# 8. CASE STUDY FOR SIMPANG NEW TOWN

- The proposed Simpang New Town, located at the northern part of the island, is expected to accommodate around 30,000 dwelling units or 120,000 persons. A preliminary plan has been prepared by HDB. Simpang New Town may be characterized, as follows:

  (a) Its land area, which extends 4 kms northwest to southeast and 2 kms northeast to southwest, covers about 700 ha, including two offshore islands, 50 ha and 90 ha, respectively.

  (b) The terrain is flat and the northeast and southeast edges face the strait of Johore.

  (c) The area immediately adjoins Yishun New Town, with a planned size of 919 ha, 60,000 dwelling units and a population of about 230,000. (About 70% has been completed as of March 1986.)

  (d) An approximate distance of 20 kms separate Simpang New Town and the CBD. The MRT will be extended to Yishun in 1990. A direct link with the expressway is not planned.

- New towns are designed based on the neighbourhood concept. The features of the neighbourhood unit will basically fit the proposed new transit system when a station is allocated to a neighbourhood unit. Each neighbourhood unit would have a radius of 300 to 350 meters centred on a station to allow ease of access. If the current planning concept is modified to have better integration with the new transit system, additional advantages are expected, such as clear segregation of car from pedestrian, better control of cars entering into the community and a resultant increase in environmental amenity.

- From the transport planning viewpoint, the basic functions of the new transit system required at the new town level are:

  - Efficient linkage among various land uses, particularly providing connections between residential areas and other destinations within new town.

  - Efficient link between Simpang New Town and the CBD must be provided. In order to minimize the distance to/from the CBD, the proposed transport system must be linked directly to the MRT via proper transfer facilities. Since Yishun New Town is large enough to have its own system, Simpang system will be separated from Yishun one.

- Alternative plans were prepared. Their common features are:

  (a) Even based on the conventional planning concept of new towns, the catchment area of the proposed system can be considerably extensive. A neighbourhood unit comprising about 5,000 households can only be served by a single station within a reasonable walking distance.

  (b) By allocating community facilities and other traffic generating sources at or near the station, accessibility can be further improved.

