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TOKAI EARTHQUAKE PREPAREDNESS PROGRAM "TOKAI-ZERO" IN SHIZUOKA PREFECTURE, JAPAN (PART 3)

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Abstract

Shizuoka Prefecture, which is located about 150 km southwest of Tokyo, Japan, has a great concern about a major earthquake called "Tokai earthquake" which may occur in the future. It is therefore an urgent task to protect the lives of citizens from building collapse and mitigate damages, promoting an anti-earthquake project for timber houses called "TOKAI-ZERO".

Focused in the project is the promotion of seismic retrofit of old timber houses built before 1981. These houses were built with the dated Earthquake Building Code and such buildings had most serious damage in the Kobe Earthquake of 1995. Financial supports are given to the owners for seismic evaluation, and retrofit planning and construction. Twenty years have passed since the project started and the society nowadays faces the problems which were not seen at the time of its launch, including declining population, number of households and birthrate, and an aging population, reduction in the number of new residential constructions, and increased vacant houses.

Table 1 shows the comparison of subsidy amounts in 2003 and 2019. The seismic evaluation remained free of charge; on the other hand, the amounts of subsidies for retrofit planning and construction were increased by about 2.5 times and new programs were also added to the program for rebuilding, moving, and partial retrofit. Nevertheless, Fig.1, which shows the transition of the number of retrofits, shows that the number dropped to the two-thirds of its peak, indicating the program was not so utilized as expected despite of all these enrichments. Questions then arise what actions should be taken to enhance anti-earthquake retrofitting, and how we can convince the residents living in seismically vulnerable houses (forming 230,000 households, 60% of which are formed only from elderly people (2013)) to retrofit their houses.

This study succeeds the paper on "TOKAI-ZERO" project presented in the 16WCEE, Santiago, 2016 and reports promotional activities such as educational campaign developed for elderly people or cooperation with related organization through events, which were conducted for TOKAI-ZERO after 20 years since its establishment.

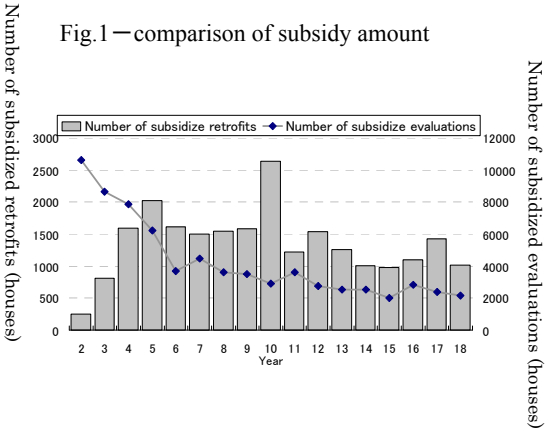
Keywords: Tokai Earthquake, A Project "TOKAI-ZERO", Shizuoka Prefecture

Table1－comparison of subsidies

Menu	2004	2019
Evaluation	Free	Free
Planning	￥96,000	￥1,000,000 (￥1,200,000)
Construction	￥300,000 (￥500,000)	
Rebuilding/Moving	—	23%、¥820,000
Partial retrofit	—	¥250,000

Households only with elderly people were granted with the subsidies indicated in parenthesis.

Fig.1－comparison of subsidy amount



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1. Introduction

In order to protect the lives of citizens of Shizuoka Prefecture and to mitigate damages from building collapse caused by an anticipated major earthquake, seismic retrofit of timber houses compliant with the dated Earthquake Building Code is promoted based on "TOKAI (Tokai, Collapse)-ZERO" project.

Ahead of the nation, with the beginning of the 21st century, free seismic evaluation was started in FY2001, and fixed-amount subsidies (300,000 yen) for seismic construction was started in FY2002. Shizuoka Prefecture set a goal to increase the number of houses given seismic construction subsidies to 20,000 by the end of FY2015, and this goal was achieved in FY2016.

At present, based on "Seismic Retrofit Promotion Project in Shizuoka Prefecture (2016～20)", we set a target of increasing seismic rate to 95% by the end of FY2020 and carry out various approaches in cooperation with municipalities. It is estimated that the rate will be around 86% at the end of FY2018 and that the target can not be achieved at this current achievement rate.

