Formation of high-quality housing stock, smooth distribution and utilization of housing stock, and appropriate management - Research development in response to the transition to a stock-based society

1. Outline of Studies and Activities

Event	Subject	Research	Reflection of results
1997 Adoption of Kyoto Protocol Increase in environmental constraints 2000 Enactment of the Housing Quality Assurance Law and start of housing performance labeling 2006 Establishment of the Basic Housing Life Law and formulation of the Basic Housing Life Plan From securing quantity to improving quality Insert "2009" in the next box? Enforcement of the Long-Life Quality Housing Law and start of long-life quality housing certification (New construction) 2012 Formulation of a total plan for existing homes and remodeling 2015 Enforcement of Vacant House Law (Increase in unmanaged vacant houses) 2016 Beginning of Long-Life Housing Recognition (Existing)	■Extending the lifespan of housing ・Planning technology for extending the lifespan of new housing ・Technologies and methods for post-construction maintenance ■Formation of high-quality housing stock ・Methods for improving the quality and ensuring the performance of new housing	Goal: Ensuring the longevity and quality of new housing ■Comprehensive project "Development of Construction and Rehabilitation Technologies for Investment Efficiency and Long-Life Urban Housing Complexes" ・Planning technology and supply method for long-term durable housing using the skeleton-infill (SI) method ■Comprehensive project "Development of Planning and Management Technologies for Ultra-Long-Life Houses" (2008-2010) ・Design, supply, and management methods for multi-generational housing (apartment complexes) ・Methods for converting existing apartment buildings into multi-generational housing through renovation, etc. ・Management techniques for multi-generational housing ・Technology for extending the service life of detached wooden houses	[Development of draft standards, etc.] ○Presentation of planning standards (draft) for skeleton-infill (SI) housing [Reflection in laws and public notices] ★Long-Term Quality Housing Act, Long-Term Quality Housing Certification Criteria [Notification] [Reflection in subsidized project standards] ○Subsidy Criteria for Long-Life Quality Housing Renovation Promotion Project ★Benchmarks for the Recognition of Long-Life Quality Housing (Existing) [Notification]
	■Formation of high-quality housing stock ・Performance evaluation technology and deterioration diagnosis technology for existing houses ・Methods and techniques for improving performance through renovation of existing houses	Goal: Diversifying the methods for surveying existing housing conditions ■Comprehensive project "Development of Performance Evaluation Technologies for Home Inspections to Reduce Uncertainties about Existing Houses" (2011-2014) • Techniques for maintaining and managing design information for existing housing • Methods for understanding materials and construction methods of existing houses • Inspection methods for existing conditions in accordance with the actual deterioration of existing houses	[Preparation of draft standards, etc.] ○Developing a database of materials and construction methods for existing houses ○Presentation of current condition inspection method for existing houses
	■Responding to the increase in unmanaged vacant houses ・Methods of utilization of vacant houses ・Methods for dealing with poorly managed vacant houses ・Preventive measures to address the mismanagement of vacant houses	Goal: Reducing the number of unmanaged vacant houses **■Itemization "Research on Quantification of the Effectiveness of Preventive Measures Against the Poor Management of Vacant Houses" (2020-2022).** • Methodology for quantitative evaluation of the effectiveness of preventive countermeasures against mismanagement	

1) Background events, social changes, etc.

In addition to the demand for housing and social infrastructure development with high economic and investment efficiency from a long-term perspective in response to stable growth, there are growing environmental constraints from the perspective of global environmental preservation and a strong need for the effective use of resources and energy. In 2006, the Basic Plan for Housing and Living Standards (National Plan) was formulated in accordance with the Basic Act on Housing and Living Standards. In 2008, the Long-Life Housing Law was enacted, and in 2009, the Long-Life Quality Housing Law was established, together with the start of certification of new housing as long-life quality housing.

In 2012, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) formulated the "Total Plan for Existing Housing and Remodeling," which aims to shift from a housing market centered on new construction to a stock-type housing market where the quality and performance of the housing stock is improved through remodeling and circulated through the distribution of existing housing. The goal was to double the market size by 2020.

While housing stock has been accumulating, the number of vacant houses nationwide reached 8.2 million, accounting for 13.5% of all vacant houses (according to a 2013 survey of housing and land statistics), and some of them are left unattended without proper management. To address this situation, the Vacant House Special Measures Law was fully enforced in 2015, strengthening measures to deal with unmanaged vacant houses.

2) Research and development tasks

The following factors were identified as contributing to the short lifespan of Japanese housing: ① Inadequate initial housing performance; ② Changing lifestyles and rapidly increasing housing needs; ③ High land valuation and low housing (upper property) valuation; ④ Underdeveloped existing housing market and housing distribution market; and ⑤ Institutional infrastructure that does not provide incentives to supply and own long-life housing. In order to solve these factors and respond to the transition to a stock-based society, research and development is needed from the viewpoints of ① promoting the supply of housing with consideration for long-term durability; ② promoting the renovation of existing housing; ③ promoting proper maintenance of housing and residential land; ④ promoting housing distribution (rehousing); and ⑤ developing institutional infrastructure suitable for the supply and ownership of long-life housing.

