7.11 Construction Plan

7.11.1 General

(1) Approach

It would be appropriate to use as much as possible the construction methods widely adopted at the project area while paying attention to quality and cost of construction. The JICA Study Team applied common construction methods used in the project area as well as in Indonesia.

(2) Major Work Items and Quantities

Table 7.11.1 shows major work items and estimated quantities based on the preliminary design.

Table 7.11.1 Major Construction Quantities

Item	Unit	Mamminasa Bypass	Trans Sulawesi	Hertasning Road	A.D. Sirua	Total
Mortared Stonework	m3	184,721	154,978	13,719	44,865	398,283
Common Excavation	m3	1,026,978	376,227	60,212	671,719	2,135,136
Common Embankment	m3	2,999,660	961,307	178,096	773,379	4,912,442
Selected Embankment	m3	18,469	25,447	892	3,814	48,622
Aggregate Base Class A	m3	149,737	91,640	14,984	44,146	300,507
Aggregate Base Class B	m3	233,357	193,751	23,352	68,798	519,258
Cement Treated Sub Base	m3	0	22,277	0	0	22,277
Asphaltic Concrete-Wearing Course (3-5cm)	m2	1,479,056	954,207	146,910	434,790	3,014,963
Asphaltic Concrete-Binder Course	m3	0	23,885	13,719	0	37,604
Asphaltic Concrete-Base Course	m3	0	15,036	6,624	0	21,660
Portland Cement Concrete Pavement	m3	0	62,655	0	0	62,655
Structural Concrete	m3	54,320	73,453	4,421	2,481	134,675
Precast Unit Type I Girder (16-35m)	nos	416	458	11	18	903
Reinforcing Steel	ton	2,296	3,032	154	268	5,750

Source: JICA Study Team

7.11.2 Procurement Plan

(1) Labor/Machinery

The past and ongoing projects in and around Mamminasata area reveal that there is no difficulty to procure sufficient labor and machinery from the vicinity areas.

(2) Materials

1) Aggregate / Embankment Materials

Figure 7.11.1 and **Table 7.11.3** illustrate expected aggregate sources and borrow pits located in the

vicinity of the project road. Plenty aggregates and sand is available at dredging site of Bili-bili Dam. The sand collection at the Jeneberang River down stream has been restricted and, therefore, should not be planned.

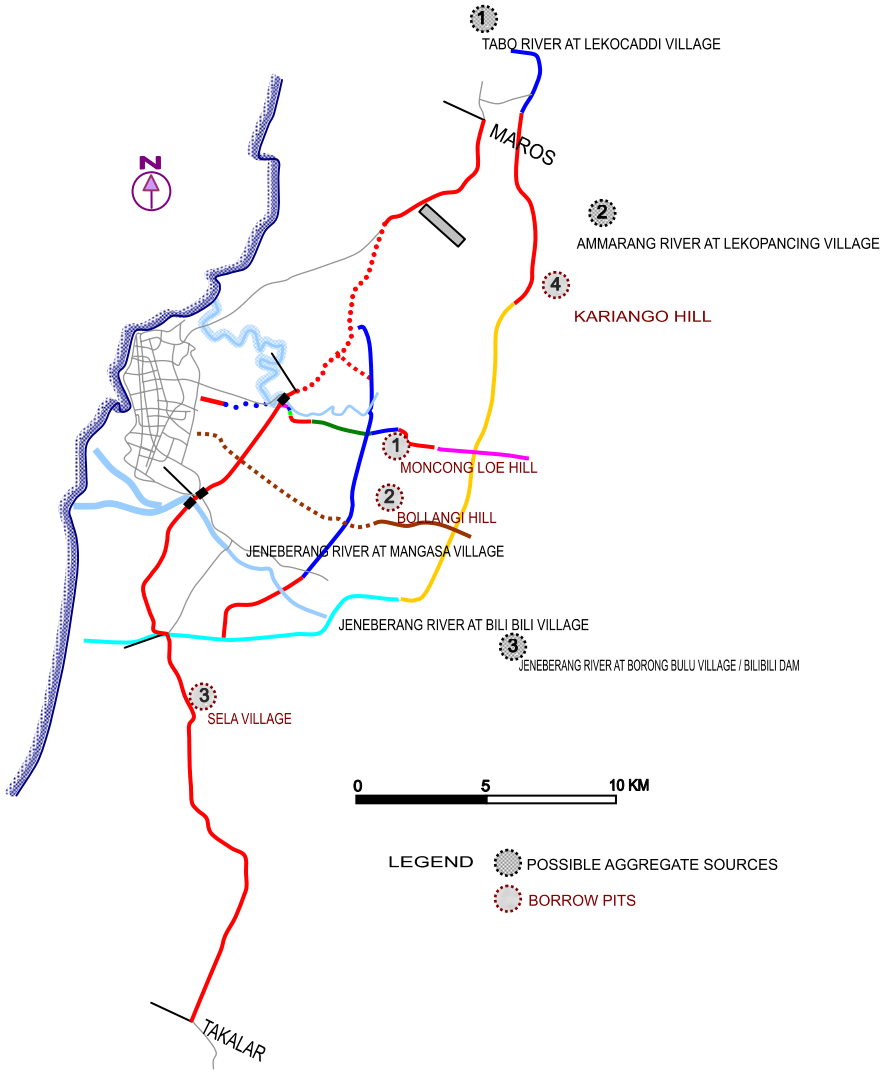


Figure 7.11.1 Aggregate Sources and Borrow Pits around the Project Road

Table 7.11.2 Outline of Possible Aggregate Sources and Borrow Pits

No.	Name	Available Material	Note
Aggregate Sources			
1	Tabo River at Lekocaddi Village	Coarse Aggregate	Water absorption is relatively high (4.66%).
2	Ammarang River at Lekopancing Village	Coarse Aggregate/ Fine Aggregate	
3	Jeneberang River at Borong Bulu Village	Coarse Aggregate	
Borrow Pits			
1	Moncongloe Hill	Soil	CBR = 7.0%
2	Bollangi Hill	Soil	CBR = 12.6%
3	Sela Village	Soil	CBR = 6.3%
4	Kaliango Hill	Soil	CBR = 7%

Source: JICA Study Team

All aggregate sources and borrow pits listed above have provided materials for the past and ongoing construction projects. Results of physical characteristics tests conducted in this study revealed that materials from above sources meet the specification requirements for embankment materials, aggregates for asphalt concrete and aggregates for cement concrete.

