



Sustainable Urban Design

-A way towards TOD trends and development in Japan-

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Contents

1. Introduction : Definition and Objectives of TOD
2. Context and Characteristics of Japanese TOD
 - Historical development process of Japanese cities
3. Target Areas and Components of TOD Practice
 - Station area and Along-railway area
3. Railway Station as the Key Factor of Japanese City Development
 - Urban development process of station areas
 - Function of station plaza(forecourt)
5. Experiences of Transit Metropolis : Tokyo
 - The important roles of private railway company
 - Business model of Tokyu group
6. Concluding Remarks

1. Definition and Objectives of TOD

Definition: Urban development close to transit in order to promote the public transport use. Narrowly, high density, mixed-use, compact development near a station.

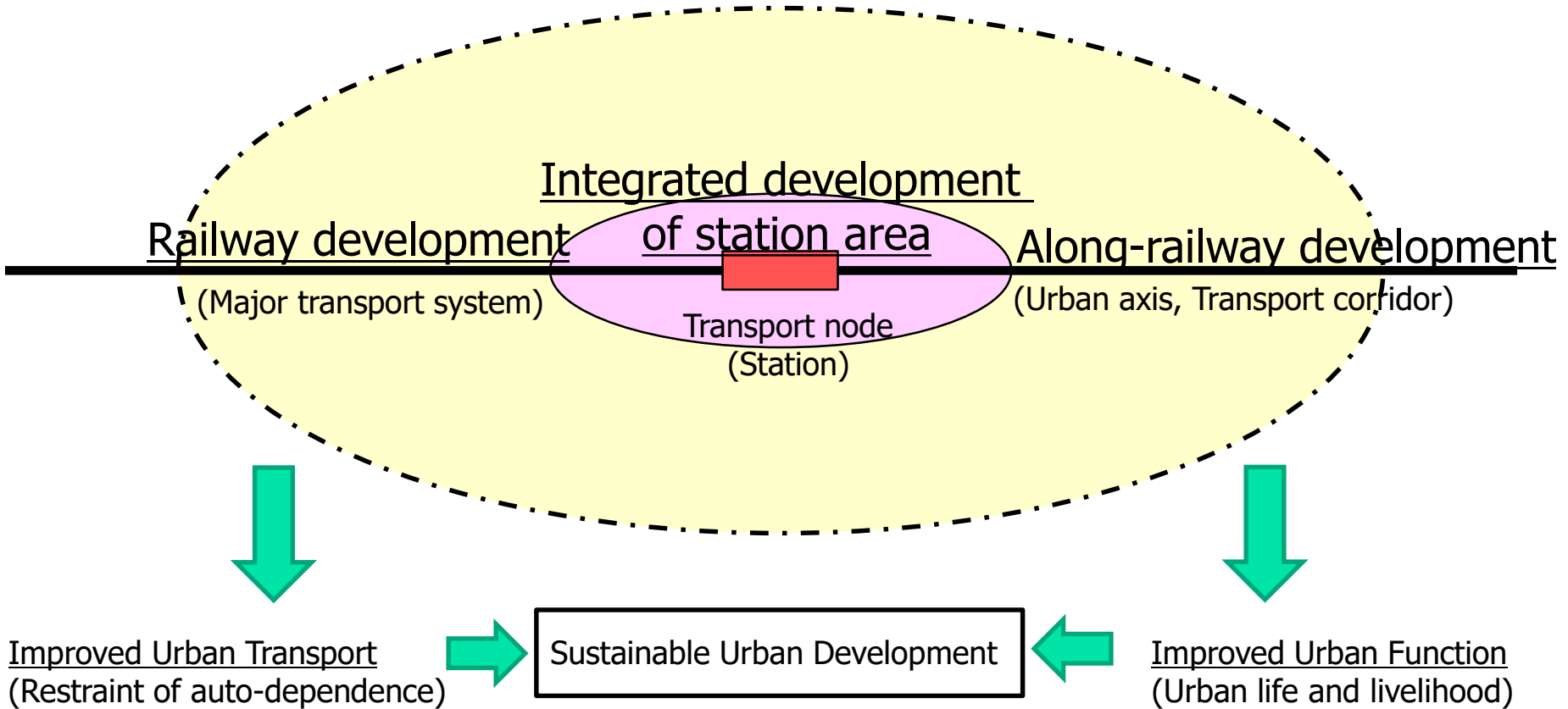
- Transit : Mass transit/Large capacity public transport –Rail, LRT and BRT

Objectives: Varies according to the context of urban development and motorization process.

- To increase transit use by developing easily accessible residential areas close to the transit.
- To provide appropriate houses and residential areas, preventing urban sprawl.
- To provide transit as an alternative to car for reducing traffic problems and auto-dependence.

* TOD with improved urban public transport/mobility service is an effective way to promote EST and Sustainable Urban Development

Figure 1 EST and TOD Concepts



2. Context and Characteristics of Japanese TOD

1. Historical context:

- Private sector led the development of railways together with houses and residential areas before the modernization period. *Rail preceded cars.
- The most advanced transport technology at the time was rail.
- The urban development layer based on rail was added to the legacy of former compact castle town allowing growth of population and new economic activities. *Rail today is an efficient mass transit with expandable capacity.

2. Real estate development by private sector:

- New large scale developments in the suburbs was connected to the central areas by new railway. Along the railway, various commercial activities have developed by the group. The terminal station area in the center has intensively developed by the railway company.

3. New town developments by public sector:

- Railway as mass transit is the prerequisite to provide reliable access to the CBD. PPP measures such as land readjustment program are used for the implementation.
- Urban renewal programs also for the improvements/expansion of station and tracks(e.g. Grade-separation, and double-track).

3. Target Areas and Components of TOD Practices

1. **Regional/Metropolitan Area:**

-Master plan of urban transport strategies with an hierarchical public transport systems including access modes to rails. Both for passenger and freight, together with road transport systems.

2. **Urban Development Axis/Transport Corridor:**

-Along-railway area near the major railway lines and the station area close to the multi-mode transport interchange node are the key areas for urban development.

3. Local area close to the station or **Station Area:**

-Station site and spaces: Dis-/under-used railway space, inside space of the station and station building have potentials for urban use.

-Station as a transport node: Station plaza and underground space.

-Walkable area (~1km) of the station: Integrated urban development with multi-mode transport interchange.

-Impact area or Catchment area of a station: Residential development with easy access modes(feeder bus, bicycle and walking)

*Various means to implement TOD concepts have introduced and many good practices are found in the urbanization process of Japan.

Fig.2 Target Areas of TOD(image)

