Japanese Efforts to Supply Low Cost Housing

Hirohide KONAMI (Prof. & PhD.)
Teikyo Heisei University, Faculty of Modern Life

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Summary

Japan faced severe shortage of housing in metropolitan areas after World War II and tried to supply affordable housing by public and private. There were three big reasons to have caused such housing shortage. One was the loss of about 2 million houses by the war only on main islands, the second was the baby boom after the war and the third was the big population migration from rural to metropolitan areas.

There were three countermeasures of the governmental policy. They were the governmental loan for individual builders, the standardization of housing unit for public houses and the promotion of land supply by means of land readjustment.

Governmental housing loan organization was established in 1950 and privatized in 2007. During these 57 years, about one third of total housing supply was supported by this system and 19 million applications have been accepted. Standardization of housing unit worked well but also caused the loose family relation because of the separation of living places between children couples and parents. Land readjustment projects supplied about 4,000 km^2 of housing sites, and this reaches about one third of total urban areas at present.

Keywords: affordable housing, land readjustment

1. Housing situation in Japan

According to the analysis of Professor Shingo Tamaki, Japan was facing the severe housing shortage after World War II. The number of households was 15,980 thousand in 1948 and number of houses in the same year was 13,900 thousand. The shortage was about 2 million. Some the other estimation says it was about 4 million because of the mismatch of demand and supply.

In 1964, the number of houses finally overcame the number of households of about 22 million. About 10 million houses and apartments were supplied until the year of 1964. They were broken down as 1 million each by municipalities, governmental housing loan system, and national and local housing corporations, and another 7 million by private supply.

The total number of housing units in Japan now is 57.6 million in 2003. The half of them are in 3 big metropolitan areas, Tokyo, Nagoya and Osaka. 7.5 million among them, about 13%, are now vacant. They also located half by half in metropolitan areas and rural areas. The main reasons would be the population decrease in rural areas and the mismatch for housing demand in metropolitan areas. Mismatch means the transportation inconvenience, no good medical services for aged people, the change of way of thinking in young generation, and etc.

The vacant houses in rural areas are expected to be rented to city people as a second house and those of metropolitan areas should be broken away or rehabilitated. A current Japanese couple produces only 1.3 babies. This means that one third of Japanese houses and apartments would be vacant in the long future.

2. The efforts to cut down the housing cost

"The Liaison Council of Public Housing Organizations" published " Cost-down Manual for Public Housing" in 1998.

There are 5 factors, such as basic plan for housing, structure plan, detail plan of housing unit, utility plan and outside finishing, to cut down the cost of public housing.

(1) Basic plan for housing

The estimation of housing demand by the family size and housing type is important. After World

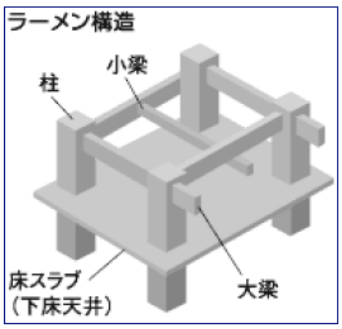
War II, Japan faced severe shortage of houses and Professor Yasumizu Yoshitake, Architecture Department of the University of Tokyo, and his group proposed 51C type of public housing in 1951. The basic concept was to decompose the spaces of eating and sleeping, and also the spaces of children and parents. As a result, two-bedroom type with a dining room became the typical standard of Japanese public housing. This promoted Japanese new couples to live apart from parents. We called this type of living as “nucleus family”. Until then, it was natural for Japanese people to live all together, grand parents, parents and the new family of the eldest son. This unit plan method could cut down the housing cost and became the standard type of Japanese dwelling unit for labors.

(2) Structure Plan

The basic structure should be selected from RC bent type, RC wall type and RC wall-bent type. RC wall type is good for up to 5 stories, RC wall-bent type is for 6—14 stories and RC bent type is for taller structure.

It was found that RC wall-bent type has the advantage for a mid-tall (6-8 stories) building.

Pillar and beam are as follows in RC bent type and RC wall type.



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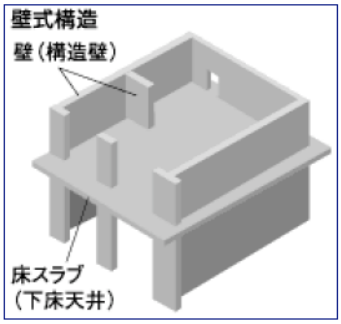
RC bent type



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RC wall type

In Japanese case of apartment house for 40-60 household units, by anti-earthquake design, the consumption of concrete, formwork and rebar (steel bar) were 48--54 m^3/unit, 341--400 m^2/unit and 6.1--7.7 ton/unit respectively.