2) Other Materials

Since any special materials are not planned to be used in the project, all required materials are manufactured and obtained in and around Makassar. Steel materials are mostly brought from Surabaya. Cement is available from two cement producers (Bosowa Cement and Tonasa Cement) between Maros and Pangkajene.

7.11.3 Construction Procedures

The project is either the existing road widening or new construction. Major works are earth works for widening, drainage, bridges, pavement, and countermeasures against soft ground and road facilities. Representative procedures of winding, new construction and soft ground countermeasure works are described below:

(1) Widening Work of the Existing Road

Since two lane widening work of the existing road is carried out while managing large traffic on the existing road, sufficient attention shall be paid to safety of traffic and pedestrian. Existing road used as detour for traffic should be maintained by contractor to keep smooth traffic flow and pedestrian safety.

It should be also taken into account that temporary drainage is to be installed appropriately to avoid any disturbances on the subgrade/base during construction.

Figure 7.11.2 shows general procedures for the existing road widening work.

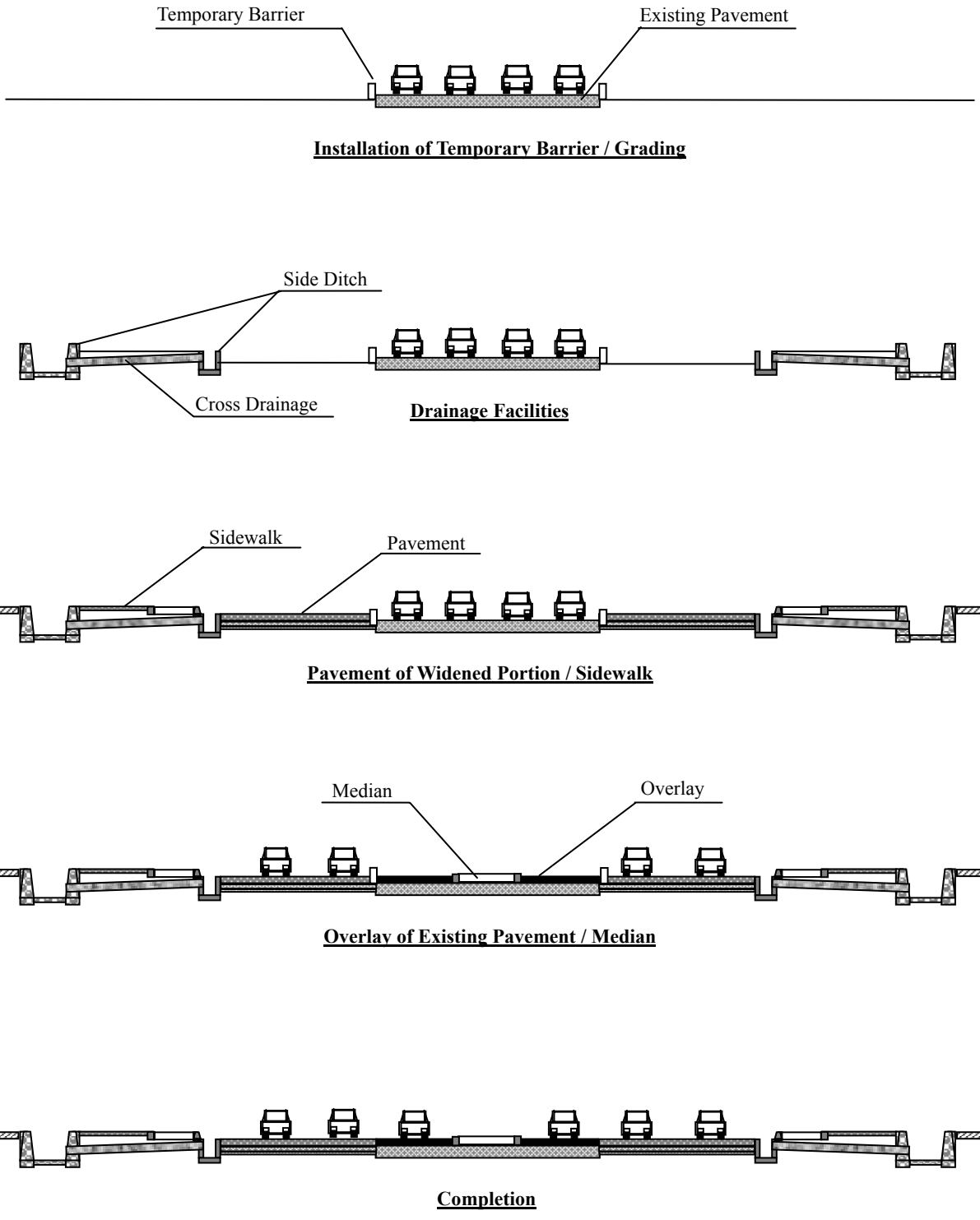


Figure 7.11.2 Common Procedures for the Existing Road Widening Work

(2) Construction of New Road

Unsuitable materials under roadway including the center median, which will be used for additional lane widening in the future, should be removed at first so that it will not cause any damage or settlement to new road.

Existing road used as access road to construction site should be appropriately maintained by contractor to keep smooth traffic flow and safety.

Figure 7.11.3 shows general procedure for new road construction.

