanitary paper -- cigarette paper -- insulation and other coated papers
No. 8	Fertilizer Industries	-- nitrogenous -- phosphatic -- mixed
No. 9	Cement Industries	-- portland cement (including slag cement, puzzolona cement and production) -- asbestos cement products

Table 11-20 List of Polluting Industries (continued)

No. 10	Petroleum Industries	-- oil production -- oil refining -- lubricating oils and greases -- oil exploration
No. 11	Petrochemicals Industries	
No. 12	Drugs and Pharmaceuticals Industries	-- narcotics, drugs, pharmaceuticals including vitamins (antibiotics, indigenous systems of medicines recovered)
No. 13	Fermentation Industries	-- alcohol (industrial and potable)
No. 14*	Rubber (natural & synthetic) including Rubber Products Industries	-- natural and synthetic rubber -- tyres and tubes -- surgical and medical products including prophylactics/latex wear -- footwear -- other rubber products
No. 15	Paint Industries	
No. 16*	Leather Tanning Industries	
No. 17	Electro-Plating Industries	
No. 18*	Chemical Industries	-- coke oven by-products (nitrogen, oxygen, acetylene, argon, carbondioxide, sulphur dioxide, nitrous oxide, halogenated hydrocarbon, ozone, etc.) -- industrial carbon -- alkalines -- electrochemicals (metallic sodium, potassium and magnesium, chlorates, perchlorates, and peroxides) -- electrothermal products (artificial abrasive, calcium carbide) -- phosphorus and its compounds -- nitrogenous compounds (cyanides, cyanamides, and other nitrogenous compounds) -- halogens and halogenated compounds (chlorine, fluorine, bromine and iodine) -- explosives (including industrial explosives and detonators and fuses)
No. 19	Insecticides, Fungicides, Herbicides, and other Pesticide Industries	
No. 20*	Synthetic Resins and Plastics	
No. 21	Manmade Fibre (Cellulosic and non-cellulosic) Industries	

Note *: expected operation in the IMT

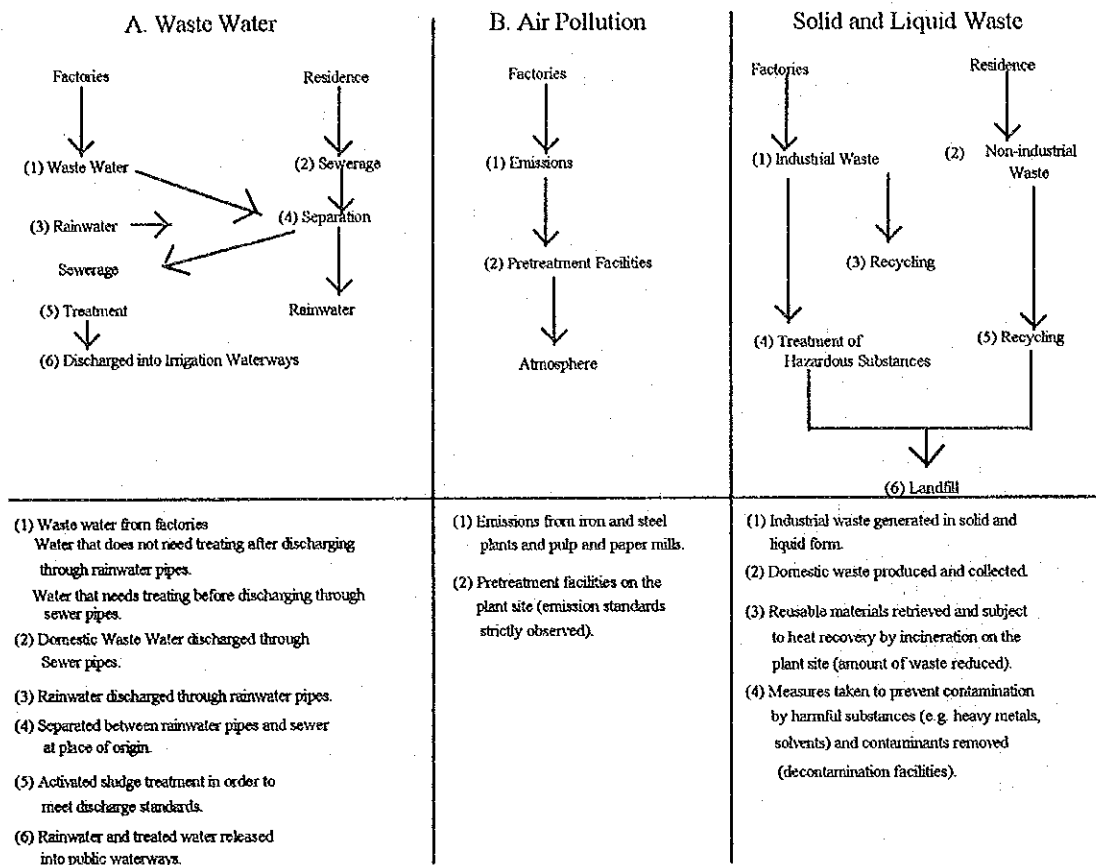


Figure 11-16 Waste Water and Waste Treatment and Disposal System

11.6 The Development Schedule and Management and Operation System

11.6.1 The Development Schedule

After completion of the IMT Master Plan Study, the following development stages should be followed for the successful implementation of the IMT.

- Feasibility Study
- Detailed Design
- Consolidation of the IMTPO and commencement of the IMTPO Activity
- Land Acquisition
- Land Reclamation and Infrastructure Development
- Facilities Construction

(1) Feasibility Study (F/S)

The screening of an appropriate site for the F/S, and review of the conceptual plan drafted during the Master Plan, should be accomplished. Feasibility of the IMT must be studied technically, and economically, to derive alternatives.

(2) Detailed Design

Financial resources and funds should be clarified and allocated for the construction works, as well as the specifications compiled for the technical documents with work drawings.

(3) Consolidation of the IMTPO and Activities

The IMTPO should be established in an early, preparatory stage for the commencement of investment promotion and the IMT works.

(4) Land Acquisition

Land acquisition should be based on the results of the feasibility study.

(5) Land Reclamation and Infrastructure Development

Land reclamation and infrastructure (water supply, sewerage, electric power supply, telecommunications) development should be executed for the IMT and residential area. The HSIDC and HUDA will directly undertake to execute the land reclamation and infrastructure development.

(6) Facilities Construction

The IMTPC facility will be constructed and the IMTPO will manage the IMT's day-to-day operations. Also, factory buildings and residential housing will be constructed. The implementation schedule described is shown in Figure 11-17.