Some other method to save the cost would be as follows.

・In case of pile base, tall and RC bent structure can save the number of base piles but the upper structure cost may increase.

・Pit space for water pipes under the floor may be designed for the minimum space and save the amount of soil disposition by back-filling the saved space.

・Flat wall can save the cost not only for construction but also for maintenance. Flying geese (Zig Zag） patter is not recommended.

・The good balance of cut and bank of soil work can save the cost.

・Service facilities such as elevator, fire hydrant, and etc. should be carefully designed taking legal regulations into the consideration.

・The establishment of the numerous standards for each design such as floor height 2,700 mm, ceiling height 2,400 mm, beam height 1,900 mm, slab thickness 150 mm, floor height of ground floor GL+400 mm, width of balcony 1,200 mm, width of corridor 1,400 mm, width of main stare cases 1,200 mm, width of sub-stare cases 900 mm, and etc. can save the cost.

・Finishing of outside wall should be standard type such as exposed concrete in order to save the cost. But, sometimes it may be needed to decorate to make better urban landscape.

・Roof design should take account of the life-time cost including the maintenance cost.

・In case of row house, the dividing wall between next door works for both sides and contributes to save number of walls. Therefore, the row house type would be recommended if possible.

(3) Detail plan for each housing unit
In the planning of each housing unit, followings are the ideas to save the cost.
・Introduction of standard flat plan and the unit facilities for interior design,
・Save the space for corridor by the good circulation planning, and
・Foreign products are sometimes less expensive.

(4) Utility plan
Followings are the ideas to save the cost.
・To centralize the water related facilities in order to save the length of water pipes, and
・To utilize the unit products as much as possible.

(5) Outside finishing
Followings are the ideas to save the cost.
・To avoid the expensive pavement,
・The necessary parking space for cars and bicycles should be carefully estimated,
・To save the length of inside road by the good circulation planning, and
・To consider the utilization of recycled materials.

3. Difference of construction cost by construction methods
According to the homepage of "house search" (http://sumai.nikkei.co.jp/house/calc/calc_finish.cfm), they compare the cost of 7 types of Japanese house building method as shown in table 1.

Teble 1 Cost comparison among 7 construction methods
Small town in Tokyo Suburban Area (10,000 Yen/㎡) About ¥100=$1US

Construction method	Low Cost	Standard	High Grade
Wooden traditional	14 -15	17 -18	18 -20
Wooden prefabrication	15 -16	18 -19	19 -21
Two by four	17	18 -20	20-22
Steel prefabrication	17 -19	20 -22	22 -24
Steel beam	18 -20	21 -23	23 -25
Concrete prefabrication	19 -20	22 -24	24 -26
Reinforced concrete	20 -21	23 -25	25 -28

Local town in Hokkaido (10,000 Yen/㎡) About ¥100=$1US

Construction method	Low Cost	Standard	High Grade
Wooden traditional	13 -14	15 -16	16 -18
Wooden prefabrication	13 -15	16 -17	17 -19
Wooden two by four	14 -15	16 -18	18 -20
Steel prefabrication	16 -17	18 -20	20 -22
Steel beam	16 -18	20 -21	21 -23
Concrete prefabrication	17 -19	20 -22	22 -24
Reinforced concrete	18 -19	21 -23	23 -25

(1) Construction cost includes electricity, water system, gas supply, solar water warm up system, and miscellaneous.

(2) The cost was calculated by dividing the total construction expense by the total constructed floor space of selected projects.

According to this data, it can be said that the cost difference between Tokyo metropolitan area and Hokkaido rural area is only 10% and the difference among the grades is much larger than that and reaches to 20 - 25 %.

The difference among construction methods is also large enough and reaches to 40 - 50 %. But this may be influenced by various conditions such as so much wood resources in Japan and so little in Mongolia.