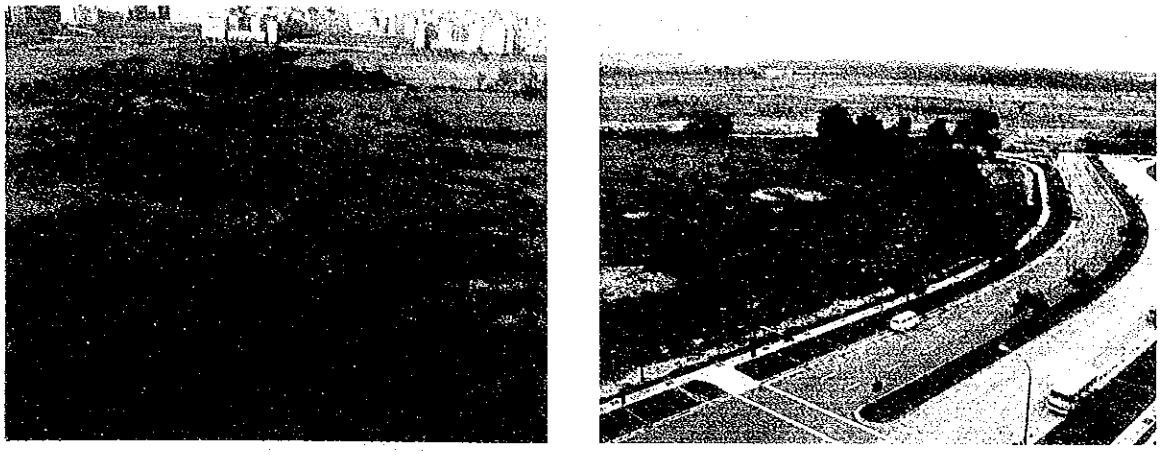


Figure 17

A Modal of a New Town Integrated with a New Transit System

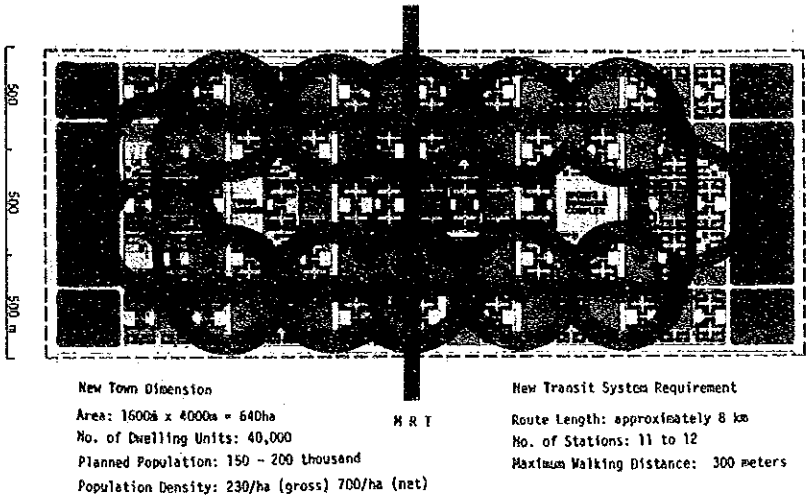



Figure 18 Basic Transport Structure and Neighbourhood Unit

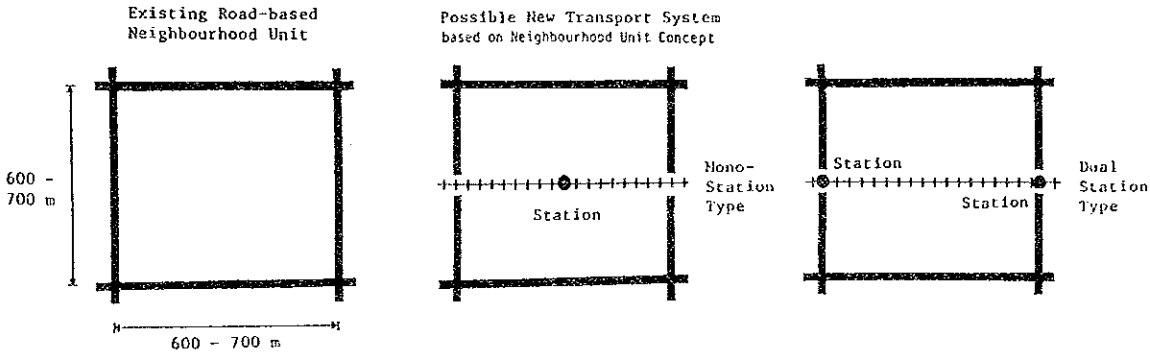
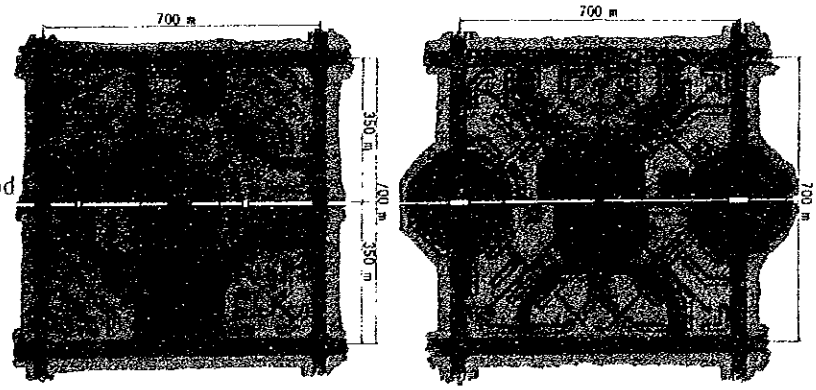



Figure 19

Alternative Planning Concept for Neighbourhood Unit Integrated with New Transit System



(c) The most expensive single component of a new transit system investment is structures. If the system can be constructed as such that less structures are used, the investment cost of this system can be greatly reduced.

The advantages are on both cost and demand aspects.

- The transport demand of Simpang New Town was estimated based on the trip rate and travel pattern analyzed in Ang Mo Kio New Town. Total traffic demand was estimated to be about 307,000 person trips/day. Considering the geographical location and transport network of the country, it is likely that the people would rely more on the MRT when a good feeder system is provided. Simpang New Town can be designed in such a way that people can access new transit system station with ease at a maximum walking distance of 350 to 400 meters, or with an average walking distance of about 200 meters. The entire area can be fully covered by frequent, comfortable, and fast services. It is, therefore, not impossible to attract almost all public transport passengers and even expect considerable diversion from private transport. The estimated passenger ridership on the proposed system can reach 150,000 to 200,000 passengers a day, or even more.

- The preliminary physical plan for the proposed transport system of Simpang New Town has the following characteristics:

  (a) The proposed transport system will have a total route of 25.0 km (single track length), including a connection with Yishun MRT station.

  (b) The alignment within the new town is basically at-grade. However, where the system intersects with roads or pedestrian paths, it will be grade-separated either above or below ground level.

  (c) With relatively long station spacing made possible due to integrated development, the average scheduled speed will be 26 to 29 kph.

  (d) Loop routes within the new town will encourage access to various facilities and residential units located in other neighbourhoods and strengthen the community bond of the residents.

  (e) Stations will also be constructed according to the same planning concept. Not only stairs but also slope and lift, when and where necessary, will be provided to facilitate easy access and use of stations.