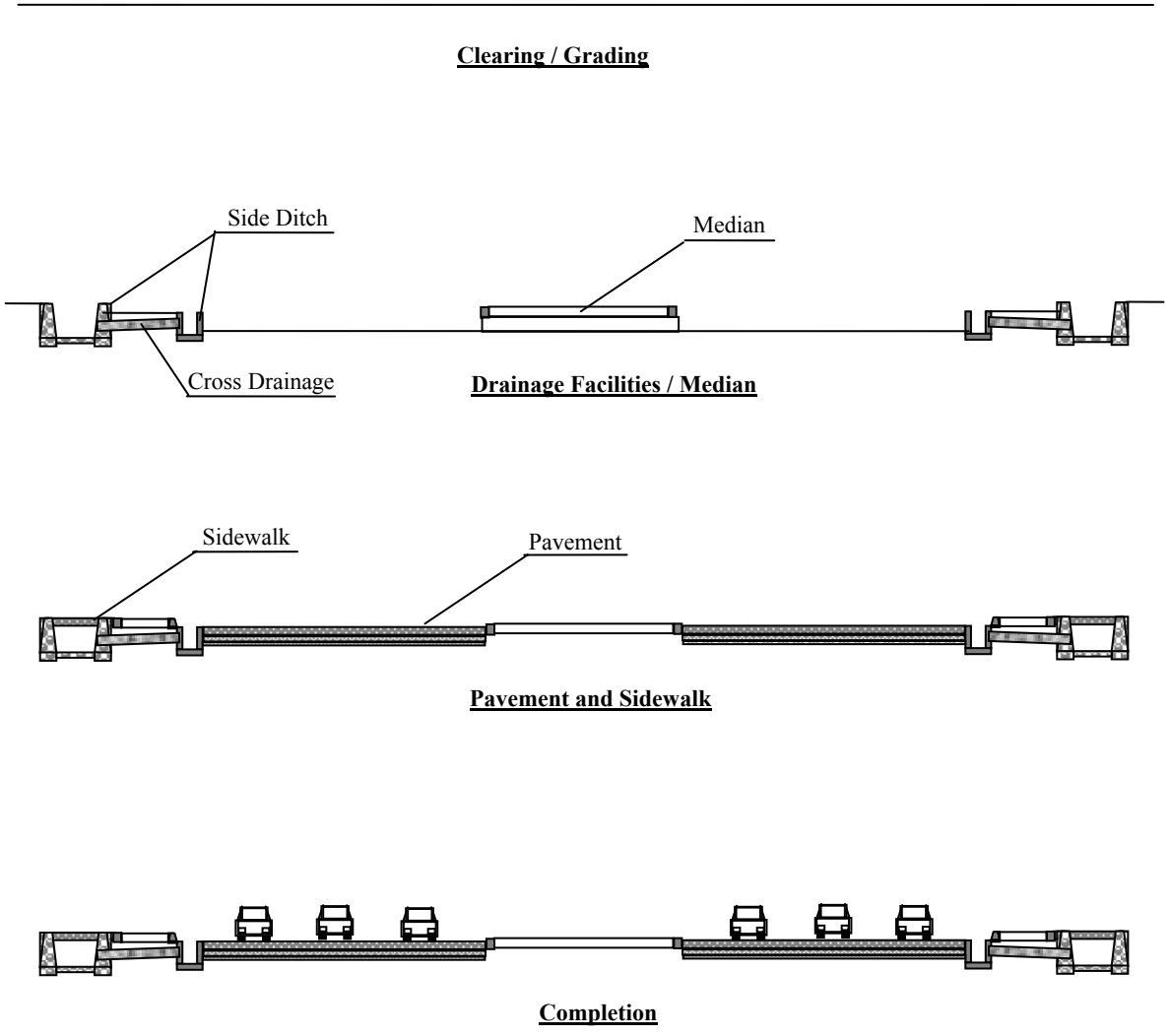


Figure 7.11.3 Common Procedures for New Road Construction

(3) Weak (Soft) Ground Countermeasure

Since part of Section B in the Trans-Sulawesi Mamminasata Road passes across a swamp area of the Tallo River basin, slab concrete on PC piles was planned as a countermeasure against settlement or embankment failure. **Figure 7.11.4** illustrates the procedure of countermeasure work for deep soft ground.

For other sections of where the existing CBR is less 2%, unsuitable materials are replaced with specified embankment or selected materials. Embankment will be constructed on geo-textile sheets.