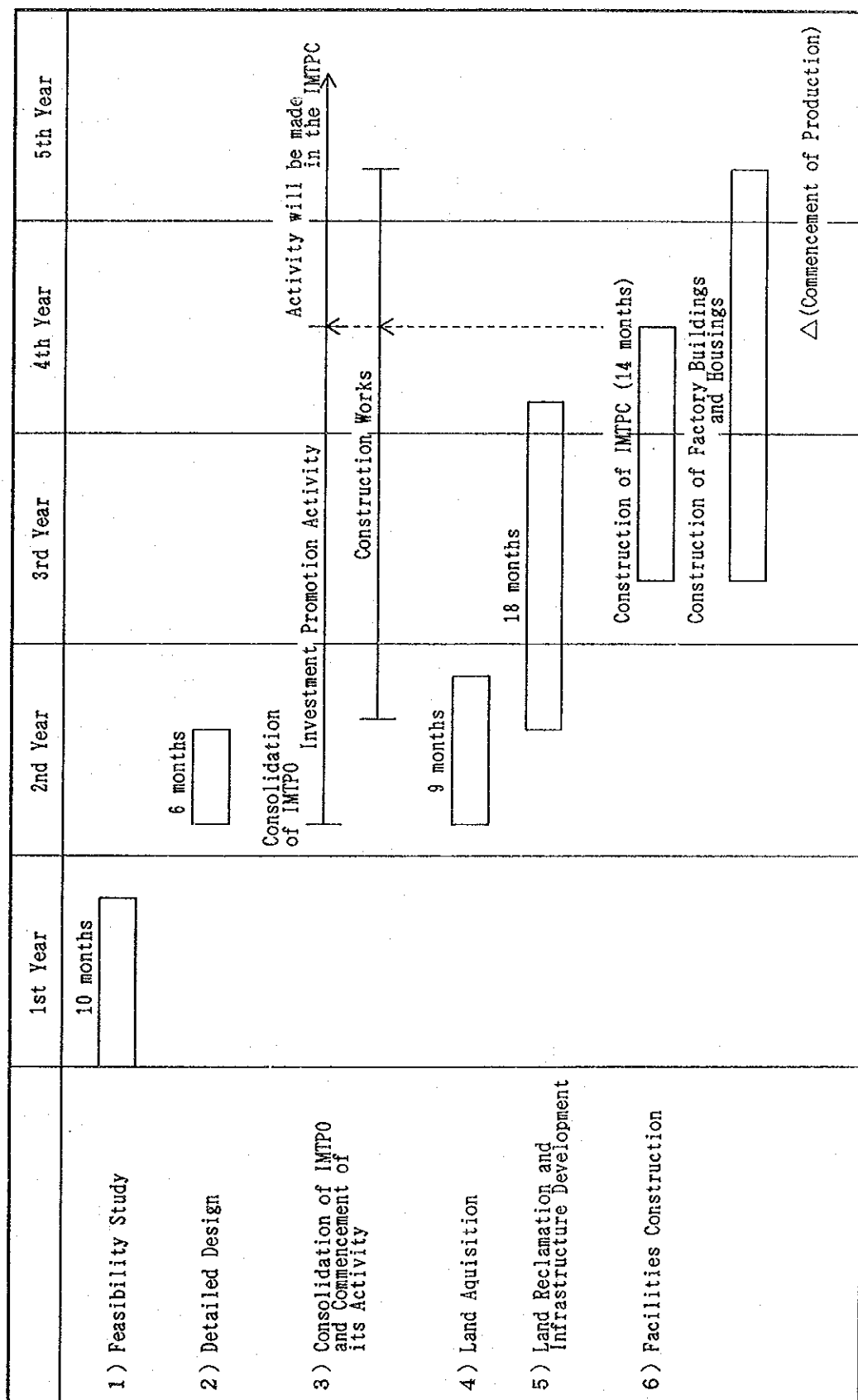


Figure 11-17 The IMT Development Schedule

11.6.2 Management and Operation

The IMTPO (provisionally termed) will have a management body represented as the IMT promotional centre (IMTPC) with a board of administrators under a chief executive officer. The chief executive officer will be responsible for the day-to-day IMTPC functions and activities. The IMTPC will consist of a planning and development division, a management services division, and a general administration division. The IMTPC will also have a liaison council representing the various companies located within the IMT. A complete description of the organisational structure of the IMTPC is illustrated in Figure 11-18.

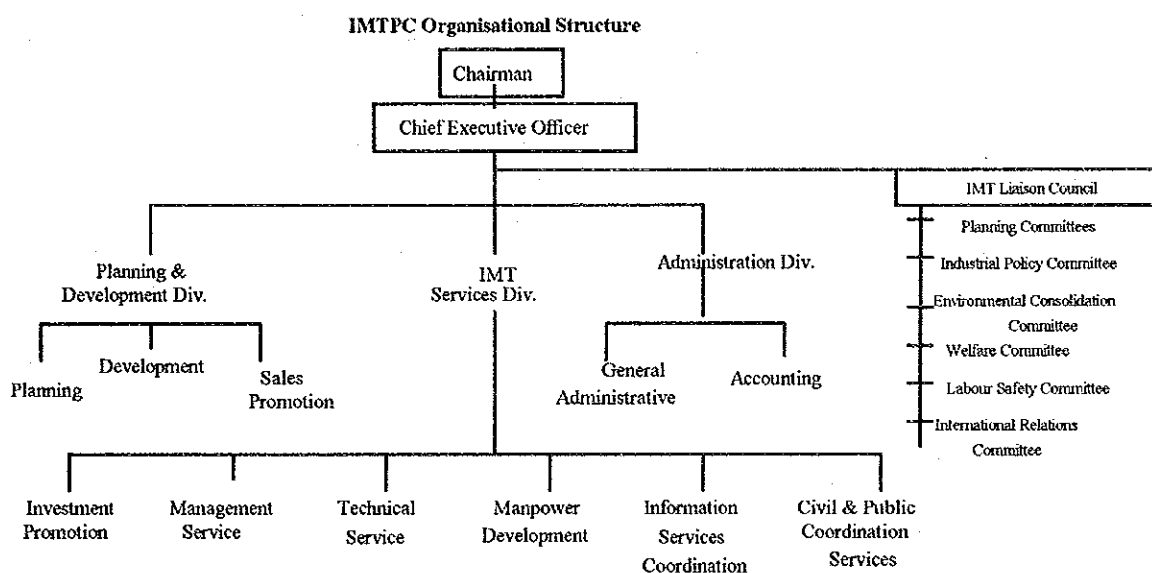


Figure 11-18 IMTPC Organisational Structure

(1) Planning and Development Division

The planning and development division will be responsible for establishing communication with state-level industrial development corporations upon implementation of an IMT project within the state, as well as provide sales promotion activities to garner foreign and domestic investors.