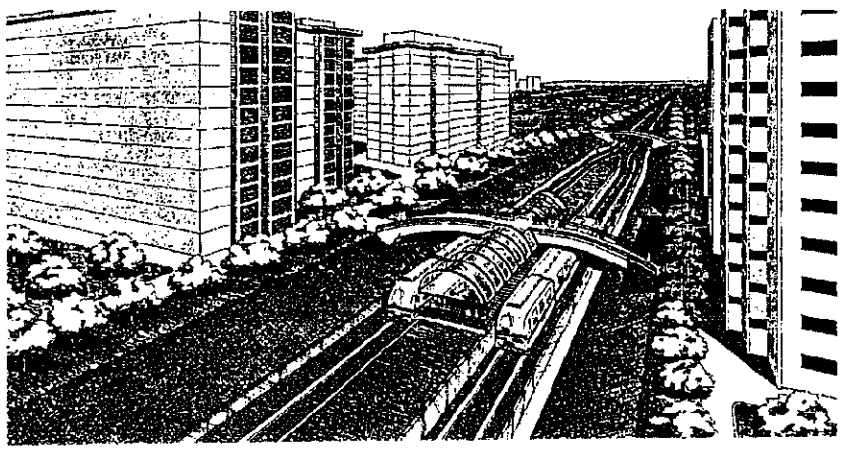


Figure 20 Conceptual Development Plan for Simpang New Town

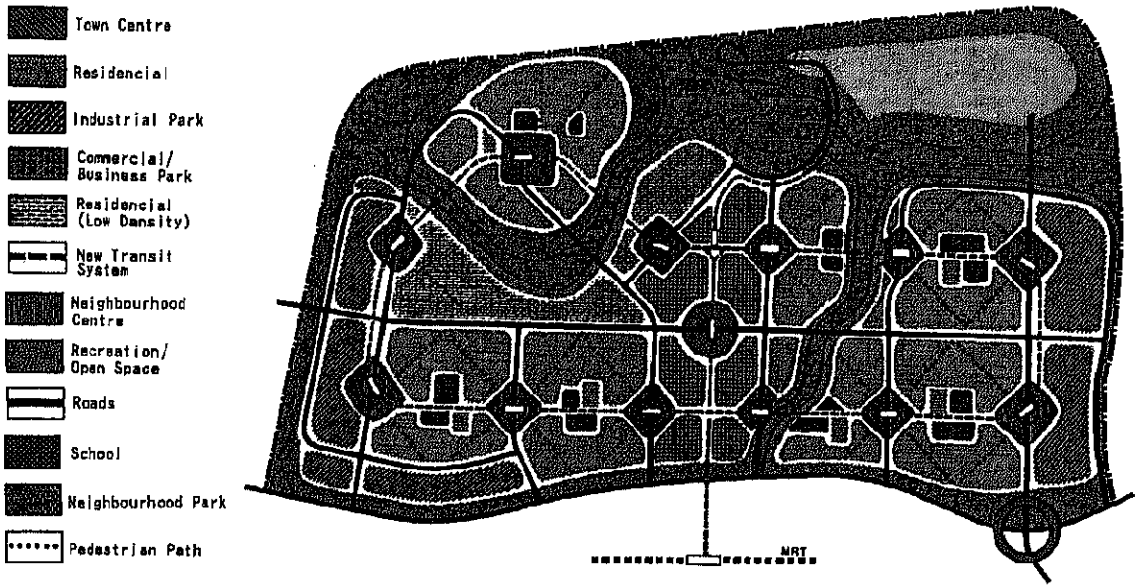



Figure 21 Conceptual Plans for Stations

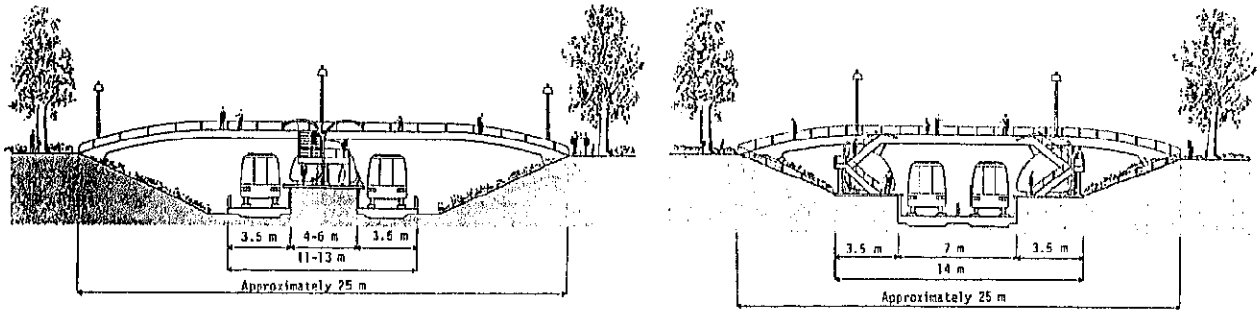
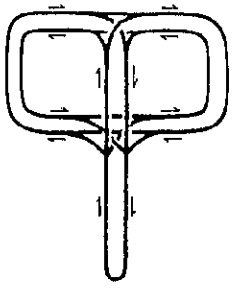



Figure 22

Route Structure of the Proposed System



| | Description |
|---|---|
| Service 1<br>-Length : 20.6 km<br>-Turnaround Time : 26 min 5 sec<br>-Scheduled Speed : 27.6 | INNER CIRCLE anti-clockwise movement / OUTER CIRCLE clockwise movement |
| Service 2<br>-Length : 11.2 km<br>-Turnaround Time : 23 min 20 sec<br>- Scheduled Speed: 28.9 | |
| Service 3<br>-Length : 7.4 km<br>-Turnaround Time : 16 min 55 sec<br>-Scheduled Speed : 26.1 | |
| Service 4<br>-Length : 7.9/7.5 km<br>-Turnaround Time : 14 min 55 sec / 14 min 10 sec<br>-Scheduled Speed : 28.7/29.7 | Inner Circle Outer Circle / Inner Circle Outer Circle |

- Cost estimate was made based on the information of Ang Mo Kio system. However, for civil work the physical conditions of the project site were duly considered.

  The estimated total investment cost is approximately S$306 million. The investment cost/km is only about S$12 million/km even with the inclusion of a grade-separated section between Yishun MRT station and the new town. This is largely due to the difference in civil work for grade-separated and depressed carriageways.

  The operating cost is S$8.7 million or S$18,780/day.

Table 15

Estimated Investment Cost for Proposed Simpang New Town System

| Cost Item | Amount (S$000) | % |
|---|---|---|
| 1) Civil work | | |
| a) Viaduct/Bridge 1/ | 39,220 | 12.8 |
| b) At grade Carriageway | 44,660 | 14.6 |
| Sub-Total | 83,880 | 27.4 |
| 2) Station/ Terminal and Building | 19,370 | 6.3 |
| 3) Depot | 27,850 | 9.1 |
| 4) Vehicles | 71,760 | 23.5 |
| 5) Power Supply System | 53,420 | 17.5 |
| 6) Control/Signalling/ Telecom Systems | 49,590 | 16.2 |
| Total | 305,870 | 100.0 |
| Cost/Km (Single track length) | 12,230 | |

1/ including approach portion between Yishun MRT Station and New Town of S$19.95 million.

Table 16

Estimated Operating Cost for Proposed Simpang New Town System

| Cost Item | Amount (S$000) | % |
|---|---|---|
| 1) Vehicle Maintenance | 2,212 | 25.4 |
| 2) Maintenance of Equipment and Facilities | 2,418 | 27.8 |
| 3) Electric Consumption | 2,085 | 24.0 |
| 4) Manpower | 1,199 | 13.8 |
| 5) Overhead: 10% of the above | 771 | 9.1 |
| Total: per year | 8,705 | 100.0 |
| per day (S$) | 23,849 | |

Table 17

Comparison of Construction Cost Between Grade-Separated and Depressed Carriageways S$000

| Grade-Separated | Depressed |
|---|---|
| S$12,280/km | S$6,810/km |

- The economic viability of this project is significantly high due to the reduced construction cost and the increased accessibility through the integrated development approach. The proposed system will also contribute to the reduction in space of major roads by 15 to 25% of the total road space. The estimated savings from road construction is approximately S$28 million.