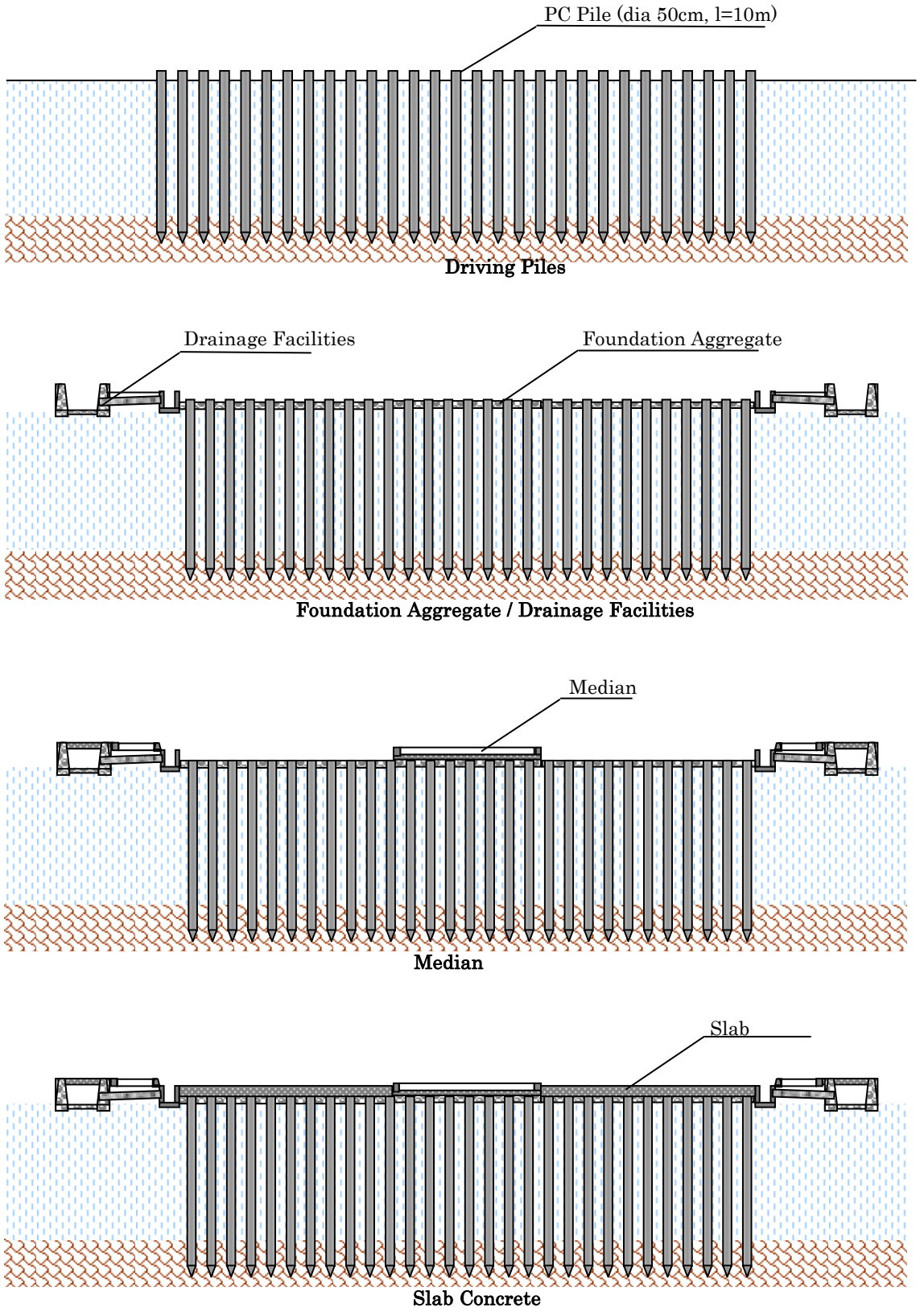


Figure 7.11.4 Procedure of Soft Ground Countermeasure Works

7.12 Road Development Methods in Harmony with Urban Development

7.12.1 Necessity of Applying Urban Development System for Road Development

(1) Possible Friction between Road Development and Urban Settlements

As described in Section 7.7 Route Study, the F/S and Pre-F/S roads were aligned keeping a clear distance from settlement areas, meandering through urbanized areas, especially in sprawl areas. This is to minimize affecting the existing communities and urban lives of people, and to avoid large expenses for compensation of land and building. However, either in the planning or implementation stage, it may be difficult being free from frictions between road development and urban settlements in case of the urban road development.

(2) Compromising Desirable Road Functions and Standards

These road-routing practices sometimes are needed to compromise with the desirable road functions, alignment and design standards like higher moving speed, shorter distance and better visibility of sight, smooth connection with other roads which would be vital for effective transport system. In some cases, the planned road can not pass through the densely built-up areas. In these cases, one and only the way of developing roads is to demolish the existing houses and buildings either for providing new right-of-way (ROW) or widening the existing ROW. However, this method is likely to face strong objections from the land/building owners and tenants because they have been deeply rooted in the local places and they are doing business and keeping social/private lives. In some cases, extraordinary high compensation may jeopardize the financial soundness of the project, the road development is long delayed, or halted finally.

(3) Urban Development System harmonizing Road Development and Urban Settlement

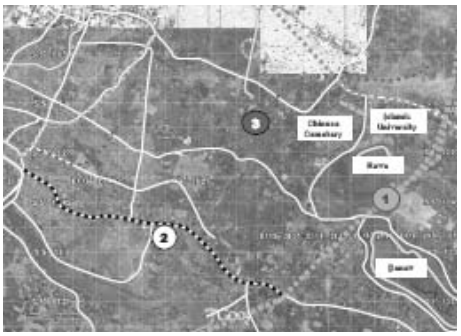
In this context, urban development system could be applied in the course of road development so as to ease the frictions between road development (new or widening) and urban settlements. A plan could be made to arrange (or adjust) the existing plots, buildings and infrastructure which would lead to benefiting both sides. That would improve urban settlement/ environment (regularized shape of plots, efficient and intensified landuse, infrastructure improvement and others) as well as securing ROW required for road development. The urban development system, if possible and applied, will contribute to a wider range of road routing alternatives other than avoiding the existing urban settlements, and consequently leading to effective and efficient urban road network establishment.

7.12.2 Possible Frictions between Road Development and Urban Settlements

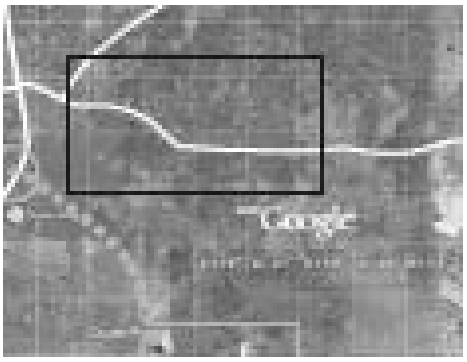
For optimistic road routes selection for Trans-Sulawesi Road, Outer Ring Road, Abdullah Daeng Road and Maminasata Bypass, there are some areas where frictions with the existing urban built-up areas may take place as shown in **Figure 7.12.1**. Urbanization has stretched outward from the Makassar city center. It has spread along the national road of Perintis- Kemerdekaan in the north

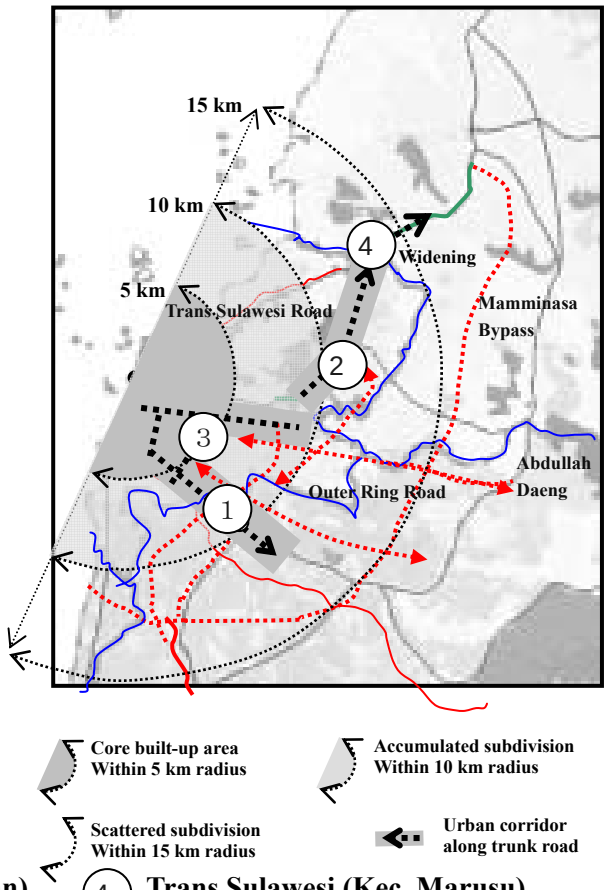
and along the national road of Makassar-Sungguminasa in the south, by creating the densely built-up belts.