2. Outline of the Project

2.1 Big changes of social back ground

Twenty years has passed since the project started. During this period, social back ground changed significantly. The population of the prefecture has been on a decreasing trend since its peak in 2005, while the number of households has also reduced since its peak in 2015. In addition, it can be estimated that the number of households with elderly people (65 years or older) will increase approximately 186,000 over 15 years from 2005 to 2020.

With respect to housing-related changes, number of new housing starts has been decreased significantly since Lehman Shock in 2008. Additionally, the increase of the number of vacant houses has been a major social problem recently and some of them are in very dangerous condition without being demolished.

A series of these changes can be seen all over the country as well as in our prefecture and be regarded as a social problem. Various countermeasures against these changes have been implemented. In the promotion of seismic retrofit of old timber houses, countermeasures should be taken considering these factors.

＜Indicators related to Shizuoka Prefecture＞

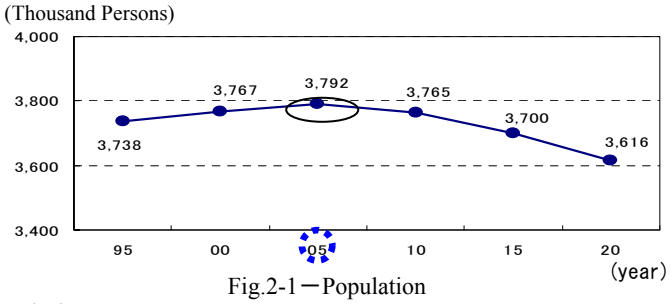

Fig.2-1－Population

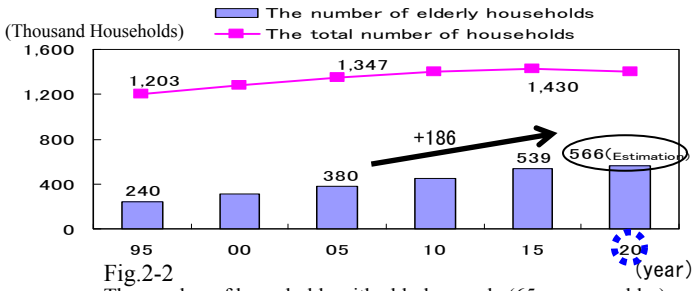

Fig.2-2
The number of households with elderly people (65 years or older)

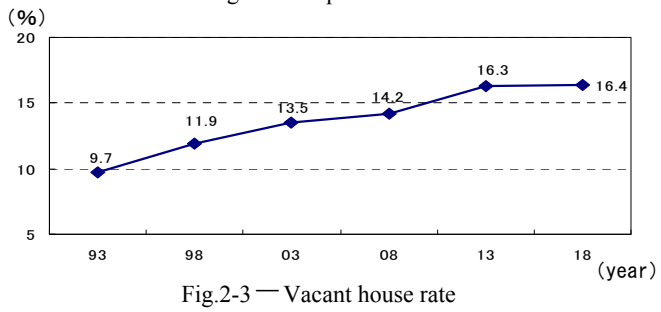

Fig.2-3 — Vacant house rate

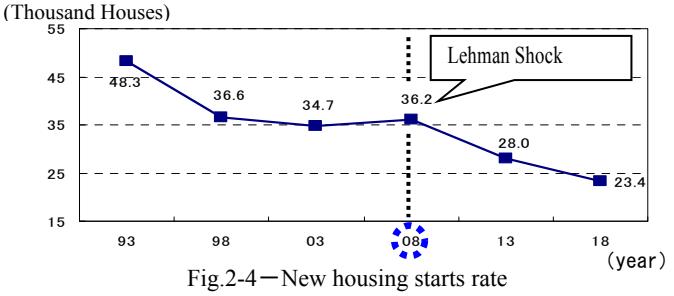

Fig.2-4－New housing starts rate

2.2 Subsidy system

The pillars of the project are as follows

1. Free seismic evaluation by experts
2. Subsidies for seismic retrofit planning
3. Subsidies for seismic retrofit construction

The project is targeted for timber houses compliant with the dated Earthquake Building Code built before May, 1981.