  With an estimated passenger patronage of 200,000/day, the project would generate an FIRR of 3.4% at the assumed fare of S¢30/trip (if the government shoulders civil works and station costs). An increase in fare to S¢40/trip, on the other hand, would generate an FIRR of 4.3%, even without government involvement, except land. If the project shoulders only the vehicle cost, the FIRR would be 15.6%, even with a S¢30 fare. This implies that the cost of infrastructures can be included into the new town development cost, while the operation is maintained by users of the system.

- Positive effects on landscaping and overall amenity of new town due to the construction of the project would be more significant than in the case of Ang Mo Kio, as opportunities of coordinated and integrated developments are higher.

Table 18. Comparison of Road Space Required for Neighbourhood Unit "with" and "without" New Transit System

| Plan Based on: | Road Type | Road Width (m) | Road Length (m) | Area (sqm) | Area % to the Whole Area |
|---|---|---|---|---|---|
| Existing HDB Concept | Ave-1: Primary Access | 31.8 | 1,400 | 22,260 1/ | 4.5 |
| | Ave-2: Secondary Access | 26.2 | 2,100 | 36,680 1/ | 7.5 |
| | Street: Local Access | 18.0 | 2,100 | 37,800 | 7.7 |
| | Total | - | 5,600 | 96,740 | 19.7 |
| NTS Based Concept, Alternative 1: (Mono Station) | Ave-1: Primary Access | 31.8 | 1,400 | 22,260 1/ | 4.5 |
| | Ave-2: Secondary Access | 26.2 | 1,400 | 18,340 1/ | 3.8 |
| | Street: Local Access | 18.0 | 1,700 | 30,600 | 6.3 |
| | Sub Total | - | 4,500 | 71,200 | 14.6 |
| | New Transit System | 7+7 3/ | 700 | 9,800 | 2.0 |
| | Total (Road + NTS) | - | - | 81,000 | 16.6 |
| | Saving: Road only | - | - | 25,540 | 26.4 2/ |
| | Saving: Road + NTS | - | - | 15,740 | 16.3 2/ |
| NTS Based Concept, Alternative 2: (Dual Station) | Ave-1: Primary Access | 31.8 | 1,400 | 22,260 1/ | 4.5 |
| | Ave-2: Secondary Access | 26.2 | 1,400 | 18,340 1/ | 3.8 |
| | Street: Local Access | 18.0 | 1,800 | 32,400 | 6.6 |
| | Sub Total | - | 4,600 | 73,340 | 14.9 |
| | New Transit System | 7+7 3/ | 700 | 9,800 | 2.0 |
| | Total (Road + NTS) | - | - | 83,100 | 16.9 |
| | Saving: Road only | - | - | 23,400 | 24.2 2/ |
| | Saving: Road + NTS | - | - | 13,640 | 14.1 2/ |

Total Area of Neighbourhood Community: 49 ha

Note: 1/ only half of the road space is included.

2/ % is against the road space of existing HDB concept plan.

3/ only 7 meter is required for carriage way, while additional 7 meter is included for maintenance.

Table 19. Comparison of Construction Costs of Ang Mo Kio and Simpang New Transit System

| Item | Unit | Unit Price :S$ | Quantity | Amount S$000 |
|---|---|---|---|---|
| A. Grade-Separated Carriageway: | | | | |
| Viaduct and Bridge | | | | |
| 1) P. C. Girder | M3 | 1,080 | 5,730 | 6,188 |
| 2) Steel Girder | T | 8,160 | 200 | 1,632 |
| 3) Pier R. C. (A) | M3 | 600 | 1,890 | 1,134 |
| 4) Pier R. C. (B) | M3 | 600 | 220 | 132 |
| 5) Driving Pile ϕ600 | M | 170 | 2,400 | 408 |
| 6) Earthwork 1/ | M3 | 980 | 670 | 657 |
| 7) Others | L.S | | | 1,013 |
| 8) Contigency | L.S | | | 1,116 |
| Sub-total | | | | 12,280 |
| B. Depressed Carriageway | | | | |
| 1) Earthwork | M3 | 18 | 28,050 | 505 |
| 2) Driving Pile ϕ600 | M | 170 | 20,000 | 3,400 |
| 3) Drainage | M | 131 | 2,000 | 262 |
| 4) Slope Surface | M2 | 40 | 6,480 | 259 |
| 5) Slab Concrete | M3 | 500 | 2,400 | 1,200 |
| 6) Others | L.S | | | 562 |
| 7) Contingency | L.S | | | 619 |
| Sub-total | | | | 6,807 |

1/ Trench Sheet

# 9. CASE STUDY FOR OTHER AREAS

## A. ANG MO KIO HOUGANG-MARINE PARADE ROUTE

- The study area comprises three major communities; Ang Mo Kio and Hougang new towns and Katong. The study area has a population of 230,000 and 66,000 employment in 1981 (excluding Ang Mo Kio new town) and since then, has been growing rapidly. The route provides the first major circumferential transit service in this region and links central corridor with eastern corridor directly. The route extends 12.6 km with a grade separated system.

  The expected passengers are mainly three types; traffic moving within the study area, feeder traffic to/from the MRT and trunk bus and inter-zonal traffic moving along the route. The estimated daily volume of passengers for each type are 27,500, 53,500, and 31,600, respectively. A potential 112,600 passengers form roughly 17% of the total traffic demand of the study area. A high density of traffic is foreseen in the sections between Ang Mo Kio and Upper Serangoon Road and near the MRT in Katong area, where the sectional traffic was estimated to be about 55,000/day.

