

The damages of land liquefaction by the 3.11 Eastern Japan Great Earthquake Disaster and public financial support in Ibaraki prefecture, Japan



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SUMMARY

We identified the issues of public financial support for the damaged housing by land liquefaction from the practices of Mito and Itako city in Ibaraki prefecture, which was seriously damaged by the 3.11 Eastern Japan Great Earthquake itself, not only by the Tsunami. Serious land-subsidences were found mostly in the landfill areas, which are especially along the river, used to be the ponds or lakes and transitions of cut and embankment. Not all the reconstruction cost could be covered by the public fund, citizens' self-reconstruction is necessary. However, the damage evaluation standard is too complicated, even though the standard prescribes the amount of subsidy, which based on the national law. Citizens' conflicts happened for the finance support in the municipalities, more specialists such as certificated architect or some kinds of network are needed to inspect and evaluate the conditions precisely.

Keywords: Eastern Japan Great Earthquake Disaster, Land liquefaction, Public financial support, Ibaraki

1. INTRODUCTION: RESEARCH BACKGROUND

The 3.11 Eastern Japan Great Earthquake Disaster (Tohoku earthquake) caused serious land liquefaction in many cities such as Kitakami City in Iwate Prefecture, Itako city in Ibaraki Prefecture, Kuki City in Saitama Prefecture, and Over10 cities in Chiba Prefecture. The main issues of land liquefaction are, the Land Infrastructure such as street, sewer, water...etc, Agricultural land, Public facilities and housing, and Private housing. On this topic, most serious issue is regarding the private housing, because leaning house by the land liquefaction has many difficulties for living, even though they are not seriously damaged on the structure. And all the cost couldn't be covered by the public fund, mostly fixed by the citizens themselves. Moreover, recovery of the land subsidence costs really high and requires the high level skills. On May 2, 2011, Japanese Cabinet Office widens the financial support for the households with serious land liquefaction damages, based on National Act on Support for Livelihood Recovery of Disaster Victims (ASLR). However, it is not enough, still many households cannot get the support. So, Chiba Prefecture decided to incorporate its own support fund into its supplementary subsidy. But the adjacent prefecture, Ibaraki prefecture has no support as a prefecture government. In this research, from the viewpoint of public financial support, we report the situation of the land liquefaction by the Eastern Japan Great Earthquake Disaster and the implementation of the ASLR through the cases in Ibaraki Prefecture, Japan. We chose Mito and Itako city, which are seriously damaged in the city centre. From the criteria of National government, the degree of damage for the housings is categorised into 4 categories, Major (almost of all the part were broken or gone), Major-Moderate (most of the parts were broken or gone), Moderate (almost half of the parts were broken or gone) and Minor (partly damaged). As of January 2012, In Ibaraki prefecture, different from the other 3 prefecture, Iwate, Miyagi and Fukushima, the 98% of housing damages were evaluated as half damaged /moderate (23,397 house hold) and partly damaged: Minor, (161,159house hold). See the Table 1.

Although there are already many researches on ASLR since it was enacted in 1998, such as Abe (1999), Yamazaki (2001, 2003, 2004, 2006), Fukuzaki (2005), Shida et al. (2006), Yoshida (2008), Shigekawa (2008a, 2008b), Shiozaki (2008), Tanaka et al. (2009), only the article written by Watanabe (2011) analyzed the actual application of ASLR after the Tohoku Earthquake. However, this article is from the aspect of the financial affairs of the four municipalities in Tohoku, which suffered huge losses, and differs from our research purpose. Nakagawa (2011) and Japanese Federation of Bar Associations (2011) provided suggestions on ASLR to resolve problems arising in the past, which are related to the objectives for the subsidy, it should include not only the housing also the factories, retail shop, fish industries, agricultural land, farm, land embankment and the area polluted by the nuclear plant. Quick mention of the findings from the past practice here as well, Shigekawa (2008) pointed out some issues of the inspection and evaluation process based on ASLR from the case study of Wajima and Kashiwazaki, she pointed out the shortage of the staffs and proposed to develop the self damage inspection method by the disaster victim themselves and mentioned that it would be useful in the damage survey, especially for the catastrophic events in the metropolitan area. However, in the serious situation to get the subsidy, some residents torn down their houses before the inspection or evaluation by the municipality for instance. (From the interviews of city offices in Ibaraki prefecture, 2011). It would be drought that the self-inspection system does work well in case of the serious disaster in the urban core.

