

## Presentation of Foundation-Assisted Research Findings 2000 Realizing Environment-Friendly Architecture and Urban Development

Architecture and urban engineering research is included in Area 3 of the natural sciences research supported by the Foundation. A presentation of research findings was held July 13, 2000, at the United Nations University. After Chairman Seya's opening remarks (read by Senior Executive Director Sato due to the chairman's absence overseas), Professor Shigeru Ito, chairman of the Selection Committee, introduced the presentation themes, which was followed by the two keynote speeches. Selection Committee member Fuminori Tomosawa chaired the panel discussion after the intermission and fellow member Kenichi Kimura and MIT professor Shun Kanda provided commentaries. The proceedings elicited numerous questions from the audience in what turned into a lively discussion.



Professor Shigeru Ito,  
Selection Committee  
Chairman



Professor Fuminori  
Tomosawa,  
Selection Committee  
Member



Professor Kenichi  
Kimura,  
Selection Committee  
Member



### Keynote Speech

The Design of Multifamily Housing Suitable for Long-Term Habitation

-Management of Living Environments in a Materialistic Society-

Associate Professor Shuichi Matsumura, Department of Architecture, School of Engineering, University of Tokyo

How to deal with aging multifamily housing projects will become an issue in Japan and other parts of Asia in the future. Since they are more advanced in dealing with this issue in North America and Europe, we compared the specific responses of each country and studied their policies. Two-thirds of Japan's housing stock was built in the 1950s or later, making it extremely young. While some of the large housing projects built in the post-war era in the West are in derelict districts, there are some notable examples in which older multifamily dwellings have been revitalized. In Europe, the annual percentage of renovation projects in the building statistics total is between 50% and 60%. In Japan, it is 15% to 20%, but climbing.

Attitudes toward renovation projects fall into two categories in Japan: replace or repair. In the West, however, it is viewed from many perspectives, such as "how to divide residences," "improving communal spaces," and "adding exterior spaces." As a result, this has given rise to a diverse range of jobs in renovation projects, which have created a new market. It is useful to think of housing management as an issue that falls into one of three categories: (1) an issue that should be addressed at the regional level, (2) an issue that should be addressed at the level of housing project administrators or citizens, or (3) an issue that should be addressed at the level of individual residents. The examples seen in the various countries indicate that these three are intricately intertwined. It is inevitable that "areas in which no one wishes to live" will crop up in Japan in the future. Since revitalization projects must be carried out every 10 years on an ongoing basis, it will be necessary to study the methods used in the West to respond to budgets and the state of a building's decline, and to restructure the industry in light of this situation.



## Keynote Speech

### Urban Space Greening and Stockpiling

-Making Use of Real Estate and Transportation Market Power-  
Professor Yoshitsugu Hayashi, Department of Geotechnical and Environmental Engineering, Infrastructure and Environmental Planning, Nagoya University

We studied economic development and urban change under the theme of "the impact of land use and transportation on the environment." We gained an understanding of demographic change dynamics and the pace of urban structural growth. The differences in transportation network planning in the various locations are striking. In Tokyo, the population is distributed according to sub-islands along commuter routes. In London, there are numerous islands on the periphery that are connected by railways. In Bangkok, the low-income people live in the city center and the population is spread out in a thin plate shape. It took 70 to 80 years for London to spread to the suburbs, while Tokyo took 15 years and Bangkok 10. When income rise and automobile ownership rates rise, transportation energy consumption increases. Bangkok has the worst volume of traffic transecting urban spaces.

According to estimates, Japan's population will peak in the near future, falling to 100 million in 2050 and 67 million in 2100. With respect to population dynamics in the large cities, we must ask from a macro perspective "to what extent will the existing housing stock remain and where will it be allowed to return to green space?" In addition to the proposals to "replant the suburbs with greenery" or to "coordinate transportation and land use," there is an additional proposal to "make use of the areas surrounding the railway network, funding it with tax monies." In the relationship between land, housing and transportation, there is one school of thought that suggests greening the entire transportation sector by putting automobile ownership taxes back into land use planning, lowering the environmental burden, and merging the roads and railroads. It is one that advocates combining city planning regulations with various tax systems and running simulations. It would combine the legal means with planning and the lowering of the environmental burden. We plan to continue our research into simulation tools that clarify the interaction of land use, the tax system and transportation.

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## Panel Discussion

### Theme: Realizing Environment-Friendly Architecture and Urban Development

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#### Concrete Recycling

Professor Masaki Daimon,  
Department of Metallurgy and Ceramics Science, Graduate School of Science and Technology,  
Tokyo Institute of Technology

Although reinforced concrete lasts a lifetime, non-reinforced concrete made with various waste materials mixed with the concrete may hold the secret to creating a recycling-oriented society and culture. Concrete can become the garbage pail that preserves the regional and global environments.