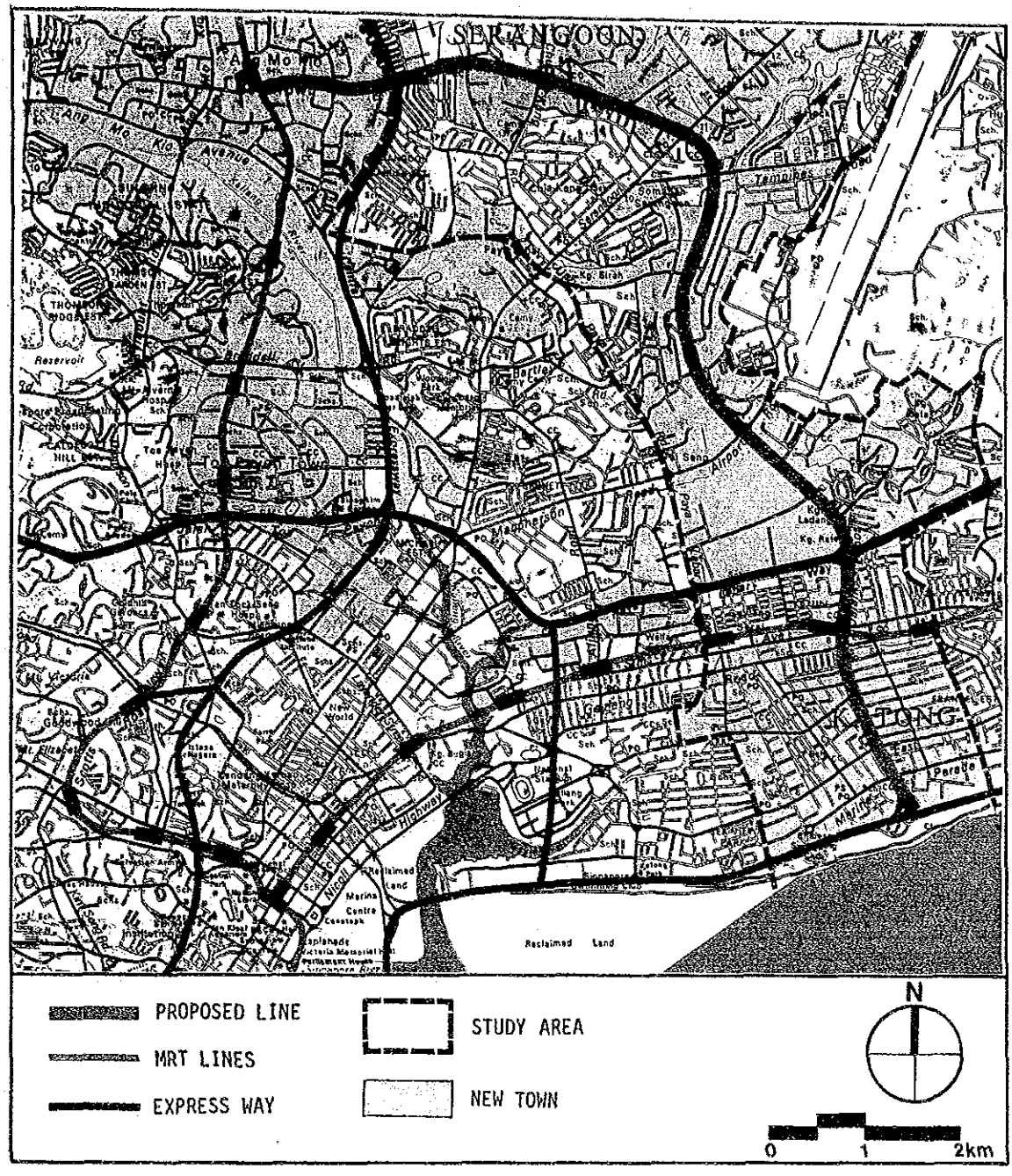
- The same system as that for Ang Mo Kio has been selected to be integrated with the Ang Mo Kio system. Accordingly, the integrated system will not only function as a feeder transport but also as a vital secondary transport route to strengthen and complement the trunk system. With Ang Mo Kio new transit system completed, incremental cost benefit ratio for this route becomes more favorable. There are 18 stations with an average station spacing of 700 meters. The system provides services at three minutes intervals during peak hours and 5 to 6 minutes during off-peak hours with two-car trains. The average travel time is 25 minutes (one way) with a scheduled speed of 29 kph. The estimated construction cost of the project is about S$340 million or S$13.3 million/km. Operating and maintenance costs are S$6.6 million/year or S$17,950/day on the average.

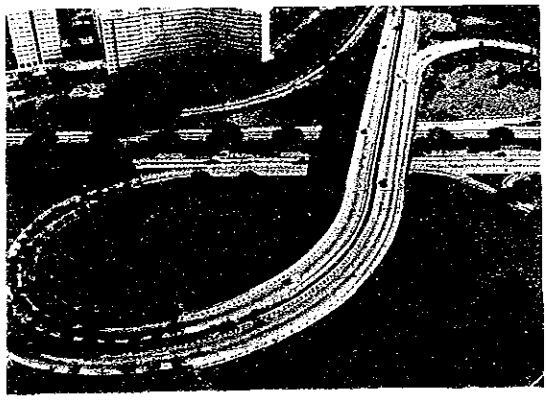
- The project is economically feasible. Time savings of 5 minutes per passenger alone would give a B/C ratio of 1.4 at 2% discount rate or EIRR of about 5%. The expected impact of this project is also on the urban development. It is more likely that the introduction of high-grade transit system in the area isolated from the MRT system will encourage the development of sub-centres.

  Financial viability of the project is assured if the government will assist in providing part of the infrastructure costs. If civil works and station costs are shouldered, the project generates FIRR of 5% and 10% under the average fare of S¢50 and S¢70 for 100,000 riders a day, respectively.

Figure 23

Ang Mo Kio-Hougang-Marina Parade Route



B. ORCHARD-SENTOSA ROUTE

- The study area is characterized by a combination of different land uses. Orchard and Sentosa are two major tourist destinations, and the areas in between comprise of new town, industrial area, commercial area, and others. Approximately 150,000 persons in 1981 reside in the area. Two projects are currently underway. One is the construction of a causeway to link Sentosa Island with the Mainland. The other is to develop Sentosa Island farther to attract more visitors from the 1987 record of 2 million to about 4 million in the early part of 1990s.