(2) Management Services Division

The management services division will provide assistance in six areas, such as investment promotion, management services, technical services, manpower development, information services coordination, and civil and public services.

(3) General Administration Division

The general administration division will provide general administrative and accounting services.

(4) Liaison Council

The liaison council members will consist of companies' representatives located within the IMT (it is strongly recommended that all IMT companies have a representative). The liaison council will act to effectively reflect the needs and observations of IMT enterprises, and provide feedback as to a company's general satisfaction with the IMTPC's activities and assistance.

CHAPTER 12 COST ESTIMATE AND FINANCIAL ANALYSIS

CHAPTER 12 COST ESTIMATE AND FINANCIAL ANALYSIS

In this chapter, the investment cost for the development of the Industrial Model Town is estimated based on the conceptual design mentioned in detail in Chapter 11, and the unit construction cost collected during the field survey. Following that, the sale and lease process of land and operation and management (O&M) costs are calculated based on the estimated development cost of the IMT. The financial feasibility of this project is evaluated by comparing the calculated prices with those of other industrial estates in India, and other countries.

12.1 Conditions and Assumptions for Cost Estimates

The following conditions and assumptions are applied to the cost estimate.

(1) Scope of the Cost Estimate

In this study, an investment cost estimate of the inside of the IMT was accomplished. As for a building, only the common facilities (administration centre, investment promotion centre, conference room, laboratory, etc.) have been included in the cost estimate. The investment costs for a power plant, water supply system, sewerage treatment and drainage facilities, and solid waste management system to be constructed as a utility facility of the IMT, have been estimated under a separate category.

(2) Price Base

Total costs are estimated in 1993 constant prices; inflation is not included.

(3) Currency and Exchange Rates

The estimates are in local currency (India Rupee), and any cost estimated in foreign currencies were converted to local currency by utilising the following exchange rates:

US\$ = Rs. 30.5 = 105 Japanese Yen.

(4) Taxes and Duties

All taxes and duties including customs duty, are not considered in this study.

(5) Disbursement Schedule

This study assumes that 40 per cent of the investment cost is paid in the first year, 40 per cent in the second year, and the remaining 20 per cent in the third year.

(6) Financing Plan

According to the guidelines of the IDBI, it is assumed that one third of the investment cost is in equity and the balance is financed by a loan(s). The loan interest rate is set at 16.5 per cent per annum based on the interest rates of the IDBI, IFCI, and the ICICI.

12.2 Cost Estimate

This study estimates the investment cost of the IMT and consists of the following six items.

- 1) Land acquisition cost
- 2) Direct construction cost
- 3) Engineering service cost
- 4) Administration cost
- 5) Contingency
- 6) Interest during construction period

(1) Land Acquisition Cost

The cost is estimated to be Rs. 742.2 million by multiplying a land area of 600 hectares by the unit cost of Rs. 123.7/m². The unit cost is calculated by adding compensatory acquisition charges and other costs to the average value of the land. Costs are as follows.

(a) Average value

An average value of the land at the selected site for the IMT is evaluated at Rs. 350,000 per acre, or Rs. 86.5/m², although values vary according to distance from a road.

(b) Compensatory acquisition charge

Cost is set at 30 per cent of the land's value, or Rs. 25.95/m², based on charges in and around Delhi.

(c) Other acquisition costs

Land acquisition requires various expenses including the costs of an organisation responsible for land acquisition. Costs estimates are derived from costs in and around Delhi. The cost is set at Rs. 11.25/m², equivalent to 10 per cent of the total land value and the compensatory acquisition charge.

(d) Unit cost

The unit cost of land acquisition amounts to Rs. 123.7/m², summing the costs of (a) to (c).

(2) Direct Construction Cost

Cost is for the construction works of the IMT, and excludes costs for engineering works and administration. The direct construction cost is separately estimated for the following six classifications: 1) land preparation; 2) roads; 3) landscaping; 4) common facility buildings; 5) electric installation; and 6) telecommunications.

(a) Land preparation

Land preparation costs are estimated at Rs. 390 million by multiplying the land preparation cost by the volume of earth and sand to be moved from leveling and dressing the site area. The unit cost of land preparation is set at Rs. 15/m², based on the data collected during the field survey. The volume of earth and sand is estimated to be 26 million m³ based on the area and grade.

(b) Road

The roads within the IMT site are to be asphalt. The cost is estimated to be Rs. 306 million, and is derived by multiplying the road area of 102 hectares by the unit construction cost of Rs. 300/m².

(c) Landscaping

The landscaping cost for park(s) and green belt is estimated to be Rs. 26.5 million, and was derived by multiplying the unit cost of Rs. 50/m² by an area of 53 hectares.

(d) Common facility

Construction cost for building common facilities is estimated at Rs. 55 million, and was derived by multiplying the total floor area by the unit construction cost of Rs. 5,500/m². The floor area is set at 10,000 m² according to the conceptual design.

(e) Electric installation

The costs of cable trench and street lights for the roads, park(s), and green belt are included as those to be incorporated into the land sales price. The cost of the cable trench is estimated to be Rs. 150 million, and is derived by multiplying the total length by the construction cost of Rs. 6,000/m. The total length of the trench is set at 25,000 metres based on the results of the conceptual design. The cost of street lights was estimated to be Rs. 31 million, and was derived by multiplying the total area of park(s) and green belt amounts by 155 hectares by the unit construction cost of Rs. 20/m². Thus, total electric installation costs are Rs. 181 million.

(f) Telecommunication system

Costs include expenses for telephone substation and lines for small factories in the IMT. The capacity of the substation is set at 100 lines and is based on the conceptual design described in Chapter 11. Substation costs are estimated at Rs. 1 million based on the capacity and unit cost of Rs. 10,000/line. The cost of cable is estimated to be Rs. 1 million based on the estimated total length of 1,000 metres and the unit costs of Rs. 1,000/m. Thus, the total cost of telecommunication system amounts to Rs. 2 million.

(g) Total direct construction cost

The direct construction cost amounts to Rs. 960.5 million, and is derived by summing the above costs (a) to (f).