Many researches of reconstruction planning process and activities in Tohoku area (North Eastern Japan) are going on. However, there are few researches on the legal issues of the public financial support for the disaster victims. In the discussion of the implementation for the evaluation of housing damage by the serious disaster (Cabinet Office, Government of Japan 2006-2007), they did some surveys including sending out the Questionnaire to the disaster victims. But now, after the big Tohoku earthquake happened, a lot of un-presumed serious issues such as land liquefaction. We have to examine what is the effective public financial support by the national law, including municipal affairs.

Table 1. Damages of the prefecture (as of January, 2012)

	Major	Major-Moderate	Moderate	Minor	flooded	burnt	other (not housing)
Hokkaido	0	4	0	7	329	545	469
Aomori	311	852	0	832	0	0	1194
Iwate	20184	4552	15	7316	1761	323	4220
Miyagi	82754	129220	135	211346	7900	11299	27819
Akita	0	0	0	3	0	0	3
Yamagata	37	80	0	0	0	0	0
Fukushima	19780	61857	80	142058	1053	340	1116
Tokyo	0	11	3	257	1715	0	20
Ibaraki	3046	23397	31	161159	0	700	13654
Tochigi	264	2062	0	68296	0	0	295
Gunma	0	7	0	17051	0	0	0
Saitama	22	193	2	1800	153	1	33
Chiba	799	9810	15	43510	0	722	660
Kanagawa	0	38	0	407	0	0	13

2. THE STRUCTURE OF THE ACT ON SUPPORT FOR LIVELIHOOD RECOVERY OF DISASTER VICTIMS AND THE PUBLIC SUPPORT FROM THE MUNICIPALITIES

As stated above, there are 4 categories for the housing damages, Major, Major-Moderate, Moderate and Minor. If the housing damages are evaluated as most 3 serious damages as follows, “Major”, ”Major-Moderate”, “the cases that the victims are forced the refuge for long time (ex. The housing were gone, seriously damaged, the original housings are designated as a hazardous area...etc) and the houses were torn down by the reason of serious damages”, National government pay 1/2 and prefecture pay 1/2 of subsidy. However, the evaluation work is by the municipalities (cities, towns and villages). The total budget is total 600 million yen. For the Tohoku earthquake, National Government already sent the subsidy to the prefecture. Highest amount of subsidy is for Miyagi Prefecture, over 920,000 households got the money.

2.1. The history of the ASLR

National Act on Support for Livelihood Recovery of Disaster Victims was enacted in 1998, in the wake of Great Hanshin Earthquake in 1995. The purpose of this act is the financial support for the victims whose housings had been damaged or destroyed. The act was revised in 2004, the total amount of subsidies increased up to 3 million yen. In 2007, the income and ages criteria for the financial support were abolished and revised to simple and time-efficient program. In 2011 May, the Japanese Cabinet Office decided to widen the standards for the subsidy based on ASLR, which included the damage by the serious land liquefaction.