Inorganic substances such as cement, glass and ceramics have a composition resembling the earth's crust and these materials are said to lend themselves easily to mass production since they use the earth itself. If we are to reuse these materials, it doesn't make any sense unless they are used as building materials. Moreover, since cement kilns burn at such high temperatures that they can be used to burn garbage without releasing much dioxin, they are increasingly in demand as a means of waste disposal. The problem is the phosphorus, chlorine and heavy metals in the garbage. According to estimates, the total amount of urban waste is 50 million tons, which produces 5 million tones of ash when burned. Of this 4-5% is chlorine. Since the cement manufactured in Japan is around the 70 to 80 million-ton level, putting all the waste-derived chlorine into the cement would produce a cement with a concentration of about 3000-4000 PPM. Since it would corrode the reinforcing steel at that concentration, could we

not take about 10% of cement production and mix in 3-4% of the waste chlorine, which could be then be used exclusively in non-reinforced concrete to build our cities. Just imagine what we can achieve if we could gather the wisdom of scientists from a broad range of fields to examine the flow of materials from all of society to free ourselves of garbage.

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#### Changes to the Planning Laws Learned from Disasters

Professor Daisuke Kato, Department of Architecture, Faculty of Engineering, University of Niigata

In the Great Hanshin Earthquake, countless buildings were destroyed and more than 5,000 lives were lost. I would like to think about the lessons to be learned from that disaster and the Great Niigata Earthquake in terms of building safety and the protection of life, assets and health.

The earthquake countermeasures law was created in stages incorporating the lessons learned from earthquake disasters. Reinforced concrete was introduced sometime in the Meiji era (1868-1912) and using the lessons learned from the Kanto, Tottori and Fukui earthquakes, the basic building code was developed in 1950. In the 1964 Niigata earthquake, apartment buildings were destroyed, and four years later in the Tokachioki earthquake, it was the shearing of reinforced concrete that was problematic, leading to the earthquake countermeasures law in 1981, which was intended to prevent shearing. At present, skyscrapers and medium-height buildings are being built on the basis of these standards. When examples of shearing were examined after the Great Hanshin Earthquake, it was determined that they were actually the result of bending. New design methods for materials were proposed to avoid this problem in future. Since beam failure is anticipated in calculating the buildings' structural design, it was determined that "the actual damage was post failure. The cause of that failure was sought and a new design model was proposed. Although the development of computers has made it easy to perform strength calculations, one must not accept the results without critical analysis. Moreover, it is important to continue to preserve disaster sites and data, and to examine countermeasures from a variety of perspectives.

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#### Sustainable Buildings and the Population Problem

Professor Shuzo Murakami, Environmental Control, Institute of Industrial Science, University of Tokyo

The trend toward increased world population is not expected to change direction in the 21st century. We must seek answers to the difficult question of how to develop sustainable living environments even as we face the three mutually reciprocal conditions of crowded housing, a desire for health and happiness, and a desire to reduce the burden on the environment.

Although the world's population experts have calculated the earth's sustainable population to be between 4 and 16 billion, we have already surpassed the lower figure. In Southeast Asia, the populations of the densely populated cities continue to increase sharply. From the viewpoint of land-use ratios and livability, this will have to be altered or there will be no green spaces left. A density of 1,000 persons per hectare or at the outer limit, 3,000 persons, is thought to be a model density at which the environmental burden and livability can be sustained. The densities of the old sections of Takashimadaira and Hanoi are 1,000 and maintain some semblance of livability, while that of portions of Hong Kong exceed 3,000 and are in need of redevelopment. We must, therefore, formulate plans that will accommodate densities as high as 3,000 in favorable circumstances. Highly insulated, airtight housing has been highly regarded recently, but this form of housing is suited to Northern Europe and the East Coast of the United States, not to the hot, humid conditions of Japan and Asia. In Asia, wind from the outside is let in, but this is exactly the point that airtight designs are meant to address. We should be building living spaces with individual character and good air circulation that have the appropriate spacing or interconnections. I think that building pleasant communities that retain livability without adding to the environmental burden will be a major theme as it relates to the population explosion.

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#### The Environment and Urban Development

Associate Professor Masami Kobayashi, Department of Architecture, School of Science and Technology, Meiji University

Reflecting on the large environmental consumption involved in the

concentration of the population and its increase in the large cities, we consider looking at small cities in the regions as a model for sustainable, stable housing environments in the aging urban society of the future.

A fresh school of thought called new urbanism has surfaced among young architects involved in redevelopment in Boston. They say that "small communities in which people can get around by walking are extremely economical and the large city model is not required." Since the major cities in Japan's outer regions are modeled on the large city model, their cores have begun to decay, large stores are relocating to the suburbs, and stores in the downtown core have lost their ability to draw customers. This is causing them to fall into a very depressed state. However, a new vision for development that embodies the distinct characteristics of the regions has arisen primarily among the young. It has been recognized anew that industry can be accommodated even in the regions, and by making the most of this, the opportunities for revitalization in the regions are increasing. Rather than saying that making a city pretty will equip it with what is necessary, this vision says that it is necessary to plant the idea in the young of returning to the local community. Youths raised with this awareness will have an appreciation of their "neighborhood." This will produce a process in which the residents will rediscover the traditional values of the town as well as themselves. And this will develop the citizens of a new era. The reality is that it is best to learn the technical traditions and materials from close up. And this is the obvious necessity for creating sustainable communities.



Professor Fuminori Tomosawa (left), Assistant Professor Masami Kobayashi, Professor Shuzo Murakami, Professor Daisuke Kato and Professor Masaki Daimon at the panel discussion.