(3) Engineering Service

The direct construction cost mentioned above is estimated based on the unit construction cost collected during the field survey, and the cost for engineering works and administration were not included. The cost of engineering works such as detail design and construction supervision was estimated at Rs. 96.5 million, equivalent to 10 per cent of the direct construction cost referenced in and around Delhi.

(4) Administration Expense

Project administration costs are equivalent to 5 per cent of the total direct construction cost, about Rs. 48.03 million.

(5) Contingency

Contingency is provided for budget cost overruns during the construction stage due to a lack of detailed information and unknown factors during the conceptual design stage. Considering there are many uncertainties at the initial stage of the project, 20 per cent of the total cost excluding land acquisition cost is estimated for the contingency. Total cost from the above (1) to (4), and the contingency is shown below.

Land acquisition	:	Rs. 742,200,000
Direct construction costs	:	Rs. 960,500,000
Engineering service costs	:	Rs. 96,050,000
Administration cost	:	Rs. 48,025,000
Contingency	:	Rs. 220,915,000
<hr/>		
Total	:	Rs. 2,067,690,000

(6) Total Investment Cost

The above costs, total Rs. 2,068 million, was divided annually, and the interest during the construction period is calculated based on the financial plan. Tables 12-1 and 12-2, give the total investment cost, including interest charges during the construction period.

Table 12-1 Total Investment Cost

(Unit: Rs. Thousands)

Year	1	2	3	Total
Total cost excluding IDC	827,076	827,076	413,538	2,067,690
Interest during Construction	45,489	143,973	235,963	424,425
Total Project Cost	872,565	971,049	649,501	2,493,115
Equity	275,692	275,692	137,846	689,230
Long-term loan	596,873	695,357	511,655	1,803,885
Total Project Cost	872,565	971,049	649,501	2,493,115

Table 12-2 Breakdown of Total Investment Costs

(Unit: Rs. Thousands)

Item	Required Cost
(1) Land Acquisition	742,200
(2) Direct Construction Cost	960,500
Land Preparation	390,000
Road	306,000
Landscaping	26,500
Common Facility	55,000
Electricity	181,000
Telecommunication	2,000
(3) Engineering Service	96,050
(4) Administration Expense	48,025
(5) Contingency	220,915
(6) Interest Charge During Construction	425,425
(7) Grand Total	2,493,115

12.3 Utility Cost

Describes the charges for electricity, water supply system, sewerage treatment and drainage facilities, and solid waste management system to be constructed as a utility facility of the IMT.

(1) Power Plant

Construction of a power plant consisting of two units of gas turbine generators (one for standby) with a capacity of 25 MW is assumed. Estimates for the generating cost of this power plant follow.

(a) Construction Costs

Based on the results of the field survey, the total construction cost is estimated to be Rs. 1,250 million, (Rs. 625 million per unit). The Haryana State Government provides Rs. 1,200/kWh (Rs. 1,460/kW) subsidy for industry-owned power plants. Thus, the estimated cost of Rs. 1,177 million was derived by deducting subsidy amounts of Rs. 73 million from the above costs.

(b) Operation Cost

The operation cost of a power plant is broadly divided into fuel and fixed costs.

i) Fuel Cost

A consumption volume of natural gas is estimated at 5,721 m³/hour by the following formula:

$$\text{Natural Gas Consumption Volume} = \text{ER} \times \text{RC} \times \text{ALF} / \text{CV}$$

where

ER	=	Energy Requirement	=	12,000 BTU/kWh
RC	=	Rated Capacity of Generator	=	25,000 kW
ALF	=	Average Load Factor of Generator	=	70 per cent
CV	=	Calorific Value of Natural Gas	=	36,706 BTU/m ³ (9,250 Kcal/m ³)

An annual gas cost estimate is Rs. 145,336,284 based on the following formula:

where

CV	=	Natural Gas Consumption Vol.	=	5,721 m ³ /hour
OH	=	Operating Hours	=	8,760 hours
UP	=	Unit Price Natural Gas	=	Rs. 2.9/m ³

ii) Fixed cost

The fixed operation cost including wages, maintenance, depreciation and interest is estimated at Rs. 153 million/year, or 13 per cent of the construction cost.

iii) Generating Cost

The generating cost is calculated to be 1.95 Rs./kWh by dividing the total operation cost amounts to 298.34 million Rs/year by the annual generating output (153.3 million kWh).

(2) Water Supply System

The water supply system with a capacity of 52,300 m³/day will be constructed in the IMT. In this section, the water supply charge to cover the required cost is estimated based on the construction and operation costs.

(a) Construction cost

The construction cost was estimated based on the unit costs collected during the field survey and discussions with the Haryana PWD, and summarises the result in Table 12-3. The land acquisition cost shown in Table 12-3 is the cost of the land used for the construction of the following facilities.

- Rising main from water source to the IMT.
- Water treatment facility to be constructed outside the IMT.

Table 12-3 Water Supply System: Construction Cost

(Unit: Rs. million)	
Item	Estimated Cost
Outside IMT	
Storage Tank for Raw Water (157,000 m ³)	17.4
Water Treatment Plant (52,300 m ³ /day)	36.0
Storage Tank for Treated Water (6,000 m ³)	6.7
Rising Main	96.0
Railway Crossing	2.5
Land Acquisition	7.2
Sub-total	165.8
Inside the IMT	
Boosting Station	86.3
Piping Network	97.5
Sub-total	183.8
Grand Total	349.6

(b) Operation cost

The operation cost estimate is summarised in Table 12-4.

Table 12-4 Water Supply System: Operation Cost

(Unit: Rs. million/yr.)	
Item	Cost Estimate
Establishments	2.0
Energy Charge	13.0
Consumable	1.5
Raw Water Charge	1.0
Total	17.5

(c) Water supply charge

A water supply charge was estimated at Rs. 1.83/m³ by dividing the annual cost by the annual supply volume of 19.09 million m³. The annual cost is calculated at Rs. 34.98 million by summing the above operation cost amounts to Rs. 17.5 million and the depreciation costs of Rs. 17.48 million (5 per cent of the construction cost; 20 year straight line method).

(3) Sewerage Treatment and Drainage Facilities

The treatment facilities for industrial and domestic waste water and storm water will be constructed in the IMT.

(a) Construction cost

Table 12-5 gives the treatment facilities construction cost for industrial and domestic waste water and storm water.