2.2. The discussions from the past Niigata disasters

The revision in 2007 was the significant revision from the aspect of the implementation by the municipalities, Shida (2008) pointed out the issues of ASLR from the interviews from the victims and the staffs in the city offices in Niigata prefecture. The national financial support by the ASLR after the Niigata earthquake in 2004 was not enough in terms of amounts of subsidy from national government and flexibility. So, Niigata prefecture made their own policies and did the support for the persons whose houses are damaged. The Niigata prefecture didn't set the income cap and widen the support for the half and partly damaged household in their policies. Another important issue is regarding the inspection quality. The inspection and evaluation is based on national guideline, however not all the inspectors are specialist of building or architecture, the accuracy and equity of the evaluation were serious problem at that time. Regarding the balance of the fund for the subsidy, ASLR provide that 1/2 of the subsidy would be paid from the national government, however in the discussion of reconstruction plan meeting by the Government, the possibility to increase the fund or the rate by the government would be really low.

3. THE DAMAGES IN IBARAKI PREFECTURE

Most of the mass media, such as TVs, Newspapers and the Internet websites reported the terrible Tsunami in the Tohoku area. However, the fact that the cities in Ibaraki prefecture are really close to Tohoku area and was seriously damaged, didn't report on the mass media at all. So, we focused on the situation of the damages in Ibaraki prefecture and did the case studies (Mito city and Itako city). First, we take a look at the damages of the cities in Ibaraki prefecture from the figures in the table 2. In the most of the municipalities, housing damages were caused by not Tsunami, by the shakes of the earthquakes itself.

Table 2. Damages of the cities in the Ibaraki prefecture (as of November, 2011)

Prefecture	No.	City	Housing damage					Other	
			Major	Moderate	Minor	flooded above floor	flooded under floor	Public	other
Ibaraki	1	Mito	579	2,839	22,210	6			
	2	Hitachi	413	3,189	12,277	565	157		
	3	Tsuchiura	6	243	4,468			10	716
	4	Koga	8	16	2,892	0	0	51	99
	5	Ishioka	18	154	2,681	0	0		
	6	Yuki	2	24	3,134	0	0	42	
	7	Ryugasaki	1	42	4,934	0	0	20	216
	8	Shimotuma	42	240	2,667	0	0		90
	9	Jyoso	0	61	913	0	0	0	0
	10	Hitachiota	105	1,202	4,168	0	0	17	90
	11	Takahagi	198	1,028	3,808	10	18	10	88
	12	Kitaibaraki	385	1,851	6,155	419	142	10	
	13	Kasama	16	131	6,434	0	0	7	
	14	Toride	23	267	2,975	0	0	80	
	15	Ushiku	3	90	2,488	0	0		
	16	Tsukuba	8	237	2,921	0	1	179	779
	17	Hitachinaka	84	759	5,996	180	139		1,490
	18	Kajima	472	2,711	2,567	155	77	62	0
	19	Itako	89	2,224	2,620	0	0	41	500
	20	Moriya	0	8	400	0	0	19	0
	21	Hitachiomiya	11	81	4,226	0	0	89	850
	22	Naka	63	255	6,356	0	0	46	1,553
	23	Chikusei	5	142	5,377	0	0	2	85
	24	Bando	4	21	2,372	0	0	18	0
	25	Inashiki	130	413	3,281	0	0	28	348
	26	Kasumigaura	7	18	1,081	0	0	37	77
	27	Sakuragawa	15	203	1,901	0	0	16	1,351
	28	Kamisu	139	1,764	3,272	25	10		
	29	Namegata	103	453	2,877	0	0	5	46
	30	Hokota	98	596	4,789	43	13	136	20
	31	Tsukubamirai	11	45	2,302	0	0	44	504
	32	Komitama	17	109	4,295	0	0	35	1,569
	33	Ibaraki	27	525	3,607	0	0	1	8
	34	Oarai	12	280	1,188	204	167	0	189
	35	Jyori	13	207	2,045	0	0	0	2
	36	Tokai	58	110	3,264	0	0	3	502
	37	Taishi	1	1	612	0	0	0	10
	38	Miura	1	18	799	0	0	13	102
	39	Ami	0	25	1,650	0	0	0	0
	40	Kawachi	7	62	379	0	0	0	29
	41	Yachiyo	0	0	4,288	0	0	7	0
	42	Goka	0	0	398	0	0	0	0
	43	Sakai	0	0	1,174	0	0	0	0
	44	Tone	22	95	3,002	0	0	0	0
	45	Ohter							
		Total	3,196	22,739	161,243	1,607	724	1,028	11,313