3) Outline of Research and Activities

From FY1997 to FY2001, we conducted the "Development of Construction and Rehabilitation Technologies for Investment Efficiency Improvement and Long-Life Urban Housing Complexes" research project and from FY2008 to FY2010, the "Development of Formation and Management Technologies for Multi-Generation Ultra-Long-Life Housing and Housing Lots" project on research and development of planning technologies and supply methods to realize the long-term durability of new housing, as well as maintenance and management technologies in collaboration with the then Building Research Institute (BRI), an independent administrative agency.

From FY2011 to FY2014, we conducted research and development aimed at proposing methods for surveying the deterioration of existing housing, technologies and methods for understanding building specifications and other information for performance evaluation, and technologies and methods for improving housing performance through renovation, including the "Development of Performance Evaluation Technologies for Existing Housing to Promote Distribution of Existing Housing and Stock Rehabilitation."

While taking into account these research and development efforts, we have also been providing technical support for the MLIT's housing policies to develop the institutional infrastructure for the transition to a stock-type society, including the Long-Life Quality Housing Certification Standard (for new construction/extension/renovation) based on the Long-Life Quality

Housing Act, the revised Housing Performance Evaluation and Indication Standard based on the Housing Quality Assurance Act, and methods for inspecting existing homes (housing inspection).

Since FY2020, we have been conducting "Research on Quantification of the Effectiveness of Preventive Measures for the Poor Management of Vacant Houses" for the development of quantitative evaluation methods. We also participate as an advisor to the National Council for the Promotion of Measures against Vacant Houses (established in 2017), which consists of approximately 1,000 local governments and related organizations nationwide, and provides information and advice on vacant house issues.

2. Main Research Results

1) Comprehensive project "Development of Planning and Management Technologies for Ultra-Long-Life Housing" (2008-2010)

A comprehensive technology development project was launched in FY2008 with the aim of conducting surveys and research on new construction and proper management of long-life existing housing and extending the service life of existing housing through renovation, as well as acquiring the technical knowledge and evidence data needed to study technical standards, etc. in related measures to promote the longevity of housing.

(Research)

In this study, we defined "multi-generational housing" as a new image of housing that has excellent maintenance and management performance and can be used for multiple generations as a social asset. Specifically, after setting the target performance levels for multi-generational housing (apartment buildings and detached houses) and housing land and other infrastructure, we examined the design and planning techniques for apartment buildings when newly built, appropriate long-term management systems, and maintenance and management methods for detached wooden houses. For existing houses, we also studied the establishment of target performance levels when implementing multi-generational housing retrofitting according to the frame performance, etc., diagnosis and retrofitting techniques and implementation methods to promote multi-generational housing retrofitting, and long-term management methods after the retrofitting.

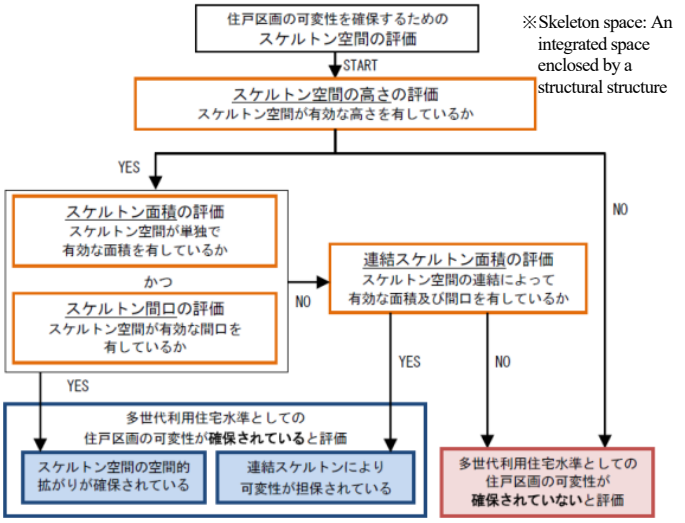
(Research Results)

With regard to the design and supply methods and management methods for multi-generational housing (apartment buildings), we proposed "a method for evaluating the variability of dwelling unit compartments in apartment buildings and proposed standards for skeleton spaces that can be evaluated as having variability" and "a new planning method for the long-term management of condominiums."

With regard to the use of existing apartment buildings (especially condominiums under ownership) for multi-generational use through renovation, etc., we proposed "evaluation methods and evaluation criteria for the framework performance of existing apartment buildings," "target performance levels for multi-generational use of existing apartment buildings," "methods for applying renovation technologies for multi-generational housing," "methods for formulating renovation plans," and "information management methods related to renovation," etc.

The project investigated and summarized matters that should be considered and implemented by home builders, maintenance managers, and residents regarding detached wooden houses, and prepared and proposed draft guidelines for the design, construction, maintenance management, and succession of ownership of detached wooden houses to prolong their service life and multi-generational use.