Table 12-5 Sewerage Treatment and Drainage Facility: Construction Cost

(Unit: Rs. million)	
Item	Cost Estimate
Sewerage treatment	
Treatment Plant (47,100 m ³ /day)	94.2
Piping Network	82.5
Sub-total	176.7
Drainage	
Pumping Station	12.5
Piping Network	67.5
Water Channel	2.1
Railway Crossing	4.0
Sub-total	86.1
Grand Total	262.8

(b) Operation cost

The operation cost estimate is summarised in Table 12-6.

Table 12-6 Sewerage Treatment and Drainage Facility: Operation Cost

(Unit: Rs. million/year)	
Item	Cost Estimate
Sewerage treatment	
Establishments	1.2
Energy Charge	1.0
Consumables	0.2
Sub-total	2.4
Drainage	
Establishments	0.4
Energy Charge	0.35
Consumables	0.05
Sub-total	0.80
Total	3.20

(c) Sewerage treatment and drainage charge

The annual cost was calculated to be Rs. 16.34 million by summing the above operation cost amounts to Rs. 3.2 million and the depreciation cost of Rs. 13.14 million (5 per cent of the construction cost; 20 year straight line method). The unit charge estimate is Rs. 0.86/m³ of feed water by dividing the annual cost by the volume of water supply (19.09 m³/year).

(4) Solid Waste Management

Many solid wastes will be discharged from the IMT factories and residences. It is assumed that special and/or toxic wastes are separately treated by each factory and the IMT is responsible only for treating general wastes. As for treatment, based on the system of industrial estates in and around Delhi, composting utilising a landfill is proposed.

(a) Primary Assumptions

The cost for solid waste management is estimated based on the following assumptions.

- Quantity of industrial solid waste : 50 tone/day
- Quantity of domestic solid waste : 25 ton/day
- Density of solid waste : 0.1 ton/m³
- Landfill site location : 10 km from IMT
- Capacity of one truck : 5 m³
- Density of compacted solid waste : 0.3 ton/m³

(b) Investment Cost

The investment cost for composting solid waste is broadly divided into land costs for dumping, transportation vehicles, and other equipment.

i) land acquisition cost

The solid waste transported by vehicles is compacted and placed in a landfill. The volume of compacted solid waste is estimated at 91,250 m³/year, based on the previously described assumptions, and with an estimated operating calendar of 365 days/year. The required landfill area is calculated at 30,417 m²/year by dividing the above volumes by a 3 metres estimated landfill depth. Land acquisition costs are estimated to be Rs. 2.28 million/year by multiplying the unit cost by the above area. The unit land cost is set at Rs. 75/m² based on the field survey.

ii) vehicle transportation costs

The solid waste volume discharged from the IMT is estimated at 750 m³/day determined from weight and density. To transport that volume of waste, 150 trucks (capacity of 5 m³) are required. The number of trucks was estimated to be 38 and was derived by dividing the total requirement by assuming four working trips per day. The required cost for purchasing the trucks is estimated to be Rs. 33.6 million by multiplying the current price of trucks used for this purpose (Rs. 80,000 per truck).

iii) other equipment costs

In addition to the above, other types of equipment are necessary at the IMT and landfill sites. The primary equipment required for solid waste management at the IMT site is a trolley for manual transportation and the garbage bins. At the landfill site, dozers and levelers are required. Other equipment costs are estimated at Rs. 4 million based on discussions with HSIDC and HUDA officials.

iv) total investment cost

Total investment cost for the solid waste management system total Rs. 39.88 million by summing the above costs.

(c) Operation cost

Labour costs for collection, manual transportation, and the dumping of wastes are estimated to be Rs. 2.4 million per year assuming that 200 workers are employed at a cost of Rs. 12,000 per worker/year. The operation and maintenance costs for the 42 trucks are estimated at Rs. 6.13 million per year based on an estimated unit cost of Rs. 400/truck/day. Operation and maintenance costs for other equipment are estimated at Rs. 0.4 million per year which is equivalent to 10 per cent of the investment costs. The total operation cost is estimated to be Rs. 8.93 million per year by summing the above three costs.

(d) Charge for solid waste management

Based on the above, an annual cost for solid waste management is estimated as follows:

- Land Acquisition:
 $30,417 \text{ m}^2/\text{year} \times \text{Rs. } 75/\text{m}^2 = \text{Rs. } 2,281,275/\text{year}$
- Depreciation of trucks (10 years straight line):
 $\text{Rs. } 33,600,000/10 \text{ years} = \text{Rs. } 3,360,000/\text{year}$
- Depreciation of other equipment (20 years straight line):
 $\text{Rs. } 4,000,000/20 \text{ years} = \text{Rs. } 200,000/\text{year}$
- Operation Cost: $= \text{Rs. } 8,932,000/\text{year}$

Total $= \text{Rs. } 14,773,275/\text{year}$

The charge for solid waste management is estimated at Rs. 540/ton by dividing the above annual cost by the estimated discharge amount of 27,375 tons/year (75 tons per day).

12.4 Financial Analysis

12.4.1 Financial Analysis Methodology

During the feasibility study stage, a financial analysis will be accomplished utilising a cash flow table for evaluating cash surpluses and/or deficits. Then, a financial internal rate of return (FIRR) will be calculated utilising the discount cash flow method as an indicator of profits. Master Plan Study, however, is not an appropriate point at which to accomplish such a detailed analysis. Accordingly, a financial analysis was conducted using the following methodology.

- Sale and lease prices of the IMT are calculated based on the estimated investment cost.
- The financial feasibility of the IMT project is evaluated by comparing the calculated land sale and lease prices with those of other industrial estates in India and ASEAN member countries.
- If the calculated prices are not competitive with those of other industrial estates, the study team recommends measures to promote the project as financially feasible.

12.4.2 Land Sale and Lease Price

(1) Land Sales

Land sales price was calculated at Rs. 583/m² by dividing the total investment costs of Rs. 2,493 million by 428 hectares.

(2) Land Lease

The land lease charge was set to recover the investment cost. It was calculated utilising the following formula.

$$a = A \times \frac{r(1+r)^{n-1}}{(1+r)^n - 1} \div 12$$

where,

a = Lease Price (Rs./m²/month)

A = Sale Price (Rs/m²)

r = Discount Rate (%)

n = Payment Period (years)

Discount rate and payment period is assumed to be 15 per cent and 30 years, respectively. From the above, the monthly land charge is Rs. 6.43/m².