4. THE DAMAGES IN MITO CITY

Mito city is located in the north of the Ibaraki prefecture and the prefectural capital. In Mito City, serious land subsidence were found mostly in the landfill areas, which are especially along the river, used to be the ponds or lakes and transition of cut and embankment. High-rise and mid-rise building and office building located in the city centre were seriously damaged including the city offices. The city staffs are doing their jobs in makeshift shelter office. Right after the earthquake, the efficiency of damage evaluation work for ASLR went down and also even in the situation, such as no air conditioner, limited smaller spaces, they were working hard for the evaluation job.

So, why the city centre was so damaged? The reason is really easy as you can check the figure 1, before Edo era, the Samurai was fighting to get their territory, so most of the shogun (the general) made a castle, where the enemy can't attack easily, like the surroundings of the castle is really high cliff or really deep lake or ponds.

After 100 years passed, the working style was totally changed, and companies needed to get the flat land. So, they put the soils into the pond called "Senba lake" and made flat lands. And almost 50years later, the headquarters of municipality and some branches of national government put the offices because the citizens are easy to get to there. From the Figure 1, you can see what happened in the city centre in Mito Area from the historical context. The Number of land liquefaction damages in the Mito city is indicated in Table 2. Most of damaged housing are evaluated as Moderate (almost half of the parts were broken or gone) and Minor (partly damaged). And total amount of housing inspection is over 25,000 houses, means that this disaster was really serious and the staff had really tough and long time to complete the inspection and evaluation. From the interviews from city staff, after the revision of the ASLR regarding the land liquefaction, a lot of houses were required to re-inspect and it took more time and changed the evaluation results, It took over 9 months to complete the inspections.



Picture 1. Damages of Mito City office (West side)



Picture 2. Damages of Mito City office (East side)

Table 2. Damages in Mito city
(As of November, 2011)

Category	Number of damaged housing
Major	580
Major-Moderate	457
Moderate	2391
Minor	22,554



Picture 3. Temporary makeshift shelter office



Picture 4. Damages of Condominium (city center)



Picture 5. Damages of office (City center)



Picture 6. Damages of office (City center)



Picture 7. Damages of public facility (along the river)



Picture 8. Damages of housing (near the river)



Picture 9. Damages of parking (near the river)

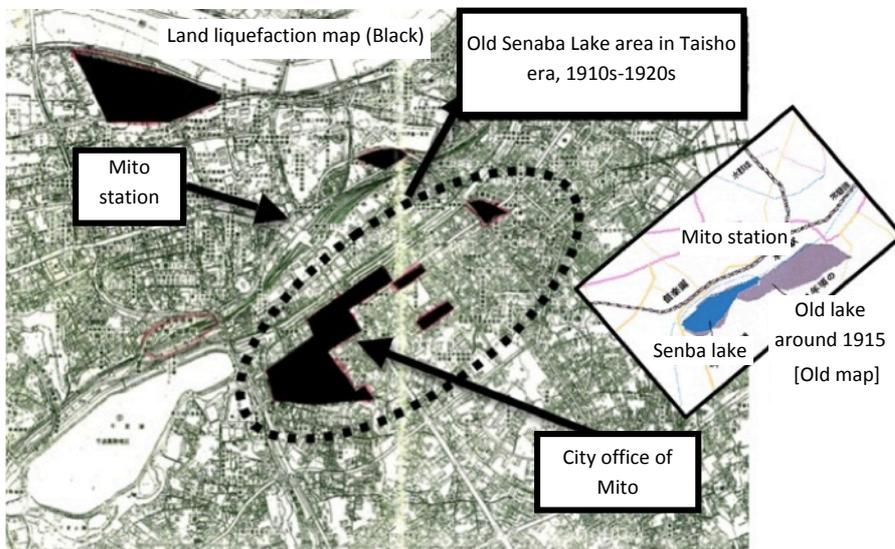


Figure 1. Comparison of old Senba Lake in 1910s to 1920s and present urban center, and the land liquefaction area mapped by black paints.