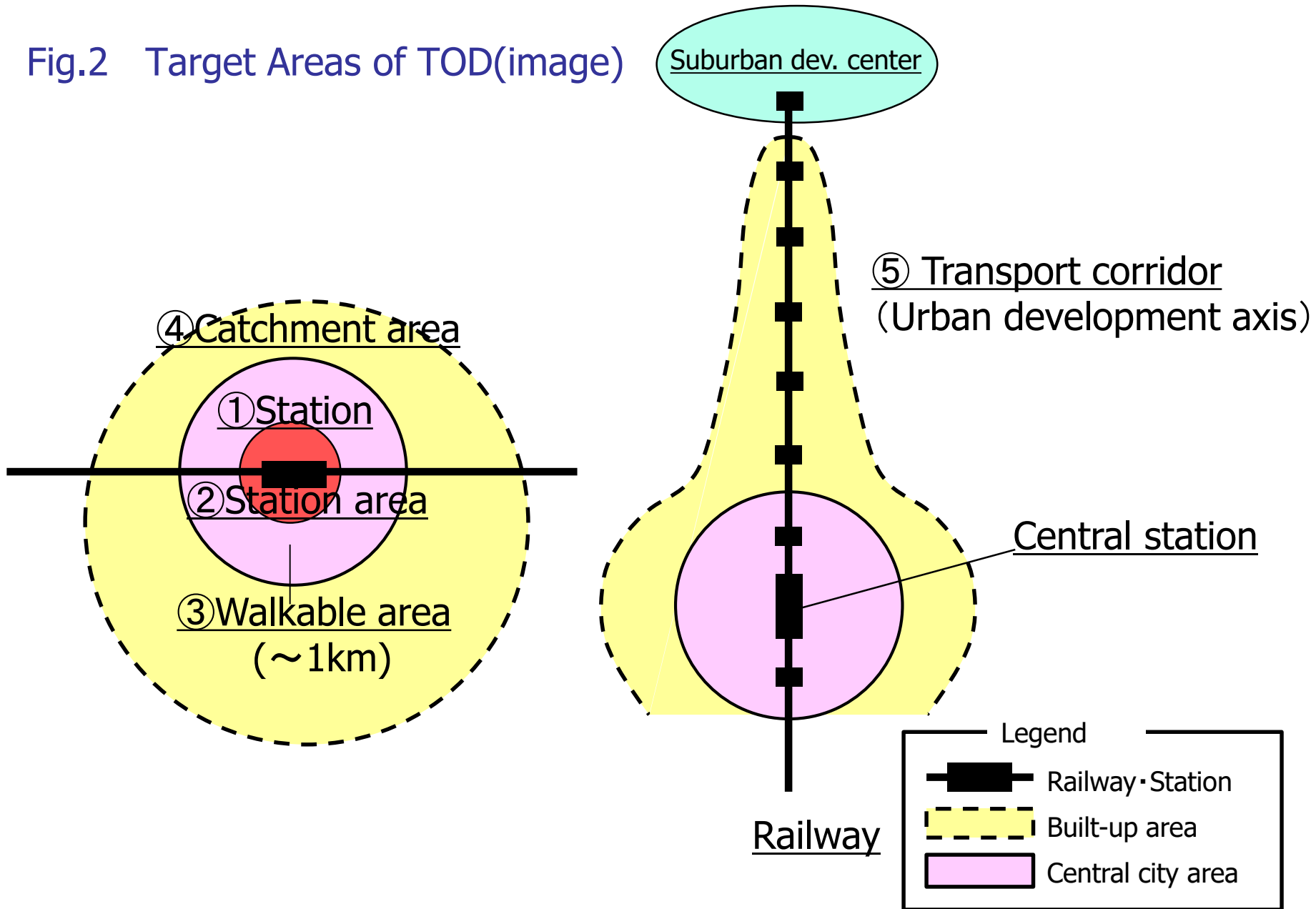


Table1. Integrated Development of Station Area and Along-Railway Area

	Targets	Function and Subjects of Development	Examples
Station Area	<ul style="list-style-type: none"> • Station as a transport node • Station Plaza • Station – Site <ul style="list-style-type: none"> - Inside area - Building • Nearby urban facilities 	<ul style="list-style-type: none"> -Inter-connection of railway services (Regional-Local-Urban; Express-Local: Own-Other co.) and other transport systems -Inter-connection with public transport services (LRT, bus, taxi), cars, cycles and pedestrian -Inter-connection with the city, city gateway(central stn) -Disused/underused railway site including under/upper space of the track -Retail and services to passengers -Facilities for retail/office/ services, public facilities (city office, library , nursery and etc.) -ditto 	<ul style="list-style-type: none"> • Central station-multi modes connection, local station-feeder modes(bus,taxi, NMT) • P/K+R, Bus/Taxi terminal, Pedestrian deck, underpass • Restaurant arcades under viaduct, Bus Terminal • Kiosk and restaurant • Department store, convenience store, sports • Department stores, city office; Underground shopping street
Along-railway Area	<ul style="list-style-type: none"> • Reuse/redevelopment of unused/underused sites • New station in the built-up area • Large-scale suburban development 	<ul style="list-style-type: none"> -Land use changes of former factory, railway yards etc. often in back sider area of the station -Large-scale urban development and redevelopment -New towns, industrial parks, research campus integrated with railway development 	<ul style="list-style-type: none"> Yokohama MM21, Makuhari Subcenter Koshigaya Lake Town Garden cities, Tama NT. Tsukuba Express Railway

4. The Impacts of the Railway Station on Urban Development

- Historical development pattern of Japanese cities with railway stations
 - From castle town system to modern city system after the Meiji Restoration (1867)
 - Urban rails were the major actor to house new comers in the rapid urbanization period
- The station is recognized as the gateway of a city and a symbol of the city's pride and culture/history/natural environment
- Functions of a railway station and its precinct in the context of transport interchange(node) and urban development
 - The station as a key trigger of urban development and redevelopment
- Importance of continual improvements of railway services and stations responding social needs