12.4.3 Operation and Maintenance Cost

In order to sustain the operation and maintenance of the IMT, O&M charges are introduced to the factories, residences, and commercial facilities. In the industrial estates in and around Delhi, the annual O&M cost is normally set at 2 to 2.5 per cent of the total investment cost, although this varies with the organisation and function of the estate. Considering that the IMT has various functions that are not found in other estates in India, the O&M cost is set at 3 per cent of the total investment cost excluding those for utility facilities. Thus, the O&M cost of the IMT per square metre of land is Rs. 17.48/year (Rs. 1.46/moth).

12.4.4 Comparison with Other Estates

The calculated land sale and lease prices are compared with those of other industrial estates, and the results are summarised in Table 12-7. As given in the table, the calculated land sale and lease prices of the IMT are competitive with those of other industrial estates. Accordingly, it can be concluded that the IMT can be attractive to foreign investors if the premises used in this study do not significantly change, and if the investment circumstances of

India are improved to a level that ensures equally profitable undertakings compared with ASEAN member countries.

Table 12-7 Land Sales and Lease Costs Comparison

Name of Estate		Sale Cost (US\$/m ²)	Lease Cost (US\$/m ² /month)
India			
IMT		19	0.21
Noida		20	N.A.
Thailand			
Jong Stit	25 km from Bangkok	56	N.A.
Bang Pakong	57 km from Bangkok	59	N.A.
Well Glow (EPZ)	57 km from Bangkok	78	N.A.
Hi-Tech	60 km from Bangkok	55	N.A.
Rojana	70 km from Bangkok	50	N.A.
Chon Buri	120 km from Bangkok	50	N.A.
Laem Chabang	128 km from Bangkok	N.A.	0.15
Eastern	190 km from Bangkok	59	N.A.
Indonesia			
Nusantara Bonded Zone	Jakarta	N.A.	0.31
Citra Habitat	29 km from Jarkata	33	N.A.
Pasar Kemis	30 km from Jarkata	33	0.66
Great Jakarta	30 km from Jarkata	33	N.A.
Bekasi International	40 km from Jarkata	40	N.A.
Bekasi Industrial Park	40 km from Jarkata	41	N.A.
Malaysia			
Prai	Penang	N.A.	2.67
Bayan Lepas FTZ	Penang	N.A.	2.88
Kertech	Terengganu	N.A.	0.94
Telok Kalong	Terenggau	N.A.	0.55
Batu Berendam	Melaka	N.A.	1.78
Alor Gajah	Melaka	N.A.	1.03
Singapore			
Loyang	Jurong	N.A.	0.72
Jurong	Jurong	N.A.	1.03
Woodland	Jurong	N.A.	0.76
Woodland East	Jurong	N.A.	0.72

Source: ASEAN Industrial Estate Guidebook, ASEAN Center, Japan.

Note: The study team converted the original data into US\$ by using an exchange rate of US\$1 = 120 Japanese yen.

12.5 Summary

(1) Investment Costs

The total investment costs are Rs. 4,322.4 million (US\$141.7 million) for the development of the IMT, including the utility facilities, and are shown in the following table.

Table 12-8 Summary of Investment Costs

(Unit: Rs. million)

Item	Investment Costs
Industrial Model Town (excluding utility facilities)	2,493.1
Power Generation Facility	1,177.0
Water Supply Facility	349.6
Sewage Treatment and Drainage Facility	262.8
Solid Waste Management System	39.9
Total	4,322.4

(2) Price and Charge

The prices of land and charges for utilities and services of the IMT are as follows:

- Land Sale Price	:	Rs.583 (US\$19.10)/m ²
- Land Lease Price	:	Rs.6.43 (US\$0.21)/m ² /month
- Operation and Maintenance Charge	:	Rs.1.46 (US\$0.05)/m ² /month
- Electricity (from insite plant)	:	Rs.1.83 (US\$0.06)/k/Wh
- Water Supply (including sewage and drainage):	:	Rs.2.69 (US\$0.09)/m ³
- Solid Waste Management	:	Rs.540 (US\$17.70)/ton

CHAPTER 13 PROMOTING FOREIGN INVESTMENT: RECOMMENDATIONS

CHAPTER 13 Promoting Foreign Investment: Recommendations

Foreign investments to India significantly increased after announcement of the "NIP-91" due in part to India's potentially large domestic market and the country's inexpensive and abundant labour supply. However, competition for foreign investors will intensify in the near future due to investment opportunities in China and Vietnam. To effectively compete with these circumstances, India must initiate more attractive incentives that currently prevail.

Although there are many factors for promoting investment, the following points as key factors when considering investment to a country.

- (1) Political Stability
- (2) Public Peace and Order
- (3) Infrastructure
- (4) Ancillary Industries
- (5) Expansion for Research and Development Ability

Considering the above, the study team proposes recommendations in accordance with the following principles:

- (1) Comparison studies of competitive Asian and neighboring countries with India.
- (2) To eliminate obstacles for the promotion of foreign investments by analyzing foreign investors' issues.
- (3) To fully consider the country's small and medium scale industries, and directing the domestic market industries as well as large scale industries.
- (4) To provide for expansion and development of India's economy, particularly related to industrial development.
- (5) To propose pragmatic amendments as a result of discussions with the Government of India and concerned authorities.

13.1 General Issues for Investment Promotion: Recommendations

As described above, foreign investment amounts sharply increased after introduction of "NIP-91", primarily in the fields of electric power and petroleum-related industries which required huge capital investments. To further promote foreign investments to the country's industrial base, the following subjects are recommended.

13.1.1 India's Investment Climate: Public Relations Efforts

Potential investors from Japan, the United States, and Germany, were found to be not well informed about India's present investment climate as previously described. In particular, small and medium-sized potential investors lacked adequate overseas information channels. Thus, the following recommendations are presented:

- (1) Investment promotion centers in overseas will be enriched.
- (2) Investment seminars will be held more frequently overseas.
- (3) Special issues about India in overseas respectable news print media will be planned.
- (4) Enhancing the relationships of economic federations between India and other countries, and promote the invitation of economic delegations from abroad.

13.1.2 The Improvement of the Government of India Regulations and Policies

The Indian Government has implemented occasional improvements of its regulations beginning with the "NIP-91", but further improvements are required. The following recommendations are suggested:

- (1) Investment Approval Scheme

Automatic investment approval industries in India are 35 industries and trading houses with the foreign equity of less than 51 percent. This restriction is not competitive with other foreign countries investment promotion efforts. Therefore, this present approval scheme should be expanded to other industries to contribute to development of domestic industries such as the scheme is abolished. Easing of this restriction is expected to attract foreign investors.