① **Outer Ring Road (Kec. Sombaopu)**

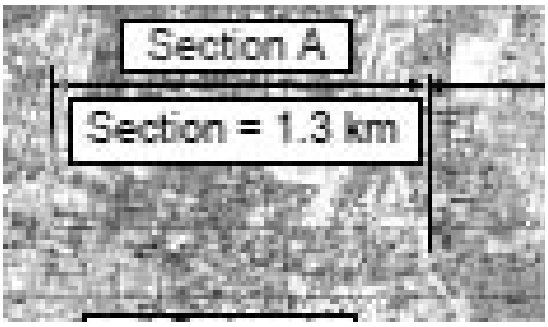


② **Outer Ring Road (Kec. Biringkanaya)**





③ **Abdullah Daeng Road(Kec. Panakkukan)**



④ **Trans Sulawesi (Kec. Marusu)**

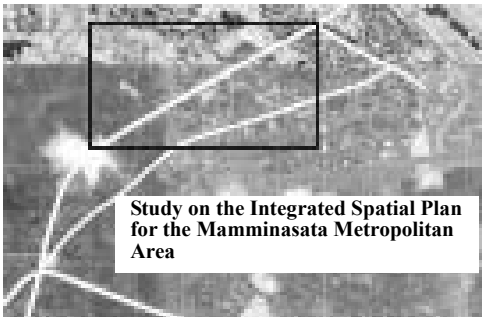


Figure 7.12.1 Possible Frictions between Road Development and Urban Settlements For the FS and Pre-FS Roads

The existing settlement is located in the accumulated subdivision area within a 10 km radius and the scattered subdivision area within a 15 km radius. The planned roads pass through the densely built-up belts along the national roads where frictions between the roads and settlements may take place.

One of the methods avoiding these frictions would be locate the road meandering among buildings in the belt. In general, city planning regulatory system is applied by prohibiting land

development and buildings in the designated ROW. An alternative method is application of land readjustment system and its systematic application for the urban development areas.

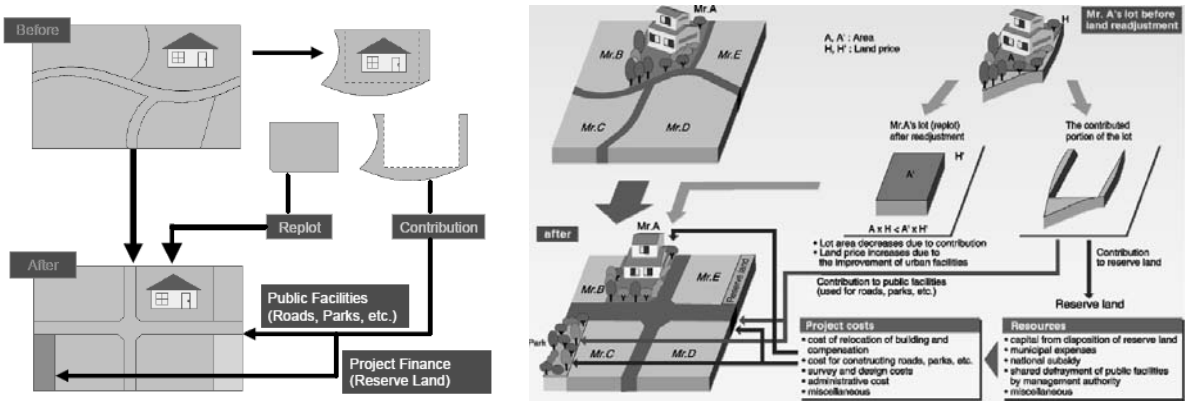
7.12.3 Land Readjustment System for Road Development Method

The land readjustment system (LR system), which is basically defined as urban area-wide development system providing urban serviced land, has been considered to be one of the most effective systems for developing road network including arterial, collector and local roads. Because its system is designed not to evict the landholders and leaseholders from the project site so as to minimize the friction between road development and human settlement. The mechanism and techniques of the LR system are illustrated and explained in **Figure 7.12.2**. The LR system is classified into the following 3 types:

i) Area-wide Land Readjustment

ii) Roadside-LR Type Road Development

iii) Roadside-Improvement Road Development



Land readjustment (LR) is one of the measures for urban area development. It is implemented through "replotting". The conceptual framework of a LR project is shown below, involving a number of unique concepts such as "replotting", "contribution", etc. Since landowners and leaseholders equitably contribute a portion of their land in a LR project, a replot (building lot after LR) becomes smaller than the lot before LR. However, urban infrastructure developed under the LR project increases land values with an enhancement of efficient/effective utilization of building lots. This is called an "increase in land use value" between original building lots and replotted lots (replot).
Source: THE GROUP TRAINING COURSE IN URBAN DEVELOPMENT (JICA)

Figure 7.12.2 Mechanism and Techniques of Land Readjustment System

The first one, "Area-wide Land Readjustment" is a LR full scale system to develop urban areas covering considerably a wider range of area, say 10 to several hundreds hectares, comprising urban land development and infrastructure. The second and third ones are systems more specified to arterial road development. The project areas are correspondingly limited to smaller areas where the arterial roads are planned to pass through. While "Roadside-LR type Road Development" focuses on some sections of arterial road belts, "Roadside-Improvement Road Development" covers land

plots influenced by the arterial road construction.

(1) Area-wide Land Readjustment

This full-scale LR system is required to apply to the disorderly urbanizing and sprawling areas with poor infrastructure services. **Figure 7.12.3** shows the typical situations before and after the implementation of LR project, illustrating how to address the urban sprawls. Private or public land consolidation and subdivision methods or land purchase methods cannot cope with these urbanizing areas with land being subdivided into pieces. Since LR is featured with cooperation and coordination between land and lease holders and the government, it is instrumental to manage urbanization. The arterial roads serving the wider areas beyond the project site, as well as within the site, are constructed through the LR projects; some typical cases in Japan are presented in **Figure 7.12.4**.

It may be advisable that the Area-wide LR system be applied for the areas of the urban arterial roads, especially the Outer Ring Road and Abdullah Daeng Road, are planned to run through. These planned roads are placed in such high potential locations and directions as undoubtedly bringing about urban sprawls along them without necessary measures like LR system. The planned roads themselves are due to be constructed through the LR projects, if LR is applied.