Figure 3-1:
Railway Station and Urban Development Process

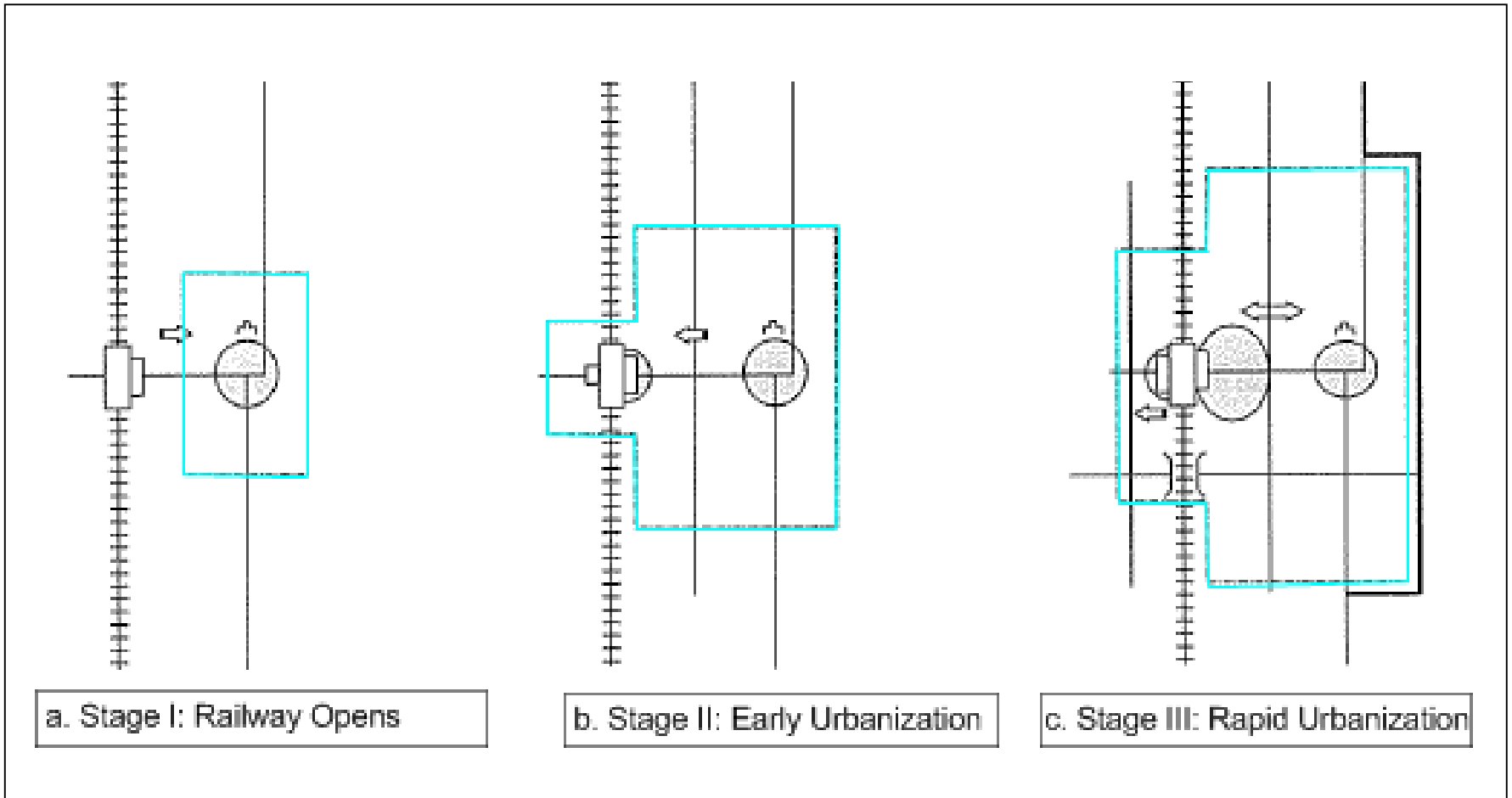


Figure 3-2:
 Railway Station and Urban Development Process

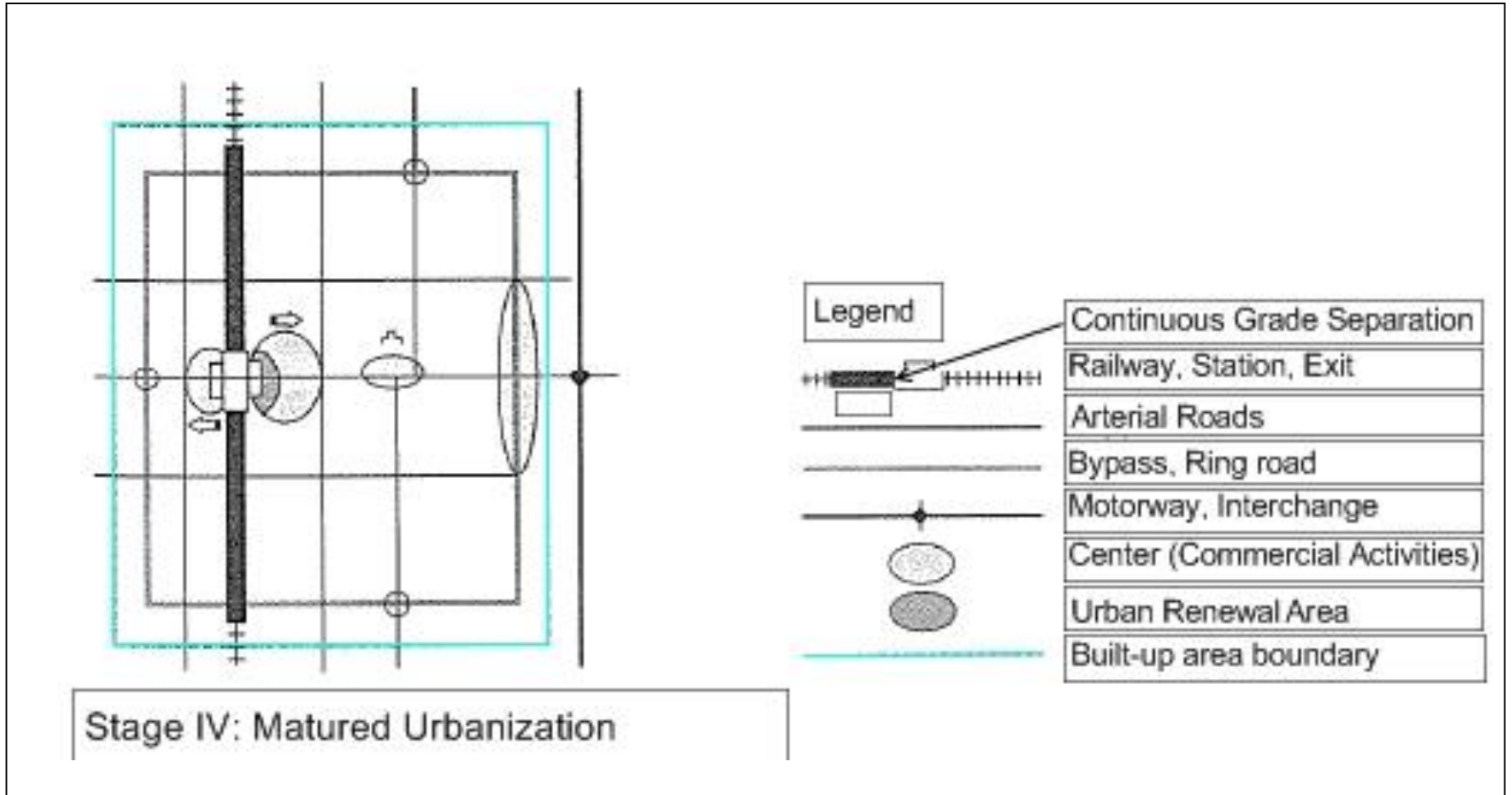


Figure 4. Functions of Station Plaza

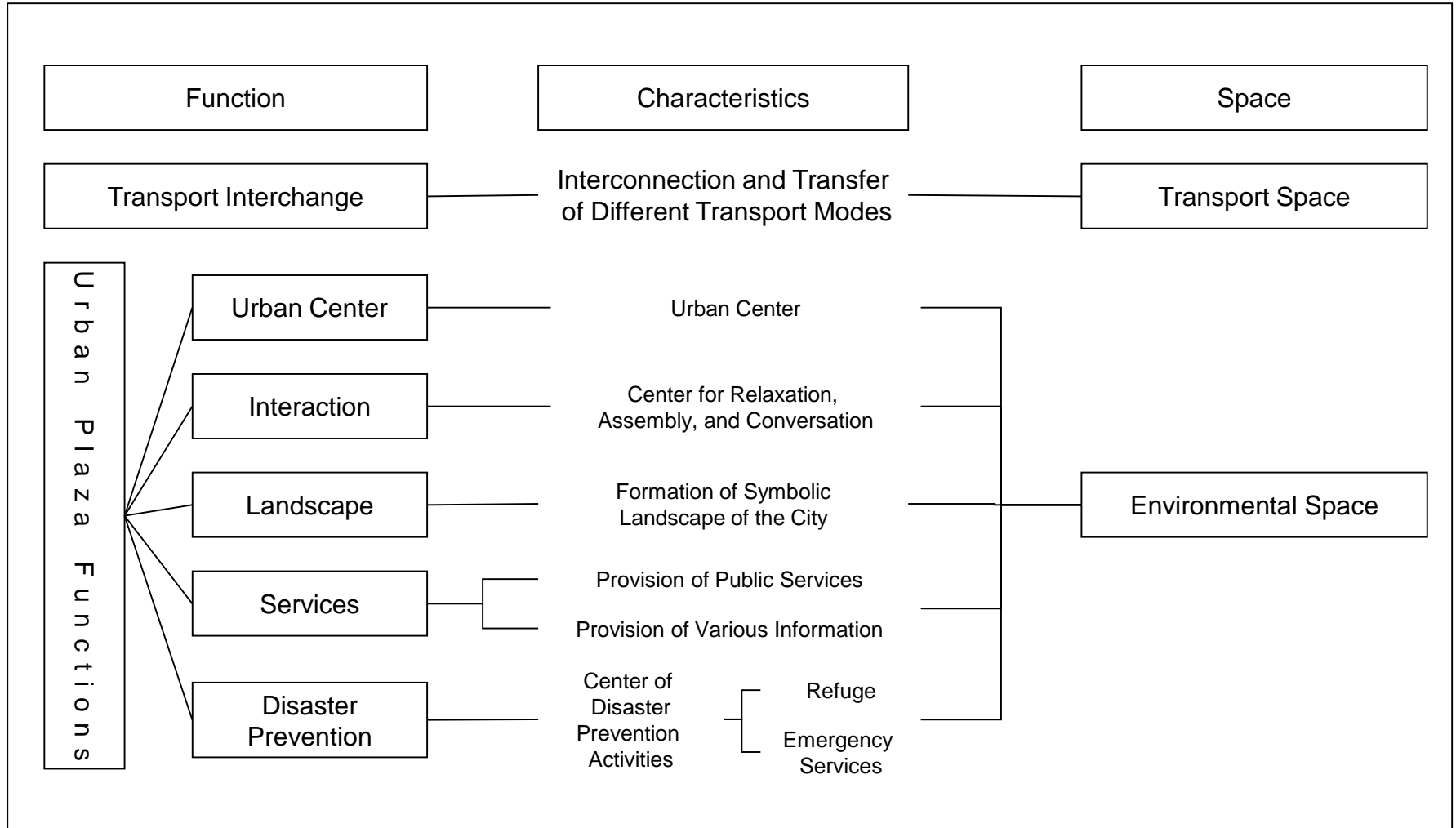
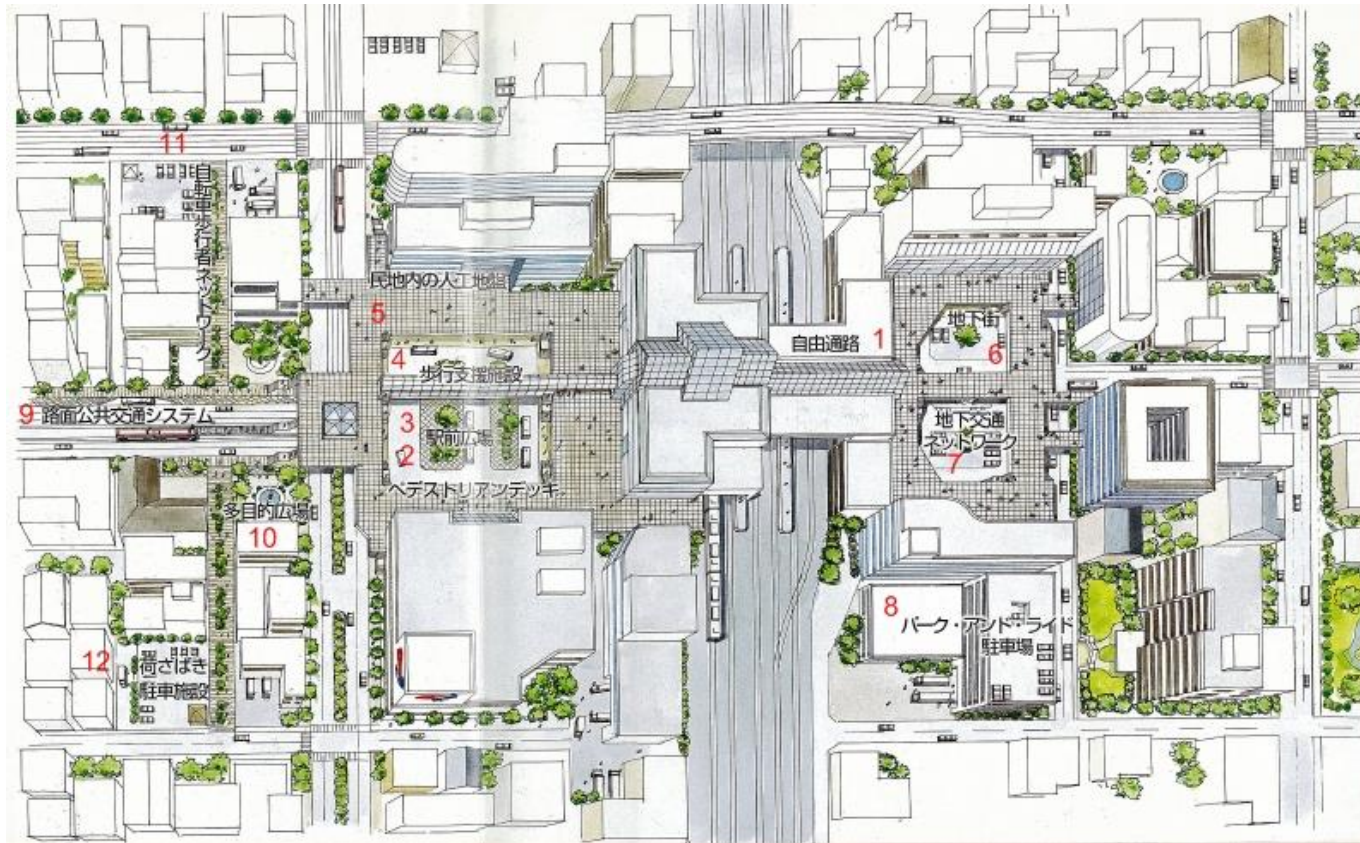


Figure 5. Transport Improvements—Elements of Station Precinct Areas



- | | | |
|------------------------------------|------------------------------------------------|------------------------------------|
| 1. Free Passageway through Station | 5. Pedestrian Deck as Part of Private Property | 9. Surface Public Transport System |
| 2. Pedestrian Deck | 6. Underground Shops | 10. Multi-functional Plaza |
| 3. Station Plaza | 7. Underground Walkway Network | 11. Pedestrian/Bicycle Network |
| 4. Pedestrian Support Facilities | 8. Park and Ride Facilities | 12. Truck Loading Dock |

(Source: Ministry of Construction ,1999)

6. Experiences of Transit Metropolis : Tokyo

- Tokyo as a Rail-led Metropolis:
 - Tokyo is Archetype C: strong-centre strategy (J.M.Thomson,1977)
- Factors behind the still powerful rails :
 - Demand , Supply, Market and Government policies
 - Business stuns and affiliated business
- Tokyu Railway Company's experiences:
 - Business model and development schemes
 - Examples : Tama Denen-Toshi, Tama Plaza area, Futako Tamagawa area and Shibuya area

