



## Displaced human mobility due to March 11 disaster

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### Abstract

After confirming the number and the data sources of the refugees caused by the March 11 disaster, we examined their destinations as well as the difficulties faced by them and the damaged areas.

### Introduction

Most human mobility in the contemporary world is considered voluntary. The giant tsunami and the Fukushima nuclear power plant accident, caused by the huge earthquake on March 11, 2011, catastrophically damaged the Pacific coastal areas of the Tohoku region. The number of casualties in the tsunami was horrific. As of March, 2012, the dead and missing are approximately 15,850 and 3,150, respectively. This disaster caused massive flows of displaced people in three prefectures: Iwate, Miyagi and Fukushima. This paper investigates their evacuation and focuses on these three prefectures.

### Number of Refugees

Immediately after the tsunami and the nuclear plant disaster, a mass evacuation took place from the coastal to the inland areas and the more distant regions. Fig. 1 shows the number of refugees (*hinan-sha*). Although this figure's curve seems very strange, it reflects the data frequently used by the mass media during the past year and shows the seriousness and complexity of the displacement.

On March 14, three days after the earthquake, the number of refugees exceeded 468,000. Then it started to decrease rapidly. A slight rise in the number in early June 2011 is related to the change of the data source from the National Police Agency to the Cabinet Office. The sudden increase of refugees in the middle of November 2011 reflects that the newly confirmed refugees at temporary housing (*kasetsu jutaku*) in the three prefectures had been incorporated into the total. Therefore, the decline of refugees until

mid-November (Fig. 1) is misleading because it overlooks a considerable part of them. If we keep this in mind, the actual number has probably been decreasing very slowly since the middle of March, 2011.

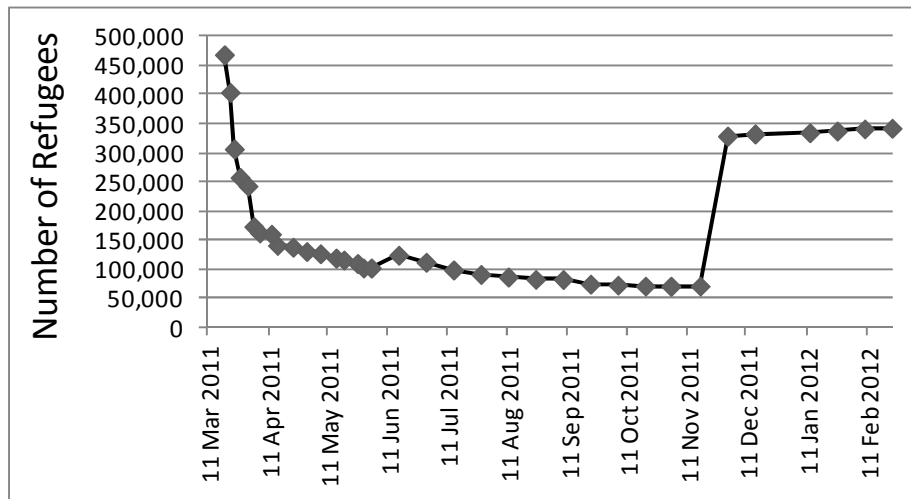


Fig. 1 Number of refugees

Source: National Policy Agency, the Cabinet Office, and the Reconstruction Agency

The evacuation started when refugees left their original residences. The great majority of evacuation sites were shelters (*hinan-jo*) and included schools, gymnasiums, preschools, city or town halls, community centers, libraries, hospitals, fire stations, shopping centers, and shrines/temples. Even inns/hotels or the houses of relatives/friends were used by the refugees. The construction of temporary housing (*kasetsu jutaku*) began in April 2011 (Kokudo Kotsu Sho, 2012), and local governments encouraged them to move into these houses. Temporary houses have gradually replaced shelters as evacuation sites.

### Data Sources on Refugees

The data sources for identifying refugees can be divided into three kinds. The first source is lists containing information on individual refugees, such as name, age, gender, home address, and so on. These lists have been uploaded to many official websites of the local governments in the three prefectures.

Iwate/Fukushima and Miyagi prefectures listed the refugee information in somewhat different formats. Iwate prefecture released 730- and 733-page lists of refugee information as of April 11 and April 28 as pdf files (see, for example, Iwate-ken, 2011). For approximately 70,000 refugees, each long list contains such information as names and

addresses of shelters, names, home addresses, and ages. Fukushima Prefecture released similar lists as pdf files on 74,872 refugees and 1,012 pages of information (March 31), 82,653 refugees and 1,100 pages (May 3), and 82,644 refugees and 1,102 pages (May 29). Moreover, many refugee lists prepared by local municipalities were also uploaded. In Miyagi prefecture, such long, prefecture-wide files were not released, but many lists, which often included handwritten information, were made available on local municipalities' websites. One excellent point of Miyagi's files is that the municipalities where refugees lived previously and the municipalities to which they moved were presented as origin-destination tables (see, for example, Miyagi-ken, 2011). This simplifies geographical investigation.