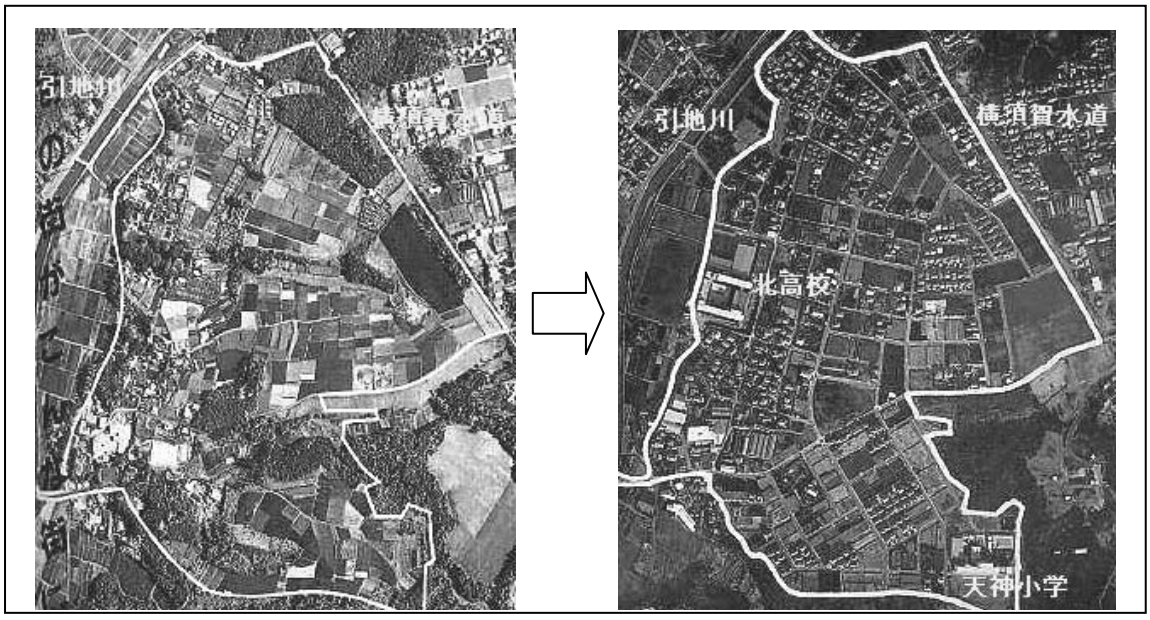
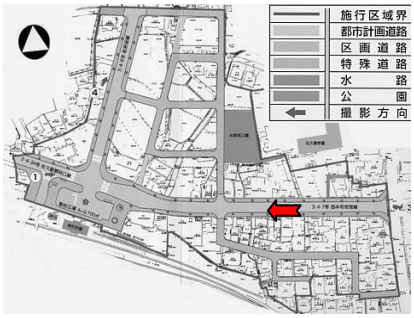
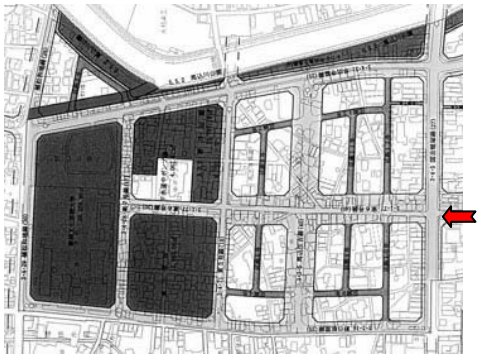


Figure 7.12.3 Area-wide Land Readjustment Applied in Urban Sprawl Areas

Fukuroi City



Saku City



Hamamatsu City

Hamamatsu City

Figure 7.12.4 Arterial Road Development through Area-wide Land Readjustment

(2) Roadside-LR Type Road Development

The full scale Land Readjustment system is streamlined aiming mainly at the arterial road development areas in such manner that:

i) The project area is limited to the roadside area which should be improved together with road development

ii) Technical standards of LR, for instance infrastructure, are relaxed in order to facilitate the road development.

Figure 7.12.5 shows the differences between land purchase method and LR type method, the latter with the great urban improvement including district restructuring, landuse efficiency, and infrastructure. In parallel with the urban area improvement, the ROW of the new road is secured through re-plotting techniques which are one of the great advantages of the LR system. In this system the existing landholders and leaseholders located in the ROW are transferred to the road side area (Re-plotting system of LR), where land and infrastructure are rearranged and renewed to accommodate them. Real practice of Roadside-LR Type Road Development in Japan is illustrated in **Figure 7.12.6.**