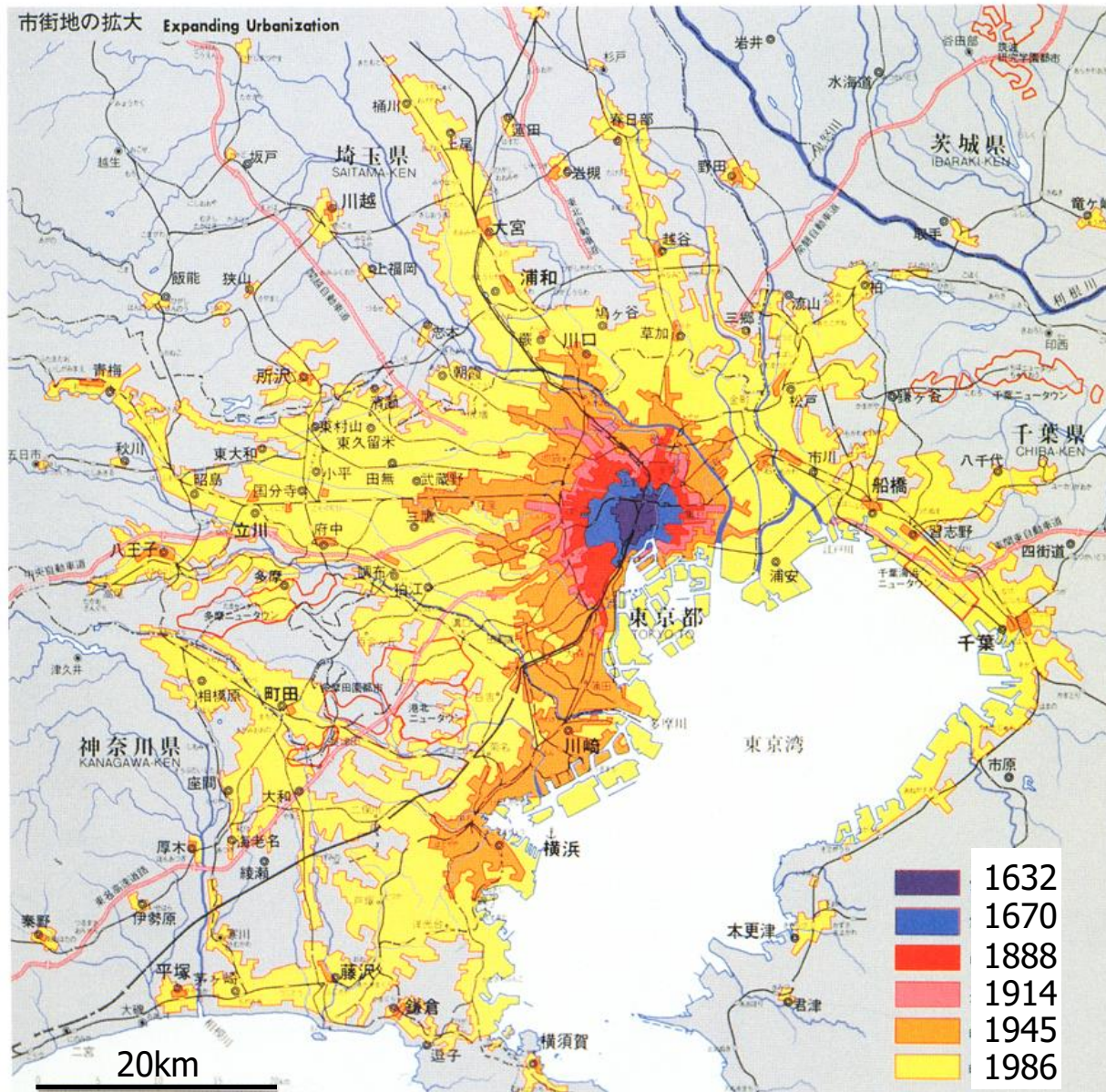


Figure6. Spatial Development of Tokyo and the Railway Network

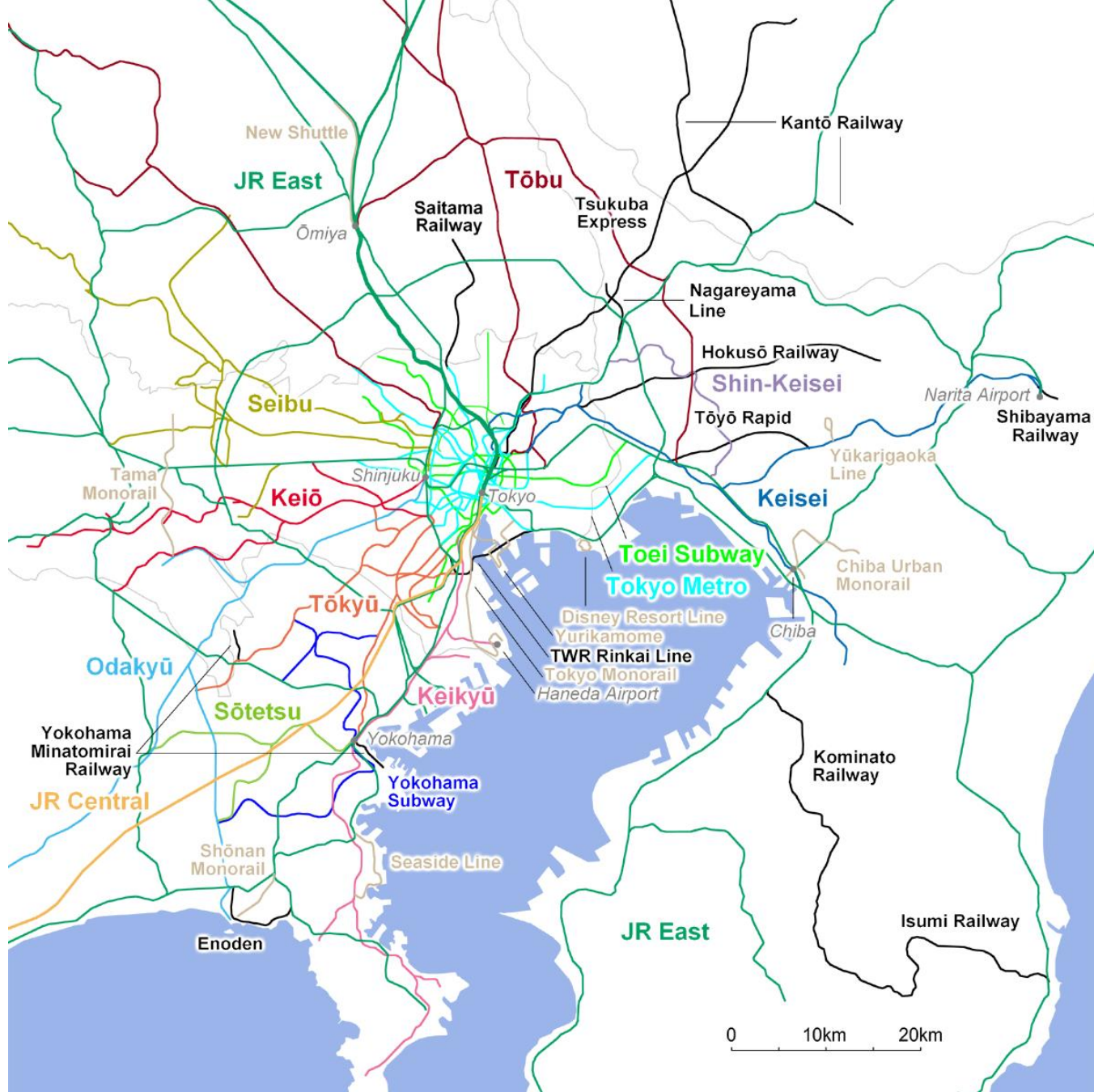
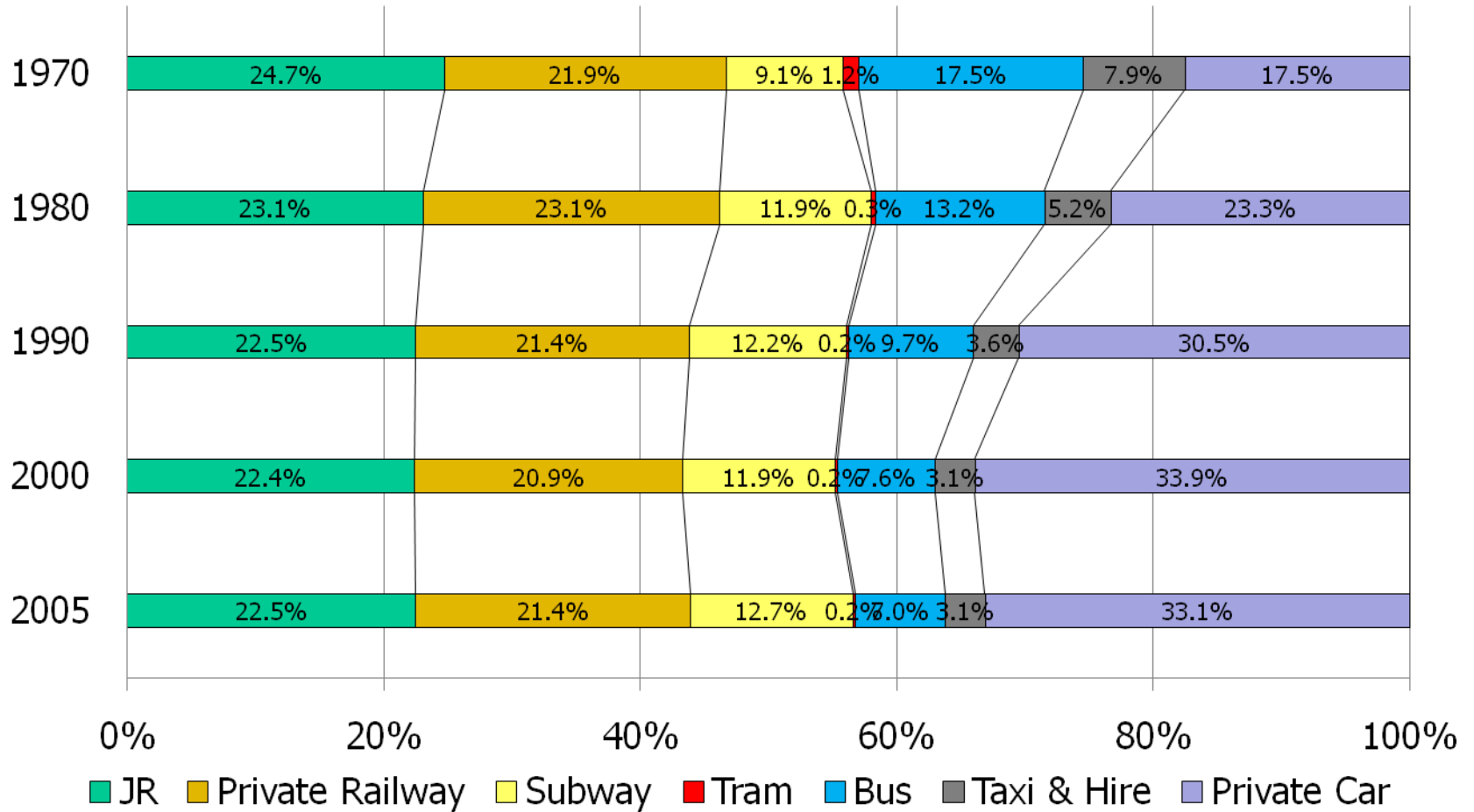