4. Land supply by land readjustment projects

In order to supply affordable housing, it is vitally important to supply low cost housing sites. Because, the land price in Japan is extremely expensive and current land price for residential area is as follows. (Public Land Price Notification in 2008)

Table 2 Land price of residential areas (Rough number, ¥100=$1US)

Area	Thousand yen / m^2
Tokyo downtown Minato Ward	2,000
Tokyo suburbs Setagaya Ward	600
Tokyo suburbs Ohmiya area	250
Osaka downtown Chuo Ward	550
Osaka suburbs Takatsuki area	190
Sapporo downtown Chuo Ward	60 -210
Hokkaido small town Akabira City	10
Fukuoka downtown Chuo Ward	130 -540
Kyushu small town Kobayashi City	20

The principle of land readjustment is the same as land pooling in India. Landowners can establish a legal project union under the Land Readjustment Law. They replace their each land based on the public approved replacement plan and construct the public facilities such as road, green parks, water supply, and etc. The project union is exempted from all of the administration commissions and taxation as far as the income meets the project cost. The union can pool the land for public facilities and money resource. Usually the total land for public facilities would be 20 - 30 % of total land and necessary money resource land is calculated by the project cost and the selling price of money resource land. Usually it would be 30 - 40 %. This means that the

landowners will pool the 50 - 70 % of their land but the land price would rise up to several times after the project. Then the landowners can easily enjoy the development benefit by selling their replaced land after the project. In case of the project in built-up areas, the land price cannot rise so much and, sometimes, pooling share exceeds the rise of land price. In this case, landowners do not like to do the project. The municipality will replace the union and pay the compensations to landowners for the loss of asset value.

In this way, Japan could have succeeded to supply affordable housing sites all over the country. The total land area supplied by these projects is about 4,000 km^2 and this is about one third of all urban areas (densely inhabited district) in Japan. These projects also contributed to confirm the ownership border by the precise surveying through the projects.

5. Eco heating system in residential areas

In accordance with the worldwide effort to cut down the exhaustions of CO2, Japan is trying to introduce as many as ideas to cut down the exhaustions of CO2.

Japan established "The Promotion Act of Clean Heat Supply" in 1972 and more than 80 companies 150 districts have been approved by the Ministry of Economy, Trade and Industry. This is the same system as the electric supply company and it is easy to establish the heat supply company attached to waste treatment centers, hot springs, power stations, coal washers, volcanic areas and so on.

It is possible to cut down the exhaustions of CO2 by introducing such centralized heat supply system with the qualified advanced technology.

It is also important to decrease the consumption of energy in each house. Therefore, roof planting, wall greening, solar panel or water warm up system on the roof, heat insulated wall, floor and ceiling, are getting popular in these days.

These ideas contribute not only to realize low carbon emission cities but also to improve the urban landscape and to strengthen cities against natural disasters.

6. Conclusion

This study concluded that the ideas for affordable housing would be as follows:

(1) To establish good plans for housing based on the reasonable demand estimation,

(2) To supply affordable housing sites by means of land adjustment or some other methods,

(3) To select the reasonable building structure and design,

(4) To establish design standards to cut down the construction cost,

(5) To choose the suitable construction method, and

(6) To introduce some good heating systems.

Reference

(1) Shingo Tamaki "The Change of Housing Situation During 1945 and1980" Kenchiku Zasshi Vol.95, No.1166, 1980

(2) "Cost-down Manual for Public Housing" The Liaison Council of Public Housing Organizations, 1998

Profile of Author

Hirohide Konami was born in Tokyo in 1942 and graduated from the University of Tokyo in 1966 as an engineer of urban planning. After the governmental contribution for about 30 years in the Ministry of Construction, he got the visiting professorial position in the University of the Philippines in 1996. At this time he became a lifetime member of EAROPH. Since then he changed the position to the professors in Toyo University and Tokyo Jogakkan College in Tokyo and Teikyo Heisei University in 2008. He is also an alumnus of Graduate School of Design, Harvard University. EAROPH presentations are as follows:

1998: Efforts to Improve Urban Environment in Japan / 16th EAROPH Congress in Bali, Indonesia
1999: Education of Future Planners / EAROPH Congress in Darwin, Australia
2002: The Impact of Shinkansen Construction on Regional Development / EAROPH Congress in KL, Malaysia
2003: Analysis on the Recent Population Change of Japanese Cities / EAROPH Congress in Nagasaki, Japan
2004: Efforts and Goals of Sustainable Development in Japan / EAROPH Congress in Melbourne, Australia
2005: Overview of Soft Infra-structure for Tourism Development / Workshop in the University of the Humanities, Ulaanbaatar, Mongolia (This is not EARPH Congress)
Capability Assessment for Readiness in Case of Urban Disasters / EAROPH Congress in Yogyakarta, Indonesia
2006: Sustainable Urban Management under the Heavy Population Concentration / EAROPH Congress in Miri, Malaysia
2008: Strategies to Develop Tourism Sites and Get More Repeaters / EAROPH Congress in Himeji, Japan