  The estimated total traffic demand of the area is about 435,000 trips/day, of which the potential demand for the proposed system is roughly 100,000 trips/day. Non tourism traffic of about 90,000 trips/day is dominant during weekdays, while Sentosa traffic will increase sharply to about 40,000 on Sundays and holidays after the completion of the planned development.

- Options for the system will include minimonorails (straddle type and suspension type) and the type of Ang Mo Kio new town. The system for the route should be separated from the existing and future systems of Sentosa Island considering that the required performance is different between the two systems and handling of visitors and control of entrance are easier. The proposed route runs through 5.6 kms, double-track, with 10 stations of an average spacing of 620 meters. The system with a 150 passenger capacity train provides services at three minutes interval during peak hours and 5 to 6 minutes during off-peak hours. The estimated construction cost of the project is S$158.8 million or S$14.2 million/km. Operating and maintenance costs total S$3.6 million/year or S$9,800/day on the average.

- The project can also be considered economically feasible by taking into account expected time savings only. The estimated B/C ratio of the project is 1.7 at 2% discount rate. If the average fare of S¢50 for 100,000 passengers can be charged, the project will generate an attractive financial return of about 15%.(It is assumed that Government will shoulder civil work and station costs including land.)

  One unique characteristic of this route is its role in providing a direct link between Orchard area and Sentosa. This route, therefore, will not only encourage tourism development in Sentosa but will also integrate two strategic areas. The system must be developed in an integral manner with the urban/tourism developments.

Figure 24

Orchard-Sentosa Route

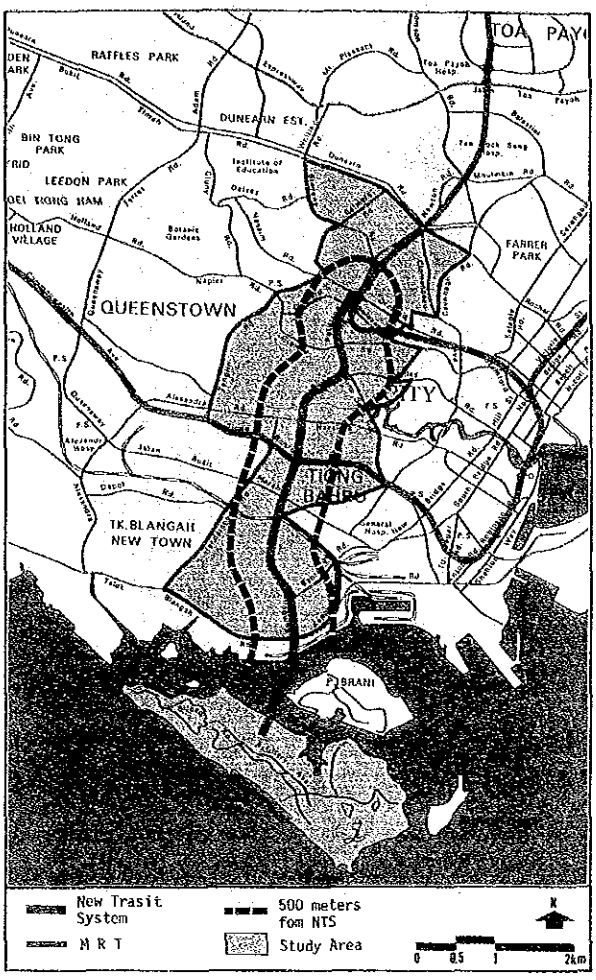



Figure 25

Interface of the Proposed System with Intra-island System

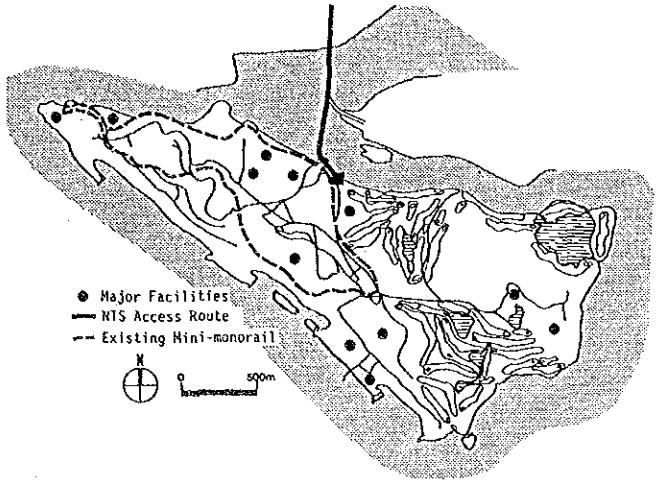
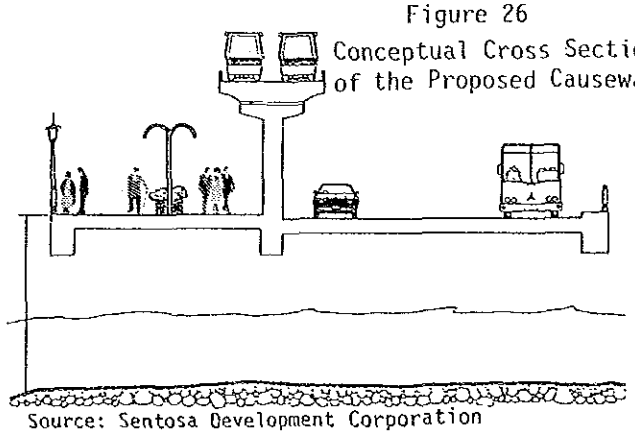
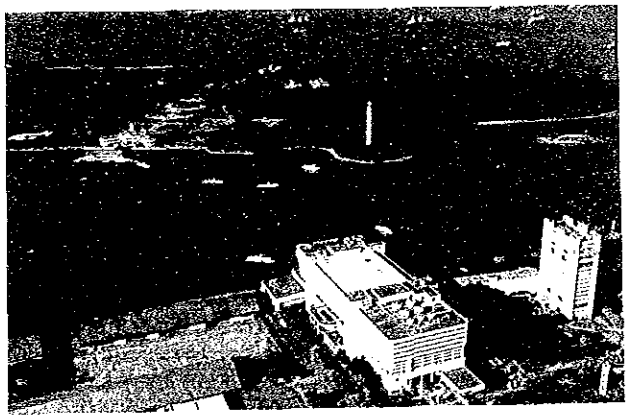