Fig.3－Overview of measures of the "TOKAI-ZERO" project

In the subsidy system of Shizuoka Prefecture, Shizuoka prefecture basically cooperates with cities or towns in this prefecture. The prefecture subsidizes the cities or the towns that give subsidies to the citizens of the prefecture who implement the project. The subsidy system is in place in all the 35 cities or towns in this prefecture (Table 2). Since elderly households tend to have less money because many of them live on their pensions and they need more time for evacuation just after an earthquake, the anti-earthquake project has mainly been promoted for elderly households. Moreover, the subsidy system for households only with elderly people is enhanced better than that for general households.

In "Free seismic evaluation by experts", the cities or the towns sign a consignment contract with building related organizations such as Association of Architects & Building Engineers and dispatch experts (Seismic Evaluation and Retrofit Consultants of Shizuoka Prefecture) for free when an owner makes an application by telephone, etc. These consultants are experts who took courses held by the prefecture and were certified by the prefecture. They conduct seismic evaluation and consultations on seismic retrofit construction and play an important role as regional home doctors in the TOKAI-ZERO project. At present, 1,963 consultants are registered.

In "Subsidies for seismic retrofit planning", general households can receive subsidies of two-thirds of the total amount and their cost is approximately 50,000 yen. Since FY2013, households only with elderly people can use for free in principle and since FY2016, expert dispatch system has been built as well as the seismic evaluation, and this has been implemented in one city.

" Subsidies for seismic retrofit construction " started as an original subsidy system of Shizuoka Prefecture in FY2002, one year after the seismic evaluation. The prefecture basically provided the cities and the towns with 300,000 yen per general household and 500,000 yen per elder-only household. The amount of subsidies of the prefecture has been increased from 300,000 yen to 450,000 yen based on damage from house collapse caused by the 2016 Kumamoto earthquake. In addition, the design and construction integrated type using a new national system (Table 2, Fig.4) has been implemented since FY2018.

Fig.4－Overview of the design and construction integrated type

Table 2－Outlines of the subsidy system

Program	Project	Current subsidy rate	Start of program
Seismic evaluation	Free seismic evaluation by experts	10/10 (Free)	2001～
Retrofit planning	The retrofit planning project for timber houses	two-thirds for general households ※10/10 (Free) for elder-only households	2002～
Seismic retrofit construction	The subsidy project for seismic retrofit construction for timber houses (Fixed amount)	450,000～1,050,000 yen (An original subsidy system of Shizuoka Prefecture) ※An increase of 200,000yen for elder-only household, etc.	2002～
	(The design and construction integrated type)	Up to 1,000,000 yen (using a national system) ※200,000yen is added for elder-only household, etc.	2018～

2.3 Achievement

The achievement of the subsidy project until the end of FY2018 is shown as Table 3. The achievement of seismic evaluation is 82,765 houses in total for 18 years and that of seismic retrofit construction is 23,095 houses for 17 years, which is the largest number in the whole country. However, the table shows that about 70% of people who received seismic evaluation did not proceed to seismic retrofit construction.

Table3－Achievement of the subsidy system

program	period	Cumulative number of houses
Seismic evaluation	2001～18	82,765 houses(2018:2,178 houses)
Retrofit planning	2002～18	26,445 houses(2018:1,115 houses)
Seismic retrofit construction	2002～18	23,095 houses（2018:1,012 houses）