Since the above files contain detailed data on the evacuees and much personal information, they should not be released under normal conditions from the standpoint of privacy protection. However, such announcements on websites were generally adopted by giving priority to confirming the safety of residents. Newly updated files have often been added, based on changes in the refugees living in each shelter. This situation reflects the severity of this displacement, but it also presents a good opportunity for human mobility research from a geographical perspective. However, as shelters (in particular, type A in Table 1) were closed due to temporary housing construction, the websites, including refugee files, have gradually been closed. Although these data based on such sources are valuable for geographical examination, they are somewhat difficult to use due to different file formats.

The second data source is announcements by the national government based on the information reported from the damaged municipalities. Since the birth of thousands of refugees on March 11, disaster reports, including the refugee-related information, have been released by the National Policy Agency, followed by the Cabinet Office, Government of Japan. After the inauguration of the Reconstruction Agency in December 2011, such work has been assumed by this agency.

This source provided decomposed refugee numbers by prefecture and four categories of facility: type A (shelters: community centers, schools, and so on), type B (inns or hotels), type C (other: houses of relatives, friends, and so on), and type D (residences including public houses, temporary houses, private houses, and hospitals). Immediately after March 11, a great majority of the refugees was forced to live in type A, and thus, the term "shelter" tended to be narrowly used to denote only this type. However, as construction of temporary houses progressed, most refugees have moved to type D.

Using these cross-tabulated data between prefecture and facility type, we can

describe the following evacuation information in the three prefectures since early June, 2011 (Table 1). Note that this information has been announced almost every two week since June 2011.

Table 1 Refugees by prefecture and facility type

No	Survey date	Iwate					Miyagi				
		Total	type A (shelters)	type B (inns/hotels)	type C (houses of relatives/friends)	type D (residences)	Total	type A (shelters)	type B (inns/hotels)	type C (houses of relatives/friends)	type D (residences)
1	Jun 2 2011	25,747	9,039		14,701	-	25,489	23,454	2,035	-	-
2	Jun 16 2011	18,641	7,018	2,032	9,591	-	19,266	17,231	2,035	-	-
3	Jun 30 2011	9,339	5,006	2,032	2,301	-	15,871	13,836	2,035	-	-
4	Jul 14 2011	6,127	2,771	2,032	1,324	-	12,874	10,839	2,035	-	-
5	Jul 28 2011	4,892	1,144	2,032	1,716	-	10,282	8,247	2,035	-	-
6	Aug 11 2011	5,092	651	54	3,516	871	7,361	5,713	1,648	-	-
7	Aug 25 2011	4,233	105	16	3,232	880	6,038	4,744	1,294	-	-
8	Sep 8 2011	1,801	4	8	884	905	2,853	2,234	619	-	-
9	Sep 22 2011	1,807	4	8	886	909	2,122	1,836	286	-	-
10	Oct 6 2011	1,877	4	8	882	983	910	822	88	-	-
11	Oct 20 2011	1,922	0	8	878	1,036	321	225	43	53	-
12	Nov 2 2011	1,978	0	0	893	1,085	398	176	25	197	-
13	Nov 17 2011	42,472	0	0	885	41,587	122,229	31	16	191	121,991
14	Dec 1 2011	43,953	0	0	882	43,071	122,557	16	15	175	122,351
15	Dec 15 2011	43,812	0	0	873	42,939	123,927	5	15	147	123,760
16	Jan 12 2012	43,875	0	0	876	42,999	125,008	0	0	137	124,871
17	Jan 26 2012	43,782	0	0	861	42,921	125,146	0	0	133	125,013
18	Feb 9 2012	43,773	0	0	863	42,910	126,232	0	0	123	126,109
19	Feb 23 2012	43,353	0	0	791	42,562	127,714	0	0	1,021	126,693

No	Survey date	Fukushima					Total of three prefectures	Total of other prefectures	National total
		Total	type A (shelters)	type B (inns/hotels)	type C (houses of relatives/friends)	type D (residences)			
1	Jun 2 2011	23,979	6,105	17,874	-	-	75,215	49,379	124,594
2	Jun 16 2011	22,063	4,744	17,319	-	-	59,970	52,435	112,405
3	Jun 30 2011	19,484	3,455	16,029	-	-	44,694	54,542	99,236
4	Jul 14 2011	16,642	2,528	14,114	-	-	35,643	55,909	91,552
5	Jul 28 2011	13,192	1,898	11,294	-	-	28,366	58,697	87,063
6	Aug 11 2011	9,077	1,015	8,062	-	-	21,530	61,569	83,099
7	Aug 25 2011	6,683	780	5,903	-	-	16,954	65,991	82,945
8	Sep 8 2011	3,834	230	3,604	-	-	8,488	66,412	74,900
9	Sep 22 2011	2,634	133	2,501	-	-	6,563	66,686	73,249
10	Oct 6 2011	1,628	95	1,533	-	-	4,415	67,163	71,578
11	Oct 20 2011	1,149	79	1,070	-	-	3,392	67,966	71,358
12	Nov 2 2011	466	45	421	-	-	2,842	68,723	71,565
13	Nov 17 2011	94,343	41	92	-	94,210	259,044	69,859	328,903
14	Dec 1 2011	95,200	19	37	-	95,144	261,710	70,981	332,691
15	Dec 15 2011	95,546	18	22	-	95,506	263,285	71,501	334,786
16	Jan 12 2012	96,835	0	2	-	96,833	265,718	72,101	337,819
17	Jan 26 2012	97,287	0	2	-	97,285	266,215	75,196	341,411
18	Feb 9 2012	97,231	0	1	-	97,230	267,236	75,273	342,509
19	Feb 23 2012	97,433	0	0	-	97,433	268,500	75,435	343,935