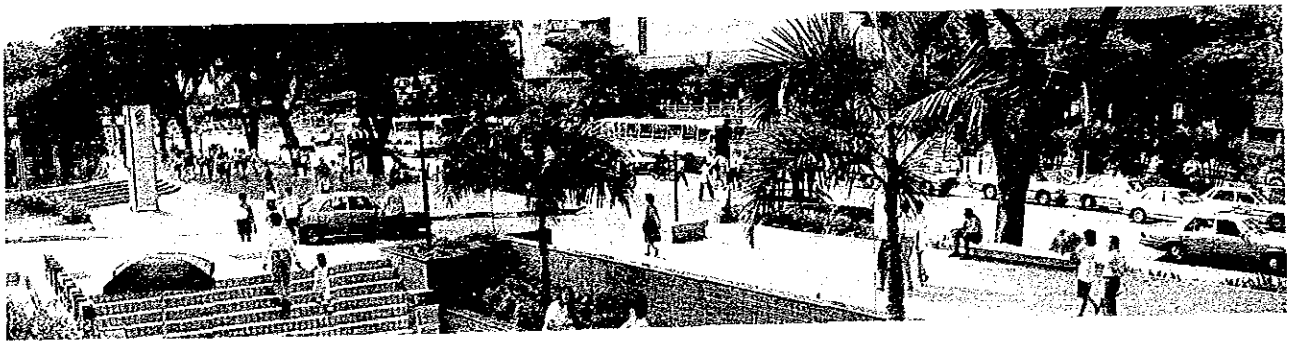

Figure 26

Conceptual Cross Section of the Proposed Causeway



Source: Sentosa Development Corporation





## C. ORCHARD-MARINA CENTRE ROUTE

- The study area covers Orchard, Bras Basah, and Marina Centre. In 1981, the population was only 18,000 while employment was 64,000. It has been estimated that population will decrease to 13,000, while employment will increase to 101,000 by 1990.

  Total traffic demand of the area is about 420,000. Potential demand for the proposed system consists of the existing motorized trips moving within the area, feeder traffic to/from the MRT and trunk bus and diversion from pedestrians. With all modes of transport with good coverage and services, potential traffic demand is not expected to be so large in terms of volume. There is, however, a higher percentage of tourists and shoppers,and, thus, patronage to the proposed system , may be largely affected by the level and nature of services which the system can provide. It is estimated that the proposed system would attract roughly 50 to 60 thousand passengers a day.

- The new transit system is aimed at revitalizing both transportation (accessibility) and urban development. The existing internal transport system, including walking, does not necessarily provide a high level of services, while the additional commercial developments are restricted by the capabilities of the exsisting transport system. This Project intends to propose a concept of improving and encouraging internal activities through the introduction of a new transit system that considers users requirements, flexible operation, aesthetic appeal, and urban development. In this context, a suspension-type mini-monorail was selected.

- The route consists of two loop routes; one with a length of 5.1 kms to serve the Orchard area and the other with a length of 3.7 kms to cover Marina Centre and Bras Basah areas. A number of stations were allocated close to the major buildings to facilitate direct access to passengers. A total of 34 stations were provided with average station spacing of about 250 meters. The system with smaller passenger capacity provide frequent services throughout the day.

  Construction cost is estimated to be S$235 million for both systems. Unit construction cost of S$26.7million/km is expected due to the extensive use of steel structures and the difficulties of constructing structures and stations in heavily developed areas along the proposed route. Operation and maintenance costs are about S$2.9 million/year or S$7,940/day.

- The economic viability of this proposal needs examination more in its integration/compatibility with urban development than purely from transportation aspect, although the expected benefits from transportation (mainly time savings) are considered large.

  The associated financial viability also depends largely on the extent the government can provide the infrastucture costs. If the government can cover civil works cost, while commercial establishments cover station cost and and users take care of the rest, the project is financially viable with the assumed fare of about S¢1.0 for 50,000 passengers.