Fig. 7. Railway Network of Tokyo Area by Railway Companies (Aug. 2007)

Fig. 8 Changes of Modal Shares of Passenger Transport
 - Tokyo 50km-radius Region -



Factors Behind the Still Powerful Rails

- Demand side: A centralized society, large population and high density concentration of socio-economic activities
- Supply side: Strong private railway companies providing variety of services. E.g. Tokyo : Fan-shaped corridor with the terminal at JR Yamanote (circle) line
- Market side: Principle of financial independence with areal monopoly
 - Employer's payment of commuting costs (and tax exemption)
- Government policies : Subsidies for new construction and improvement
E.g. Station plaza , Continuous grade-separation , Station improvements (barrier free, open passageway), Enhancement of convenience (direct connection link, integrated improvements of interchange function)

Factors Behind the Still Powerful Rails-continued

- Business stuns depends on company's DNA (founder , cultural and natural features of the area)
 - Extent of other business : Limited by law / regulation for JNR and public railway organizations.
 - Securing passengers : Developments along the railway line and at the terminal area
 - Basic services for residents : Local stores, services for daily life
 - General services for residents in the service area(somewhat similar to a regional government. E.g. Tokyu Co., Yamaman Co.

Factors Behind the Still Powerful Rails

- Examples of businesses operated by private railway companies

- Transportation: Railway, bus and taxi; trucking, parking, manufacturing of railway cars
- Real Estate: Housing estate/new town development, construction of houses/offices
- Retailing: Construction and operation of department stores, super market chains, station kiosks
- Leisure/Recreation etc: Construction and Operation of resorts, amusement parks, baseball stadia, movie theatre, fitness clubs; day care center, nursery; travel agencies, catv

Table 2. Outline of Major Private Railways in Tokyo Metropolitan Area (2012)

Name	Capital (Billion yen)	Operating Revenue		Operating length	Stations	Passengers (Million / year)
		Railway	%			
Tobu	102.1	157.8	71.1	463.3	203	879
Seibu	21.7	100.7	67.7	176.6	92	620
Keisei	36.8	58.2	75.8	152.3	69	261
Keio	59.0	81.0	68.2	84.7	69	625
Odakyu	60.4	116.2	73.3	120.5	70	721
Tokyu	121.7	148.3	57.2	104.9	97	1,089
Keikyu	43.7	77.2	66.1	87.0	73	435
Tokyo Metro	58.1	332.8	96.8	195.1	179	2,349
Soutetsu	32.6	32.6	100.0	35.9	25	226

Note : 1 JR railways are not included.

2 Operating revenue % is the share of railways in total operating revenues of the group.

3. JR East(total,2011)- Operating revenue 1733.3billion yen, 96.4%. Profit 87.0% (Tokyu 42.2%).

Source : Mintetsu Kyokai, The Data book of the Major Private Railways 2013. (in Japanese)