The above results were reflected in the Long-Life Quality Housing Certification Standards (Notification and New Construction Standards) based on the Long-Life Quality Housing Act, and were also used as the subsidy standards for the renovation promotion project to convert to long-life quality housing, leading to the Long-Life Quality Housing Certification Standards (Notification and Extension and Renovation Standards) based on the operation of this subsidy project.



Flow of evaluation of variability of dwelling unit compartments in apartment buildings

2) Comprehensive project "Development of Performance Evaluation Technologies for Home Inspections to Reduce Uncertainties about Existing Houses" (2011-2014)

The MLIT compiled the "Total Plan for Existing Houses and Remodeling" and has established measures to enhance and promote housing performance evaluation and labeling, and to accumulate and utilize housing history information. In FY2011, we started a comprehensive technology development project to enable the implementation of renovation and repair, performance evaluation and indication, and the maintenance of housing history information, even in the absence of drawings, etc., and we conducted research on design information maintenance and management methods, inspection methods that match the actual deterioration situation, and new performance evaluation methods.

(Research)

In this study, as a technology for maintaining and managing the design information on existing houses, we developed a method for easily grasping and rationally maintaining the design information (information on the shape of each part of the house, composition of members, materials used, etc.) on existing houses for which design drawings and other materials have been scattered, by focusing on the use of 3D object CAD in new house design and new measurement technology based on information technology. We focused on new measurement technologies, etc., and developed a technology to efficiently measure the shape and dimensions of the exterior and parts of a house and create a shape model.

In addition, to better understand the materials and construction methods of existing houses, we conducted a survey of the actual design specifications of detached wooden houses, aiming to obtain information on parts of the main body and construction methods that are difficult or impossible to visually inspect, and we developed materials and construction method data (about 330 items) for 1,247 houses. A database system of the materials and construction methods was developed for practitioners. In addition, we examined the inspection methods for existing houses in accordance with their actual state of deterioration.

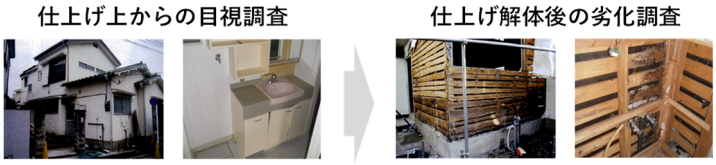
(Research Results)

We compiled the "Draft Guidelines for Creating Building Information Models for Existing Houses" regarding the use of information technologies such as 3D measurement and building information modeling as a technology for maintaining and

managing design information on existing houses.

As a method for understanding the materials and construction methods of existing houses, we developed a database system that enables efficient acquisition and accumulation of data from laptop computers and tablet terminals, etc., to support the practical work of designers and construction companies.

Based on the results of a survey of the actual deterioration of detached wooden houses, we developed a simple inspection method that contributes to a rational understanding of the current condition of existing houses by organizing the relationship between the building attributes (construction date, location environment, construction method of each part, etc.) and the tendency and location of deterioration and damage.



	場所区分	棟数		
		計	劣化あり	劣化なし
[1]	浴室(1階)	92(100%)	66(71.7%)	26(28.3%)
[2]	居室等の外周部(1階)	95(100%)	62(65.3%)	33(34.7%)
[3]	居室等の外周部以外(1階)	95(100%)	35(36.8%)	60(63.2%)
[4]	玄関・勝手口・ホール(1階)	95(100%)	40(42.1%)	55(57.9%)
[5]	2階の外周部	76(100%)	23(30.3%)	53(69.7%)
[6]	2階の外周部以外	76(100%)	6(7.9%)	70(92.1%)
[7]	小屋組	95(100%)	8(8.4%)	87(91.6%)

Example of results of a deterioration survey of an existing house (relationship between location classification and presence/absence of deterioration)

The above results have been published as guidelines for information maintenance methods and a practical support database for the maintenance of housing history information in the renovation of existing houses for long-life quality housing, etc., to support the use of the technology in practice.

3. List of Related Reports and Technical Documents

1) “Development of Planning and Management Technologies for Ultra-Long-Life Houses,” NILIM Project Research Report No. 42
http://www.nilim.go.jp/lab/bcg/siryou/kpr/prn0042.htm

2) “Development of Performance Evaluation Technologies for Home Inspections to Reduce Uncertainties about Existing Houses,” NILIM Project Research Report No. 60
http://www.nilim.go.jp/lab/bcg/siryou/kpr/prn0060.htm

4. Future Outlook

Although the performance level of new housing is improving and the number of certified long-life quality housing units is increasing, the situation has leveled off in recent years. In particular, there is a need for more diverse evaluation methods for plans and technologies for apartment buildings. There is also a strong need for streamlining inspections of existing homes to determine the state of deterioration and other conditions (housing inspections), as well as for renovation techniques and support measures to improve performance. In terms of measures to deal with the increasing number of vacant houses, there are limits to what can be done after the fact, and there is a need for preventive measures, quantitative evaluation of their effectiveness, measures to prevent mismanagement, and measures to promote the removal of mismanaged vacant houses.