Figure 27

Orchard-Marina Centre Route

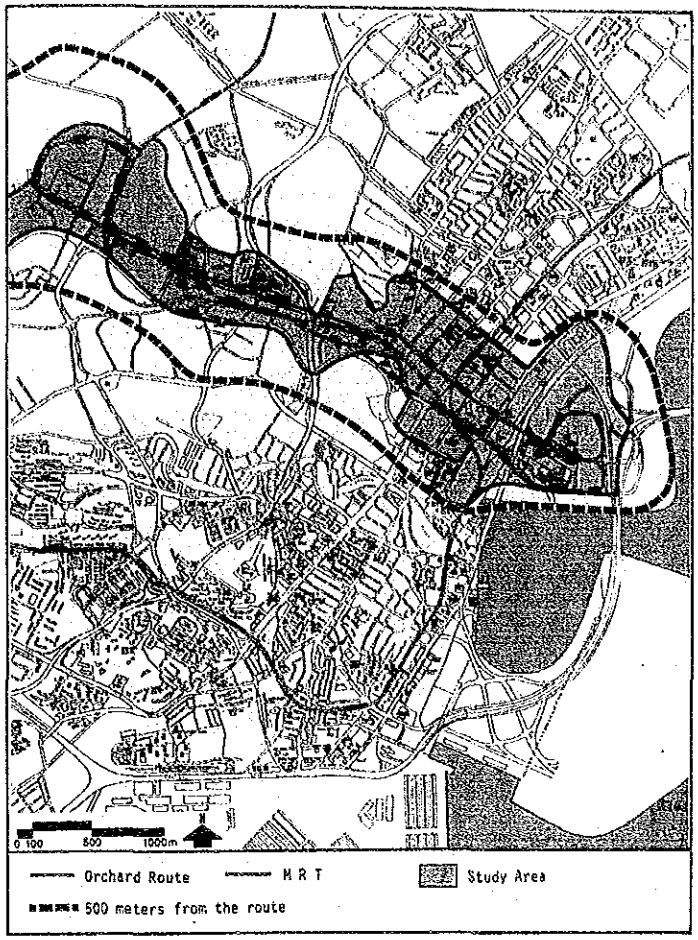



Table 20

Outline of the Operation of the Proposed System for Orchard Corridor Route

| Item | Loop A | Loop B |
|---|---|---|
| 1) Route of Length | 5.1 km | 3.7 km |
| 2) No. Stations | 21 | 13 |
| 3) Ave. Section Spacing | 245 | 280 meters |
| 4) No. of Trains | 11 + 2 (spare) | 7 + 2 (spare) |
| 5) No. of Cars/Trains | 1 | 1 |
| 6) No. of Cars Required | 13 | 9 |
| 7) Capacity of a Car | 45 passengers | 45 passengers |
| 8) Headway : peak | 1.5 -2 | 1.5 -2 |
| : off-peak | 3 - 5 | 3 - 5 |
| 9) Scheduled Speed | 14.7 | 15.6 |
| 10) Turn Around Time | 21 minutes | 14 minutes |
| 11) Frequencies | 370/day | 370/day |
| 12) Train-kms | 2,000/day | 1,360/day |
| 13) Car-kms | 2,000/day | 1,360/day |

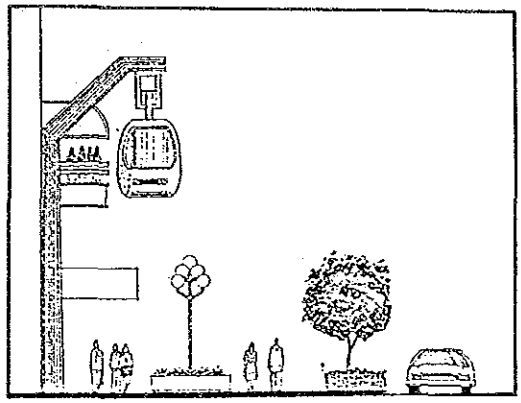
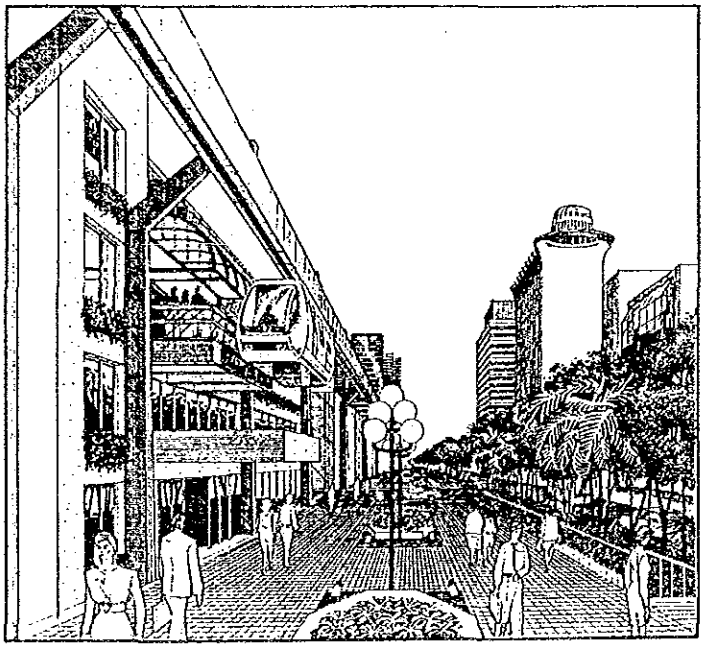
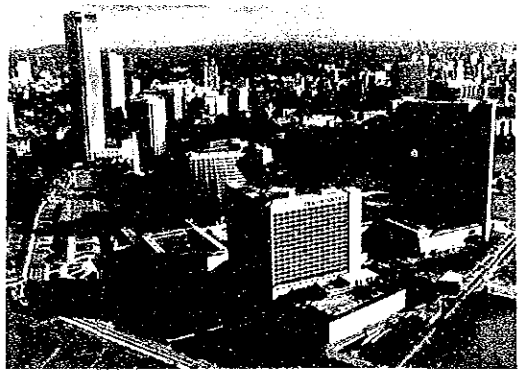


Figure 28

Profile of the Selected System





# 10. STUDY ORGANIZATION

Member of JICA Advisory Committee

| | | |
|---|---|---|
| Chairman: | Dr. Hideo Nakamura | Professor - Tokyo University |
| Member: | Mr. Chikashi Saitoh | Ministry of Construction |
| | Mr. Ryuji Masuno | Ministry of Transportation |
| | Mr. Eiji Toyoda | Ministry of Transportation |
| | Mr. Morikuni Akiguchi | Ministry of Construction |

Member of Steering Committee of Singapore Government

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| Chairman: | Mr. Chua Koon Hoe | 3 Deputy Director - General, PWD |
| | Ms. Lim Soo Hoon | Deputy Director (Land Transport), Min. of Communications and Information |
| | Mr. Ho Cheok Sun | Director (Infrastructure), Min. of National Development |
| | Mr. Wong Eng Seng | Director of Roads, PWD |
| | Mr. Joseph Yee | Director of Building Control, PWD |
| | Mr. G. Menon | Head, Roads Transportation Branch (RTN), PWD |
| | Mr. Lam Chuen Fong | Head, Roads Planning & Design Branch (RP & D), PWD |

JICA Study Team

| | |
|---|---|
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| Mr. Naoshi Okamura | Systems Analysis |
| Mr. Katsuhide Nagayama | Urban/Land Use Planning |
| Mr. Yasuhiko Kurosawa | Public Transport Planning |
| Mr. Kazuyuki Ohtsuka | Transport System Design |
| Mr. Masanao Koyama | Operation Planning |
| Mr. Shiu Ichikawa | Transport Facility Planning |
| Mr. Masashi Hattori | Environmental Assessment |
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