Figure 9. Business Model of Tokyu Railway Group

Driving force of growth strategy = Synergy effects of core business

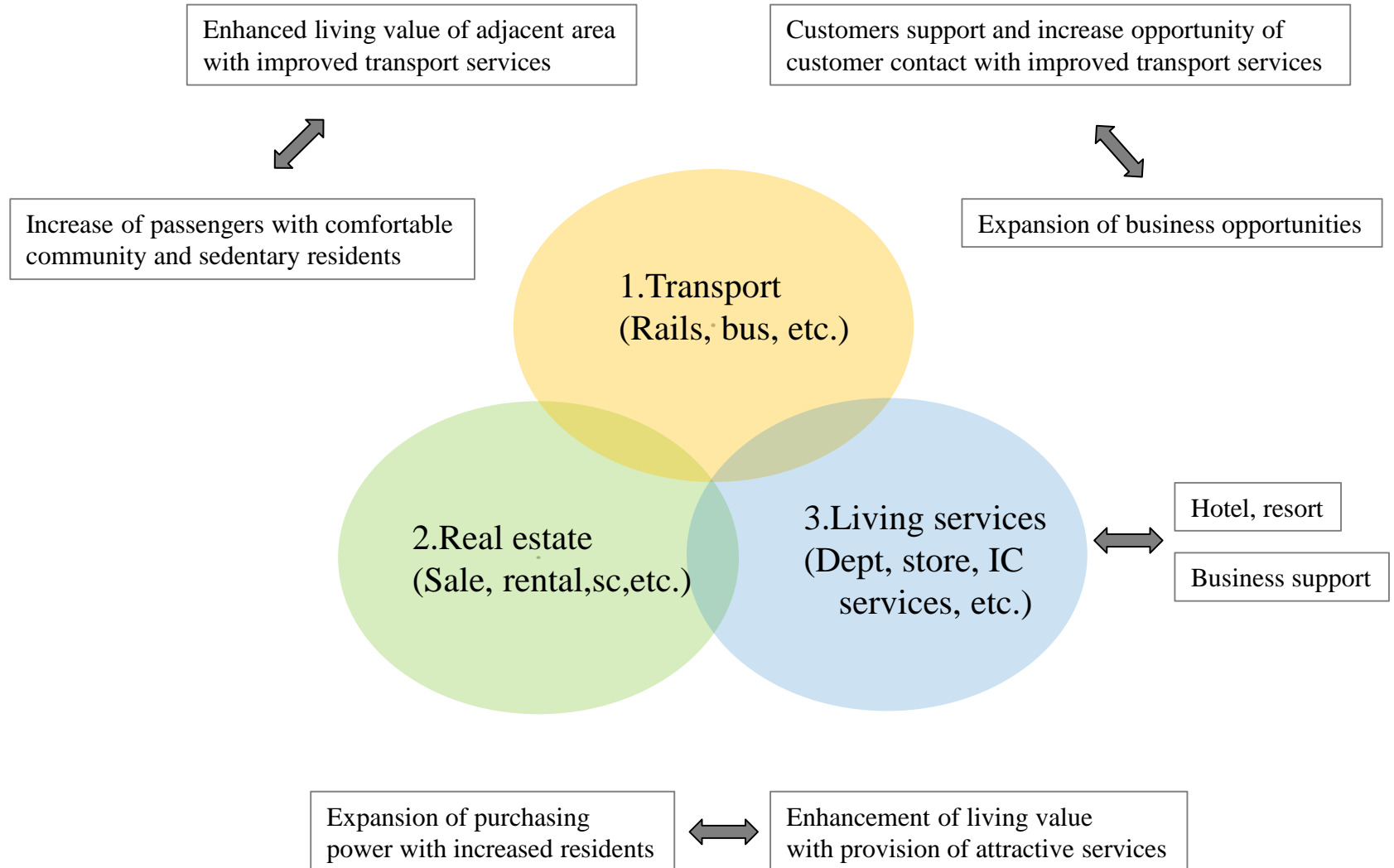
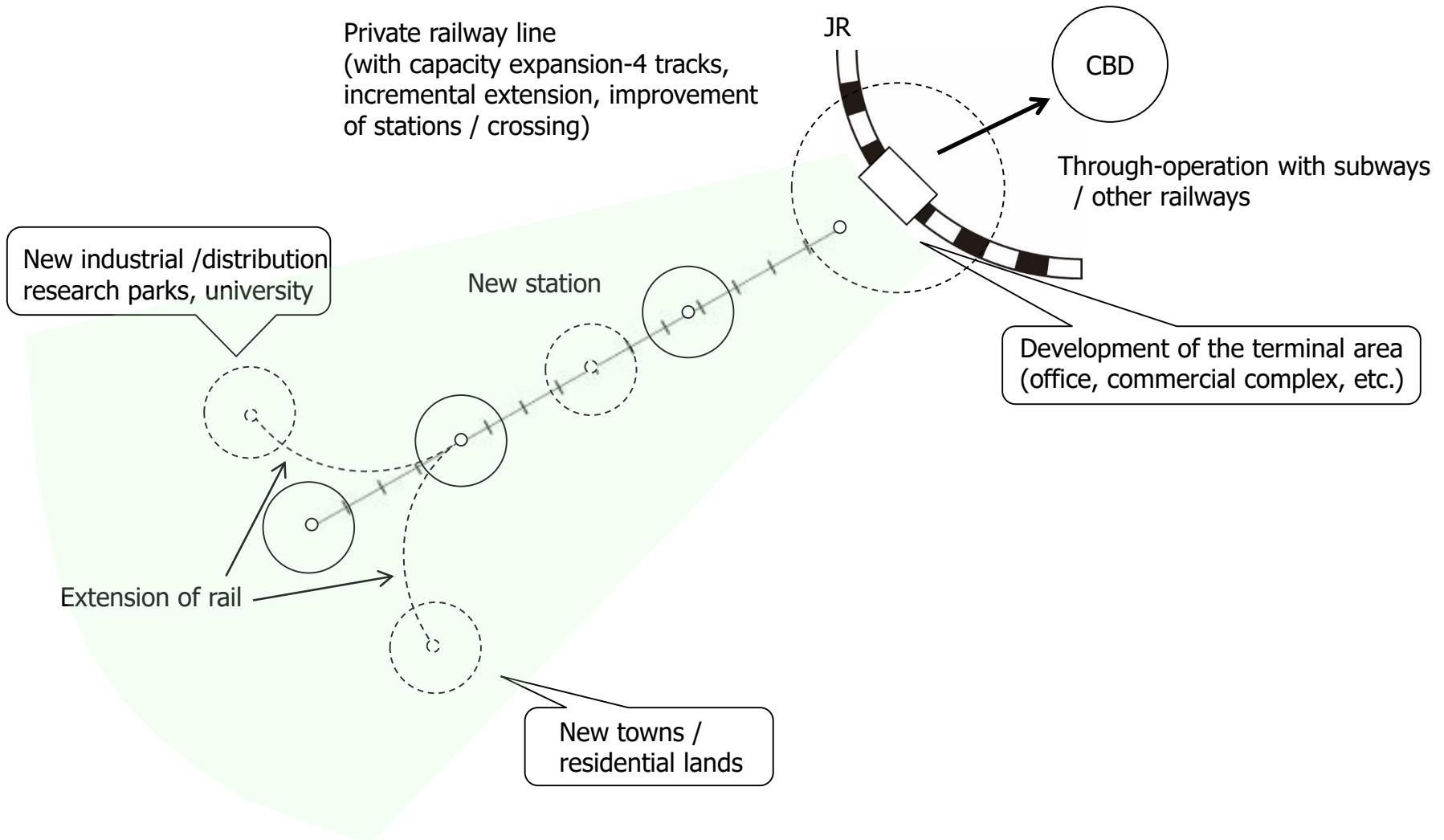


Figure 10. Development Schemes of the Railway Adjacent Area
by Private Railway Company : Corridor Development
(revised diagram of Yajima and Ieda 's book 2014)



Example 1a Development of Suburban Station Area (from the south side)
—Tama Plaza as the core of Tama Denen-toshi New Town (1985)



Example 1b Tama Plaza Station Area Today (from the south side)



Example 2a Development of Suburban Key Station Area (Futako Tamagawa)

View West from Futako-tamagawa

Extending over the Tama River along the Den-en-toshi Line, the Tama Den-en-toshi (Garden City) developed rapidly with the post-war economic miracle.



Example 2b Major Developments of Futako Tamagawa Station Area(Sub-center)

- Galleria (an open plaza with roof), shopping complex (Tamagawa Takashimaya), office (Rakuten-main office, 2015), housing complex, etc.

Tokyu Hotel



Fitness Club (Tokyu Sports System)



Cinema complex (Tokyu Recreation)



Stadio hall (iTS'COM)