(2) Dividend Balancing System

The Dividend Balancing System which is presently applied to consumer goods manufacturing industries will be abolished. Consumer goods manufacturing industries are attractive investment opportunities for foreign investors, and foreign investment in these industries will significantly help domestic industries improve productivity and product quality.

(3) Mandatory Convertibility Clause

Foreign investors are very sensitive to the guarantee that their companies are not nationalised by the government, which is one of important conditions for investment. Nationalisation is still applied for companies established before "NIP-91", was eliminated for newly established. As foreign investors may consider that more favourable decision would be given by the government, and postpone their investment, the Mandatory Convertibility Clause will be completely abolished.

(4) Import Negative List

Component imports are unavoidable for new industries (especially at the initial stages), therefore, clear descriptions about the import negative items list is strongly recommended to avoid unnecessary confusion.

(5) Technology Collaboration Contract

Boundary of automatic approval for royalty is described in the Indian Rupee. Due to foreign exchange fluctuations, a boundary amount in Rupee currency does not reflect the actual worth of foreign collaborations. Improvement in the boundary of automatic approval for royalties, is recommended.

(6) Investment Restricted Industries

Although automobiles and white goods were liberalized from restricted industries which were obligated under industry licenses, entertainment electronics is under the control industries. Therefore, this restriction will be reconsidered.

13.1.3 Improvement in Practical Procedures

(1) Establishment of adequate communications systems for official notices of the central government.

(a) Announcements in Official Gazettes and Press Notices

(b) Establishment of a system to notify by detailed Circular Letters

(c) Monthly seminars reporting government actions by the chambers of commerce and industry and/or the Confederation of Indian Industry, in each city

(2) Single Window Services

As a fundamental, simplification of the present governmental procedures is expected. The least the function of "Single Window" will be enhanced and concerned persons will be authorised broad power, or other measures will be taken to simplifying the procedures.

13.2 Special Treatment for IMT

To successfully implement the IMT Project, special arrangements and incentives should be provided to industries locating in the IMT. Domestic investors will also be able to enjoy special advantages as well as foreign investors, and both groups will develop beneficial relationships. Incentives that are provided during the initial stages of the IMT implementation will be subsequently diminished over time.

13.2.1 Establishment of Legal Standings

The IMT projects will grow across India as EPZs developed for the activation of India's industries. Therefore, similar legal arrangements arranged for EPZs should be enacted for IMT industries. The Ministry of Industry is expected to govern the IMT's industrial developments, and the Ministry of Commerce governs EPZs for export promotions.

13.2.2 Central Government's Special Actions

(1) Automatic Approval for Investments

For all industries participating in the IMT, except for eight industries (Annex I, reserved only for the Public Sector and 16 industries (Annex II, required Industrial License), will be automatically approved.

(2) Industrial License

Entertainment Electronics (VCRs, Color TVs, CD Players, Tape Recorders, etc.) will be eliminated from the List of Annex II (Industrial License obligation). This also falls under the subject of general investment promotion issues discussed above, and if improvement as a general matter is difficult, special consideration should be provided limited to IMT Projects.

(3) Dividend Balancing

Same as above. Dividend Balancing should not be applied to the IMT industries' manufactured consumer goods.

(4) MRTP Act

The MRTP Act should not be applied to IMT industries and/or EPZ industries.

(5) Tax Incentives

(a) Corporate Income Tax

The Indian Government provides five year corporate income tax exemptions for new industries in the designated industrially backward areas for development and in the EPZ for promotion of exports.

Neighboring countries, Pakistan, Bangladesh and Sri Lanka, are providing tax exemption for five to fifteen years as well. From the view point of comparison with these competitive countries, India is required to provide the same level of incentives.

China, Vietnam, and Indonesia are considered as competing with India for foreign investment funds. These countries, in fact, are not providing such tax incentives, but can compete based on other superior areas, such as geographic location, economical distance, etc., which are closer to Japan and other East Asian countries, major investment countries than to India. Under these circumstances, India should provide at least equal incentives to neighboring countries. For providing attractive incentive to foreign investors, furthermore, phased program will be taken such as 50 per cent deduction of corporate tax for the following two years after tax is fully imposed from eighth year of operation. This incentive will be provided to New Industries 100 percent owned by domestic equities in the IMT.

(b) Import Duties for Capital Goods

Import duties for capital goods installed for IMT industries should be exempted as EPZ industries enjoy free import duties on capital goods, and main and sub-materials, components, spare-parts for equipment, packing materials, et cetera.

Because capital goods have an important influence on productivity, it is desirable to allow investors to purchase from any area. This has significant merit from long-term effectiveness for developing domestic industries by foreign investment rather than the increase of import tax or domestic purchases of capital goods. Import taxes for capital goods in neighbouring countries, (such as Pakistan) exempts it for designated industries, and Thailand, Malaysia, Indonesia, Philippines, and China are also adopting import duty exemption policies. Under the circumstances considering these competitive countries' policies, India should exempt import duties for capital goods for industries established in the particular area such as the IMT.

(c) Withholding Taxes

Withholding taxes for dividends and royalties on joint ventures and technical collaboration with foreign companies should be exempted for five years.

(6) Special Finance

The Industrial Development Bank of India (IDBI), the Industrial Financing Corporation of India, the State Financing Corporation (SFC), and the State Industrial

Development Corporation (SIDC) etc., are providing medium and long term loans of 12 to 20 years with 3 to 5 year grace periods at one percent below normal commercial bank rates. Additional special interest rates, for example, two percent below the normal commercial bank rate, will be expected for the IMT.

13.2.3 State Governments' Special Incentives

Successful implementation of the IMT Projects will result in the further industrial development in the states, therefore, state governments should provide special incentives for the IMT Industries. Recommendations for the State of Haryana are as follows:

(1) Sales Tax

Sales taxes will be exempted for nine years with a limit of 150 per cent of invested capital for IMT industries; designated as "A Zone", in spite of the fact that the candidate IMT site of Gurgaon is located actually in designated "B Zone" in Haryana.

(2) Octroi

The octroi for capital goods, construction materials, production materials, etc., will be exempted for nine years as treated in "A Zone".

(3) Capital Subsidy

The state governments will provide invested capital subsidies of a maximum Rs. 75 million for IMT industries as designated pioneer industries.

(4) Subsidy for Environment Counter Measures

The state governments will provide Rs. 5 million maximum for environmental counter measures for IMT industries as other state (The State of Karnataka).

(5) Electricity Duty

Electricity duty (2 percent of electricity fees) will be exempted for 5 years.