5. THE DAMAGES IN ITAKO CITY

Itako city is located at the prefectural boundary with Chiba prefecture. By the Tohoku earthquake, only “Hinode” area was seriously damaged, which was land filled in 1950s to 1970s (picture10), the housings in the other area have no damage. Most of the damages are not on the housing structure or architecture, but on the land ground by the land liquefaction. Before the 2011 revision of ASLR, the standard didn’t include the criteria of land subsidence, even though the housings are leaning, the ground are waving and people can’t live there, the results of the damage evaluation were mostly “partly damaged (minor)” or “nothing”. But after the revision, hundred of the housings are evaluated as Major or Major-Moderate. From the interview of city staff, they experienced the definite difficulty of re-inspection caused by the criteria change by the Japanese government. Hinode area was used be the pond called “Uchinasakaura” connected to “Sotonasakaura”, which is relatively large lake. In the 1950s, land reclamation started and the land was used for the agriculture and around 1970s land adjustment association were made, in 1974, the land development were completed. Almost 60 years later, the land liquefaction happened in this area.



Picture 10. The Hinode area in 1970



Figure 2. Damages of Hinode area



Picture 11. Housing damages



Picture 12. Housing damages



Picture 13. land subsidence of School facility



Picture 14. Repair work of the land subsidence

6. ISSUES OF NATIONAL ACT ON SUPPORT FOR LIVELIHOOD RECOVERY OF DISASTER VICTIMS

6.1. Necessity of National government's decentralization of power

National Act on Support for Livelihood Recovery of Disaster Victims was enacted in 1998 in the wake of Great Hanshin Earthquake in 1995. The purpose of this act is the financial support for the victims whose housings had been damaged or destroyed. However, the big discussion on the issue of the support for the Victims is regarding “financial support by using Public fund”, means usage of the Taxes from the citizens from the all the Japanese cities. The View of Japanese Government is that it would be not possible to compensate for the individual property or estate damage, but based on the “right of peaceful life” in Japanese constitution, the subsidy could be possible for the keeping the life. After the big disasters in the past, ASLR was revised twice, and now the new 2011 ASLR includes the criteria for the evaluation of the damages by land liquefaction. The achievement should be praised, however the 3.11 Tohoku earthquake identified a lot of new issues of public support as well besides we stated. For the effective ASLR, more simple, easy and quick inspection systems are necessary, the flexibility of the ASLR is needed on the each situation of the different municipalities, means that we should discuss national government's decentralization of power to have the flexibility on the implementation of ASLR to fit the each municipalities' condition.

6.2. Shortage of inspection staffs and time consuming, inaccuracy and unfair of evaluation

Under the situation of this kind of huge earthquake, the human resource of municipalities is totally shortage, however the national government didn't support for the staff as human resource. The municipalities couldn't inspect and evaluate all the housings right after the earthquake. It took almost over 9 months to complete the inspection. In the case of Ibaraki prefecture, different from the other Tohoku prefecture, most of the housings are evaluated as half damaged or partly damaged. Millions of inspections should be carried out. By the revision in May 2011, a lot of re-inspections were required. At that time, they couldn't use the national guide provided by the government for the inspection because these guidelines were really complicated and not easy for the inspection, the municipalities made the original manual and guidance for the inspector. But this kind of matter might cause the unfairness among the municipalities. So, The national government needs to revise the law for the effective guidance and score sheet. As a result of unfairness, some citizens appealed to the city because they couldn't understand what happened in the evaluation process. For the accuracy of the evaluation, architectural specialist should be in the city office because in the most of the cities, the inspections were done by the staff in the department of property tax.

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