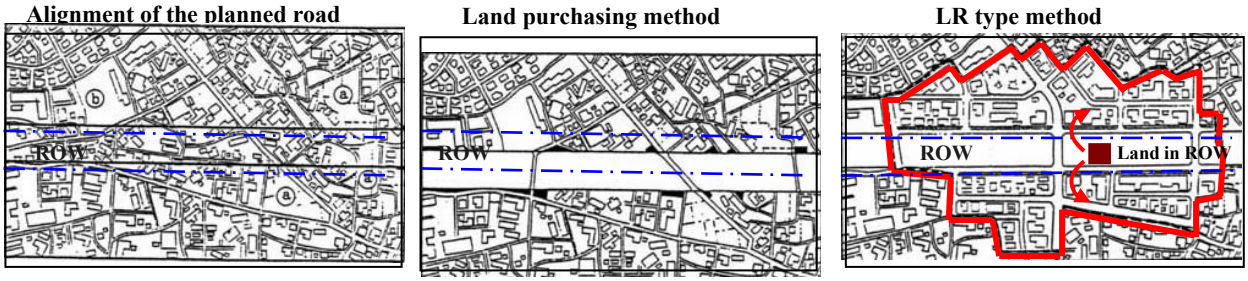


Figure 7.12.5 Differences between Land Purchase Method and LR Type Method

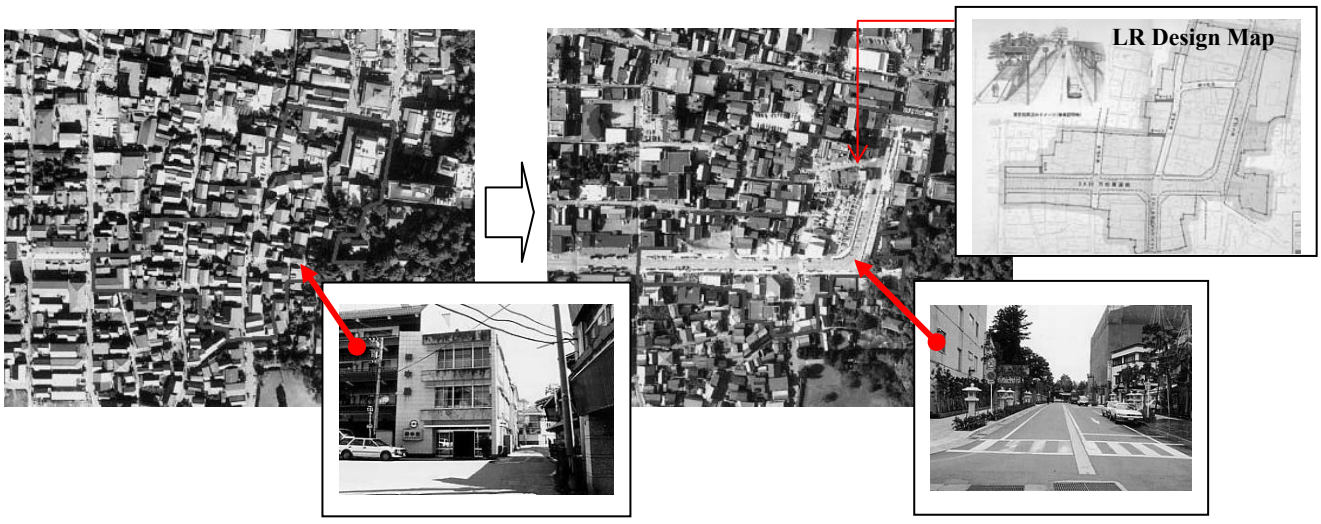


Figure 7.12.6 Real Practice of Roadside-LR Type Road Development in Japan

(3) Roadside-Improvement Road Development

This is basically classified as Land readjustment system, but mainly re-plotting technique. The system is made use of for transferring, exchanging and consolidating plots of land among the landowners for road development as well as roadside improvement. The project site is quite limited in terms of lots of land, including only the land plots relevant or connected to road construction in contrast with the broader areas of the above two cases. The advantage of "Roadside-Improvement Road Development" is summarized as follows:

i) Nobody is evicted except those who would like to sell their land, ii) Nobody/no plot loses access to the arterial road

ii) Small plots which are likely to be left after the land purchase will be merged into those with a regular size so as to use land resource efficiently, as compared to the ROW land purchase method.

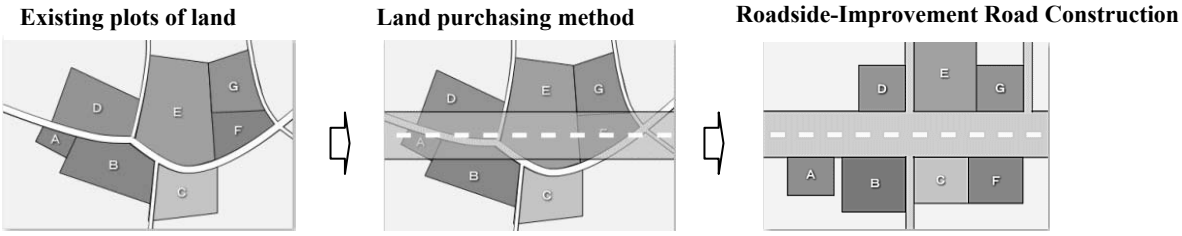


Figure 7.12.7 Land Readjustment for Road Development

It is also useful to apply it in widening the existing arterial road as shown in **Figure 7.12.8** where both sides of road are clogged with buildings, on which the boundaries of the widened ROW run.

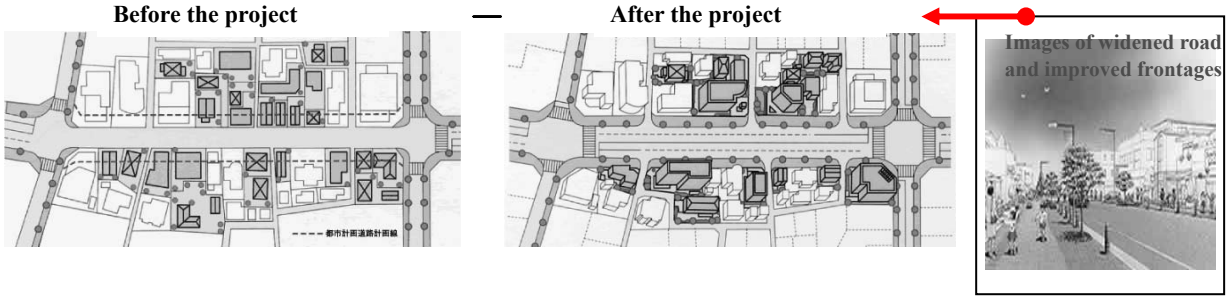


Figure 7.12.8 Roadside-Improvement Road Development

The key factors to make this road development successful are firstly grasping desires/ hopes of land holders through consultation with them, secondly rearranging and coordinating their plots of land in accordance with their hopes/desires so as to widen the space for the road construction as well as to develop the road side urban area along the widened new road.

(4) Desires/ Hopes of Landholders and Leaseholders

It is predictable that a variety of opinions/intentions of people concerned will be raised on widening

the existing road, pro and con, more specifically on selling their land. Some of them are likely to agree with selling their land either partially (part of their land in widened ROW) or totally (including the part out of ROW), and others would not like to resettle away but to keep their land and stay where they are, either on the road side or not. In addition, the neighboring landholders are invited on a voluntary basis. They are sorted out as illustrated in **Figure 7.12.9**.