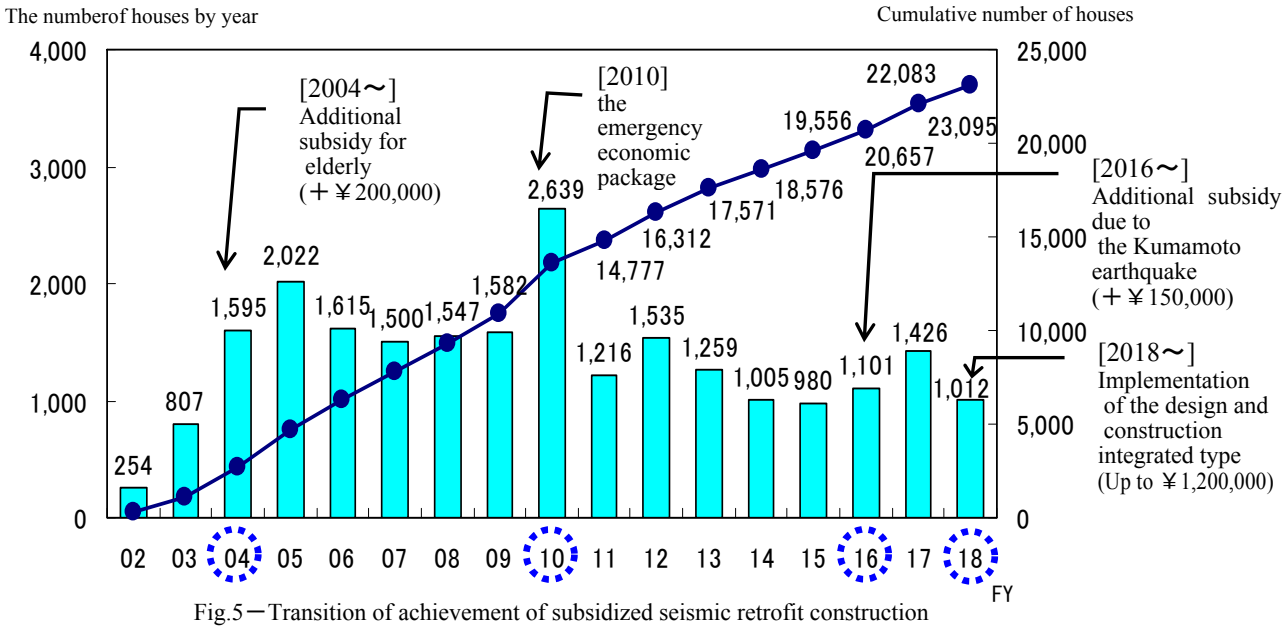

Fig.5－Transition of achievement of subsidized seismic retrofit construction

Moreover, subsidies for rebuilding, which is an important measure to advance earthquake resistance as well as seismic retrofit construction, has started since FY2017 and has been implemented in 8 cities and towns. They lead to rebuilding and moving before houses become in dangerous condition without being demolished, which also prevents the increase in vacant houses（Achievement in FY2018 : 121 houses）.

2.4 Cause of delayed achievement

As mentioned earlier, it seems difficult to achieve the goal of 95% seismic rate until the end of FY2020. The major reason that seismic rate does not increase in spite of the achievement of seismic retrofit constructions is likely that the number of rebuilding has been decreasing because of the great decrease in the number of new residential construction starts. This is why, promotion of rebuilding and moving as well as seismic retrofit construction is important.

Although the achievement of subsidized seismic retrofit construction, which is shown in Fig.5, improved temporarily in the years when the amounts of subsidies were increased, but it tended to decrease after the next fiscal year. Furthermore, even if the amounts of subsidies were increased by about 2.5 times compared to the beginning of the project, the number of subsidized cases dropped to only two-thirds. Therefore, it is thought that “high costs” or “lack of money” is not the only reason.

This prefecture has promoted the anti-earthquake project mainly for elderly households so far. However, estimated 230,000 households live in seismically vulnerable houses (2013), and 70% or more of those households were supported by the elderly. Because of this, as clearly shown in Table 4, anti-earthquake retrofitting tends not to be enhanced in areas with a high proportion of elderly households. Therefore, measures targeting elderly households are important in order to promote anti-earthquake retrofitting.

Table4 — Relationship between anti-earthquake retrofitting rate and aging

Cities and towns	Seismic rate of house (2013)	Aging rate (Apr. 2019)	Elderly household rate
A town	59.5%	46.1%	68.5%
B city	61.3%	41.2%	56.8%
C town	62.6%	45.6%	68.2%
≈		≈	
Y town	89.3%	21.9%	35.0%
Z city	89.4%	23.6%	38.0%

3. Promotion of earthquake resistance (Future initiatives)

3.1 Current initiatives

Owners are likely to be interested in earthquake resistance by getting them to know and understand earthquake resistance as well as subsidies.

SNS such as the prefecture homepage, Twitter and Facebook can be used for dissemination and awareness raising of earthquake resistance. Needless to say, we are using them now. However, as mentioned, our target is elderly households living in seismically vulnerable houses. This means that steady efforts to contact them directly are needed. Since FY2010, we have approached the owners in direct manners. For example, round-trip postcards which can be used to apply for seismic evaluation have been sent to owners of target housings. Moreover, prefectural personnel and municipal personnel have jointly conducted door-to-door visits to explain the system in detail to owners.