CHAPTER 14 SOCIAL ENVIRONMENTAL IMPACT ASSESSMENT

CHAPTER 14 SOCIAL ENVIRONMENTAL IMPACT ASSESSMENT

14.1 An Overview of the Social Environmental Impact Assessment (SEIA)

14.1.1 The SEIA Objective

The SEIA purports to identify the consequent effects and impact a particular project may produce as a result of proximity to populated settlements. The SEIA also attempts to estimate the social environmental changes accrued from such an impact, and develops mitigation or prevention measures in response to the impact assessment. The results of an SEIA ultimately facilitates the implementation of projects through physical, legislative, and institutional instruments of mitigation. If the results of an SEIA demonstrate that the greatest degree of negative impact could not be mitigated or rehabilitated, then the assessment can suggest an alternative project location, or an alternative to the original plan.

The SEIA in the IMT Master Plan Study is the initial assessment of the social environment of the candidate site, and is in preparation for the detailed SEIA that is implemented during the feasibility stage.

The SEIA describes a site in Gurgaon District, the State of Haryana.

14.1.2 Definition of Social Environment

Based on preliminary investigations and documented findings for the candidate sites, the IMT project social environment was defined as follows:

- | | | |
|--|--|--------------------------------------|
| •Land Use and Relocation | •Economic Activities | •Disruption of Community Relations |
| •Transportation | •Social Infrastructure (hospitals schools, etc.) | •Poor living conditions (slum issue) |
| •Historical and Religious Preservation | •Natural Preservation | •NGO's activity |

The social environment variables were investigated at the site, and 10 km. and 25 km. radius distances from the center of the candidate site.

14.1.3 SEIA Method

- (1) The SEIA begins with an estimation of the IMT project scale (See Figure 14-1). Although the IMT project scale is as yet undocumented, a quantitative estimate of the IMT project's impact cannot be derived. However, discussions with the study team urban planner provided an approximate project scale that led to an estimate of the project's environmental impact.
- (2) Fact finding surveys were accomplished for the study area within 10 km and 25 km from the candidate site. Three primary information sources were utilised to collect documentation related to the social environmental impact. The Census Statistics of India, 1991, interviews with central and state government officials, and a physical inspection and survey of the candidate site.

Census data for the villages within Gurgaon District was available as a database. Demographic data for the immediate surrounding villages of the Gurgaon candidate site, and the villages within 10 km radius distance from the project site were identified from the database. Statistical descriptions of the area demographics provided details utilised prior to the interview and site investigation.

- (3) Study hypotheses are generated regarding the social environmental impact during the screening process. The social environmental impact variables are listed, and associated changes in the social environment are examined. The screening is a simulation process to estimate the project impact on the site. Below is a simple flow diagram depicting the research process steps.
- (4) The research hypotheses are discussed, the social environmental changes are documented, the mitigation or alternatives to the site location are prepared and examined, and finally the scope of the full scale SEIA for the feasibility study is discussed and documented.

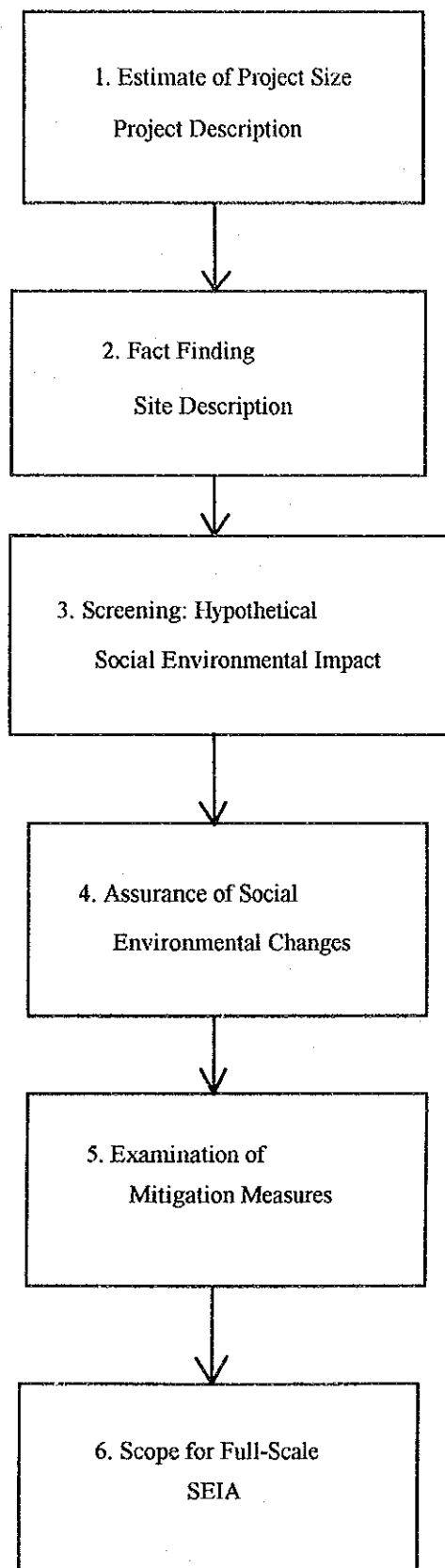


Figure 14-1 Method of SEIA for IMT Project

14.1.4 Estimate of Project Size (Project Description)

To conceptualize the size of IMT, estimates for the number of employees, total IMT population, number of housing units, residential plots, roads, green, and other facilities associated with public and commercial uses are identified.

The size of the industrial area, and other land uses were estimated to be 400 ha. and 200 ha. based on data obtained regarding a NOIDA industrial estate. The estimations however, do not constrain an urban planner; instead, the results are a method for arriving at a reliable approximate size of the IMT project for the SEIA purpose.

Table 14-1: Project Size of IMT (for SEIA purpose only)

1) Employee : 50 Nos./ha X 400 ha = 20,000 of which Managers and Engineers (20%) = 4,000 Skilled & Semiskilled (60%) = 12,000 Unskilled (20%) = 4,000
2) Population (50% of employees reside in IMT) M & T 2,000 Nos X 3 person/h.h = 6,000 S & SS 6,000 X 5 = 30,000 US 2,000 X 5 = 10,000 TOTAL = 46,000 Daytime population = 56,000 Nighttime population = 46,000
3) Land use a) Industrial = 400ha b) Housing 46,000pop. / 250 nos./ha = 184ha -Road 25% of housing = 46ha -Green 20% of housing = 37ha -Housing 55% = 101ha c) Public and Commerce = 60ha

Note : Estimation by SEIA analyst.