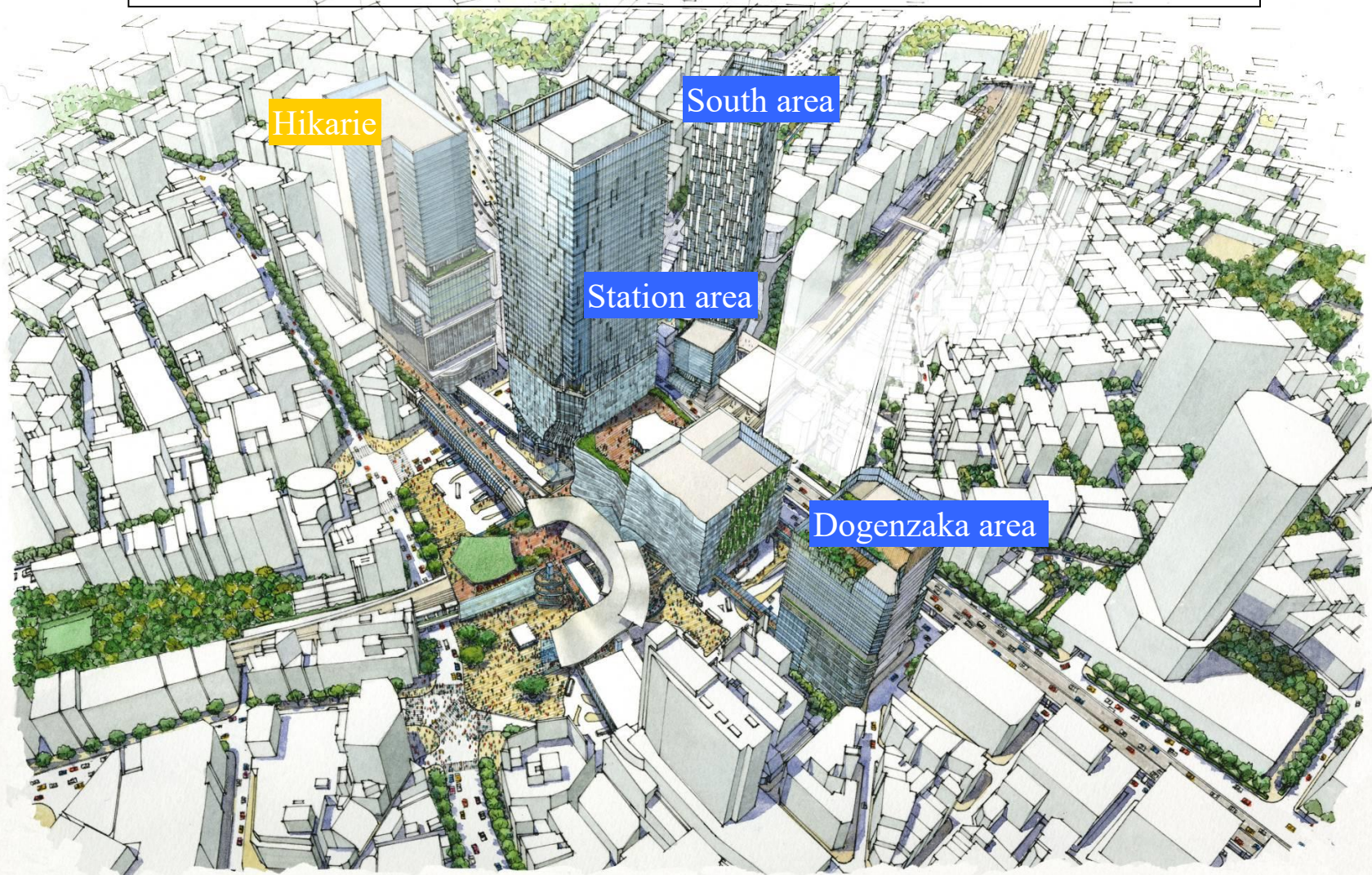


Commercial space



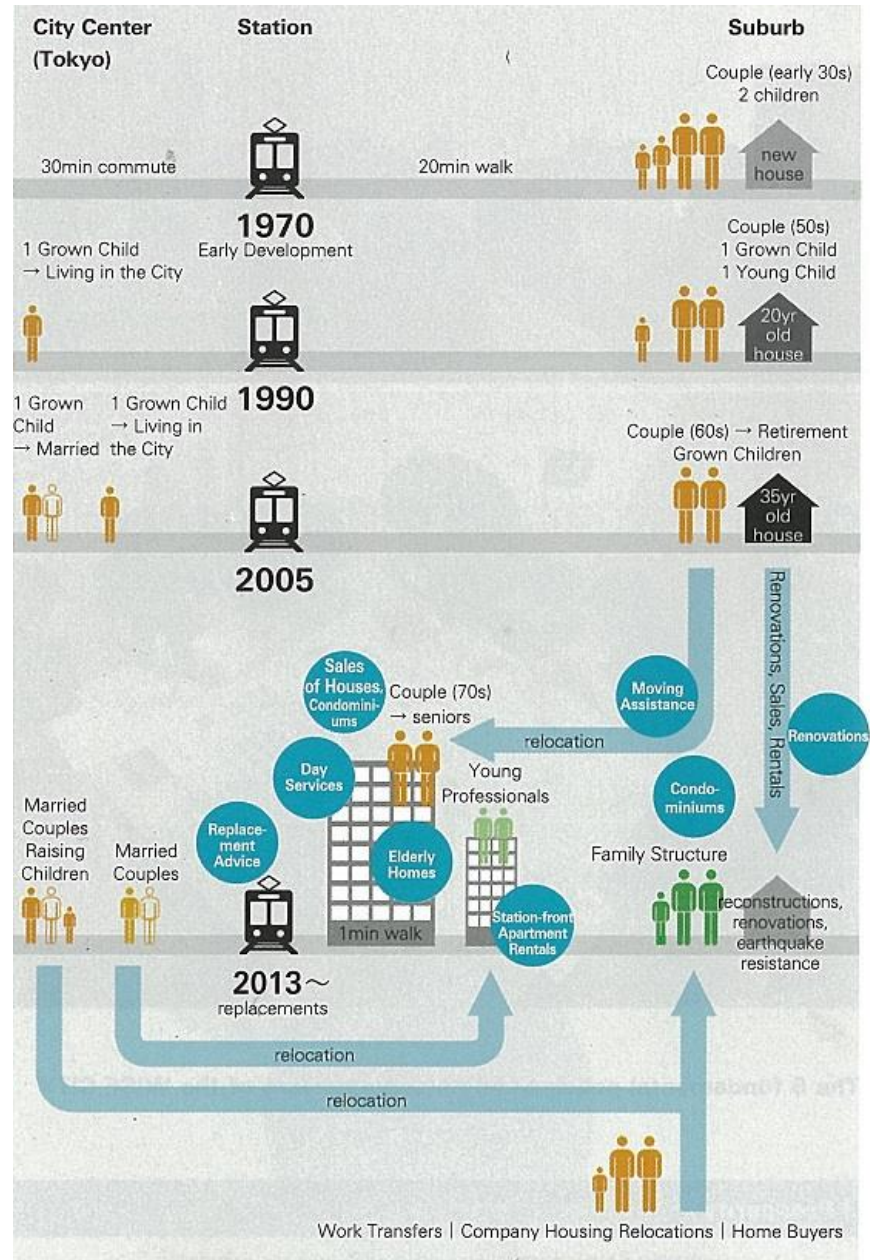
Example 3 Terminal Station Area Redevelopment — Shibuya area by Tokyu Group

Future image after urban renewal projects (major complex)



Example 4 Replacement Schemes of House (Tokyu Corp.)

- Images of housing replacements for different age groups to maintain balanced community



Replacement Products and Services

1. Selling houses and condos
2. Providing apartment rentals
3. Renovation of housing
4. Concierge service of residence and living
5. Nursing homes for elderly care
6. Day services
7. Rental storages (for several years)

6. Concluding Remarks : Lessons and Future Prospects

1. TOD-like concepts have applied for Japanese urban development in the process of modernization and industrialization. Railway was the most advanced and efficient land transport technology at the time before motorization. Even today as a mass transit.
2. Private sector (real estate developers and railway companies) is the major provider of housing and residential areas with efficient rail-access to the center. (Monocentric form)
3. In practice, various business models and development schemes have devised to support TOD implementation, adjusted to different needs and the context of each city and time. Government has introduced laws and supporting measures in railway (re)development such as double-tracking, grade separation, station building/ expansion including station plaza. Also, for urban development, programs of land readjustment and urban redevelopment /renewal, and transfer of development rights.

4. The station area development is critical for TOD. Central station is recognized as the gateway of a city and the symbol of the city. The station construction/major renovation is a good opportunity to modernize/revitalize the central area. It needs well coordinated urban (re)development projects with local stakeholders.

*The key issue here for developing cities is how to guide the private sector's development potential in the area of urban axis/corridor securing future space(ROW) of railway.

5. Today in Japan, faced with decreasing population, “intelligent shrinkage” approach is promoted for cities based on “compact plus network” concept. So, TOD in Japan enters in a new stage. Since we are in the revolution period of transport with IoT and mobility innovations such as MaaS and connected and autonomous EV or AUTO SAPIENCE, intelligent TOD should be explored avoiding the failure of the auto-dependent society today.

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 2. Takashi Yajima and Hitoshi Ieda, The Word City Tokyo is Created by Rail (in Japanese). IBS,2014.
 3. The Sustainability of the Suburbs –The Developments and Operations of Tokyu Corporation. 2013.