Accumulated achievements since 2010 are shown in Table 5. Although the percentage of the owners who made an application for free seismic evaluation was 5% as a result of direct mails and door-to-door visits, we think that these actions have a noticeable effect to find prospect owners and continue these actions. Though direct mails and door-to-door visits used to be conducted to the house-owners who did not receive seismic evaluation, since FY2019, in order to directly improve the seismic rate, direct mails and door-to-door visits have mainly been conducted to the house-owners who have already received seismic evaluation but not proceeded to seismic retrofit construction as a target.

Table 5－Achievement of direct mails, etc.

Type	Period	Accumulated number
Sent direct mails	2010～18	107,922（2018: 14,168）
Door-to-door visits	2010～18	29,134（2018: 3,094）

Furthermore, visits to locations of senior club activity where many elderly people gather, on-site lectures using "Bururu" which are experimental teaching materials of timber houses (Fig.6), and signboards that describe "Under seismic retrofit construction"(Fig.7) raise awareness among local residents and promote earthquake resistance.

Some cities and towns produce good results using the subsidy project which dispatches housing consultants to house owners who live in seismically vulnerable houses

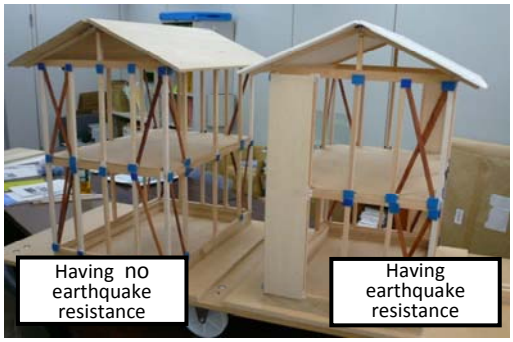

Fig.6－"Bururu", experimental teaching materials of timber houses

Fig.7－A signboards describing "Protect your own life Under seismic retrofit construction"

3.2 Measures to be taken in the future

Based on the fact that many elderly households are unwilling to do seismic retrofitting because of lack of funds and no heir, we newly created "Cue Leaflet"(Fig.8) as a hint which encourage the elderly living in seismically vulnerable houses to do seismic retrofitting. This leaflet introduces the cases where elderly people actually decided to do seismic retrofitting in order to secure the safety of their grandchildren coming to play or not to bother their neighbors. From now on, we will conduct enlightenment activities using this leaflet to reach the hearts of the owners.

Why don't you do seismic retrofitting? The subsidy is ¥1,000,000
Why did that person do seismic retrofitting?

Fig.8－"Cue Leaflet" introduction of the cases of elderly people deciding to do seismic retrofitting

(Introduction of the cases in the leaflet)

"I decided to do seismic retrofitting as a gift from us so that our grandchildren could live in a safe and secure house. I am glad I did because they were pleased that their house becomes bright because of new walls and floors."

"The reason I did seismic retrofitting was that my grandchildren and his friend were hiding under their bed during the Great East Japan Earthquake. From that time, I was worried whether I could protect these children in this house. However, I could not decide to do seismic retrofitting because I had cherished this house from the predecessor and repaired it. After that, as the number of parts to be repaired in my house has increased, I wondered if repairs and seismic retrofitting would be possible and consulted with a construction company. Based on the results of the Seismic evaluation, I talked with my family and decided to do seismic retrofitting"

4. Conclusion

It has been almost 20 years since the launch of an anti-earthquake project for timber houses called "TOKAI-ZERO". In order to find issues according to the progress of the project and to disseminate this project, we have conducted publicity and awareness raising activities on various occasions and media. Although there is no easy way to find a good solution for promotion of the anti-earthquake project, we will continue these publicity and awareness-raising activities, as the word "Persistence makes perfect".

In the current "Shizuoka Prefectural Seismic Retrofit Promotion Plan", we have been addressing how to make elderly households more earthquake-resistant as the most important issue. In the future, we will focus on how to guide 70% of those who have received seismic evaluation, who cannot do seismic retrofitting. We would like to consider what to do specifically, with a view to formulating the next plan after 2021.

5. Acknowledgements

In the promotion of this project, many people such as the government, academic experts, and building engineers have helped us. The subsidy system for seismic retrofitting of houses has been well enhanced throughout all of Japan. In order to protect as many lives as possible from collapse of houses and other facilities caused by a major earthquake, we earnestly hope that more houses compliant with the dated Earthquake Building Code will have earthquake resistance.