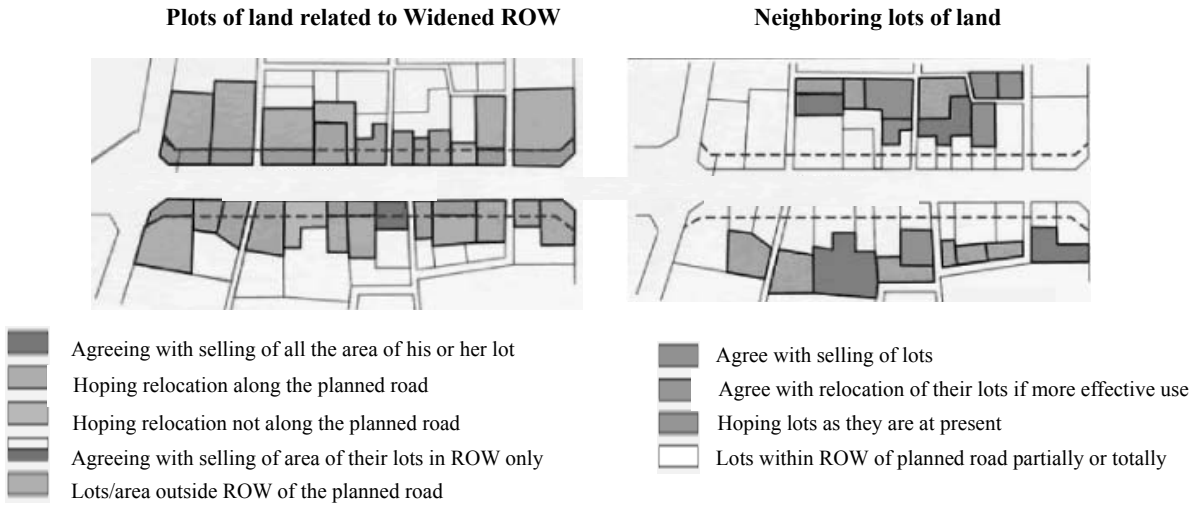


Figure 7.12.9 Desires/Intentions of Landholders about their Land

(5) Rearrangement and Coordination between Landholders

In such a manner as satisfying the identified desires/intentions of landholders, a land readjustment or land transfer plan between them is elaborated so as to enable efficient use of each plot, eventually vacating the land for widening the road. Plots are transferred in chain-reaction, for instance A in ROW is transferred to B plot, B is transferred to C plot, C sells land to the road constructing agency, thus clearing the land right of A in the ROW. This practice is defined as a combination of land purchase method and L/C system.

Figure 7.12.10 Land Transfer in Chain-Reaction between Landholders

7.12.4 Indonesian Context and Sulawesi

"Land Readjustment system" or "Land consolidation system (K/T: Konsolidasi Tanh)" in Indonesia version, has been established and a number of projects have been implemented under this

system throughout the country (in more than 25 provinces) under the authority or responsibility of land administration, especially the National Land Agency (BPN). According to the provision of Article 2, Section 2, of the Indonesian Basic Agrarian Act (No. 5/1960), the implementation of Land Consolidation System is put under the BPN jurisdiction. It was upon such legal basis that the first Land Consolidation in Renon, Bali (1982) took place prior to the issuance of a ministerial protocol (1985) and BPN decree (1991) on practicalities and procedures of Land Consolidation. In this context urban land consolidation projects have been implemented in all provinces in the Sulawesi Island since 1983 (**Table 7.12.1**). It is admitted that the Land Readjustment System for construction arterial roads as described in the preceding section can become applicable based on the past experiences of LR. On this premise LR systems were recommended in this study. This coincides with the proposal that"Land Readjustment Method" as land acquisition system be introduced for the Mamminasata Spatial Plan implementation, made in the study of "Integrated Spatial Plan for Mamminasata Metropolitan Area (JICA)".

Table 7.12.1 Achievement of Urban land consolidation in Sulawesi since 1983

Province	Area (ha)	No. Participant	No. Parcel	No. Site
N. Sulawesi	98.6110	441	106	2
C. Sulawesi	483.3163	2,956	2,127	8
S. E. Sulawesi	198.2500	1,165	1,135	3
S. Sulawesi	338.3185	1,542	1.376	5

National Land Agency BPN - Republic of Indonesia:
International Workshop on the Implementation of Rural Land Consolidation

However attention must be paid to the recommendations in the past, among others those of the JICA Study[2], made for improving and strengthening the existing Land Consolidation System of Indonesia so as to make the urban development system effective. The important points to be addressed are:

i) The existing K/T has not been equipped with self-financing mechanism for constructing infrastructure especially roads through reserved land for income-generating, leaving the responsibility of infrastructure construction upon local government.

ii) The existing K/T has rarely been applied to the urbanizing areas, mostly rural areas, failing to combat most urgent urban sprawl.

(1) Proposed L/R system for road construction

It is said that Indonesia may need a specific Act for Land-Consolidation to address these barriers so as to generalize the application of L/K over the urban areas. Without this, the first and second types of Land Readjustment for road construction as proposed in the preceding section (1. Area-wide

[2] The Study on Land Provision for Housing and Settlements Development through KASIBA and Land Consolidation in Jakarta Metropolitan Area (2000) *The State Ministry for Agrarian Affairs/National Land Agency (BPN) and The State Ministry of Housing and Human Settlements (MENPERKIM)*

Land Readjustment, and 2. Roadside-LR Type Road Construction) appear difficult to be implemented. But the third type - **Roadside-Improvement Road Development (Combination of Land purchase method and Land Consolidation system) -** as a first step of development may be applicable based on the existing systems and practices of K/T on the condition that the Provincial BPN agrees and commits itself to implement the LR projects on the side of land administration in cooperation with the Provincial Government, especially Public Works (Bina Marga) agencies responsible for infrastructure construction because this system focuses mainly the land tenure transference and exchange.

(2) Application L/R System for Road Improvement in/around CBD

While the road construction (radiating and ring roads) has been progressively implemented in the suburban areas of Makassar City, the existing arterial roads in built-up areas, especially the CBD approach roads in and around the downtown still remain to be improved for increasing their capacities. It may be safely said that the LR system as defined above can and should be applied in widening the existing roads leading to CBD, especially the East-West arterial road proposed. The L/R system should further be utilized in the urban development in the CBD of Makassar city.

(3) L/R system combining Road Development and Urban Redevelopment in CBD of Makassar City

It is predictable that in the coming 20 years the existing CBD of Makassar City will be intensively redeveloped in accordance with the increasing growth of Makassar City as a commercial, business and service center (hotels, offices, commerce, finance and other services) over East Indonesia and Sulawesi Island. This will necessitate the widening of several links of the exiting arterial roads in/around CBD to accommodate the growing traffic demand. In this context it is recommended that road improvement projects and urban redevelopment project be combined and jointly implemented where the proposed L/R system can be instrumental to implement the joint-development projects.