Source: The Cabinet Office and Reconstruction Agency

Until summer 2011 the main category was type A in Iwate and Miyagi and type B in Fukushima. However, after completion of the temporary houses, type D has become predominant in all three prefectures. In Fukushima, type B has always exceeded type A in Table 1, because facilities classified as type A could not accommodate a large number of evacuees, especially from the eastern coast areas, due to the nuclear plant accident, and a certain part of them fled to type B for safety. Type C remains important in Iwate, because it amounts to 790 – 900 persons since September 2011 and the number of evacuees in this type has been rather stable. According to an explanation by an official at the Reconstruction Bureau of the Iwate Prefectural Government, they can be regarded as long-term evacuees from Miyagi and Fukushima prefectures.

Moreover, note in the table a consistently increasing amount of refugees from 49,000 in early June 2011 to 75,000 at the end of February 2012 in other prefectures except the three prefectures. This suggests that the disappearance of large-scale evacuation since March 11, 2011 seems quite unlikely in the near future. A great majority are refugees from Fukushima Prefecture because of the nuclear plant disaster (Nihon Keizai Shimbun, 2012).

The third data source is the National System of Refugee Information (*zenkoku hinan-sha joho shisutemu*), which was established by the Ministry of Internal Affairs and Communications in April 2011 to identify the exact evacuation locations of refugees. In this system, the refugees themselves provide their current information to the municipalities of their home address through the municipalities of their current address. Therefore, unlike the first and second sources, this is based on the refugees' own declarations, which is the merit of this system. Note, however, that since a particular refugee can be counted more than once due to a change of shelter, the data based on this system are not necessarily exact and complete.

Despite the above merit, this system's data have not been tallied sufficiently since October 2011. Since the refugee number seemingly tended to increase due to evacuation termination or shelter changes, the data provided by this system diverged from actually plausible numbers. Moreover, the substantial similarity of the local municipalities' work between this system and the usual investigation of refugees, which gathered refugee information as the first data source, led to the cessation of detailed summing-up jobs. Even though the data derived from the National System of Refugee Information seem convenient to use, since this system was developed to effectively confirm refugee information, academic researchers are generally not allowed access to it.

## Evacuation Destinations

Figure 2 shows the displacement destinations by prefecture as of August 25, 2011 and February 23, 2012, based on announcements by the Cabinet Office and the Reconstruction Agency. Maps utilizing the data from the National System of Refugee Information, which were specially provided to us to investigate refugee evacuation, were also drawn, but the spatial patterns of the destinations resemble those from the Cabinet Office. Thus, maps based on the system are not presented here. Note that many fewer evacuees existed in August 2011 than in February 2012 because the former does not contain a considerable portion of the temporary housing dwellers. This figure depicts a few salient features.

First, note the massive short-distance evacuation in particular prefectures or to those located west of the three prefectures such as Akita, Yamagata, and Niigata. Intra-prefectural evacuation in Miyagi is also seen from the above origin-destination tables. Acutely damaged municipalities with saw-toothed coastlines, such as Kesenuma City, Minami-sanriku Town, Onagawa Town, and Ishinomaki City, tend to have more intra-municipality evacuees.

Second, evacuation destinations are widely dispersed throughout eastern Japan, including the Tokyo metropolitan area, reflecting that with respect to usual voluntary migration, the Tokyo area is a major destination from the Tohoku region, including the three prefectures.

Third, remarkably, a certain portion of refugees moved beyond the Tokyo area to prefectures located in the western half of the country, which contains the two major metropolitan areas of Nagoya and Osaka (also see Oda, 2012). Even prefectures farther west of Osaka received refugees, although not many, partly due to the positive support offered by local governments in western Japan (Asahi Shimbun, 2011; Nihon Keizai Shimbun, 2011c). As a result, although the Osaka metropolitan area (consisting of Kyoto, Osaka, Hyogo, and Nara prefectures) showed net out-migration from 1974-2010, the influx of evacuees from eastern Japan, including Fukushima prefecture, and office relocations from the Tokyo metropolitan area resulted in slight net in-migration (4,209 persons) in 2011 (Asahi Shimbun, 2012a).

We should also devote attention to foreign residents who returned to their home countries after the nuclear plant crisis (Nikkei Business, 2011). Due to space limitations, however, this topic is not examined here.

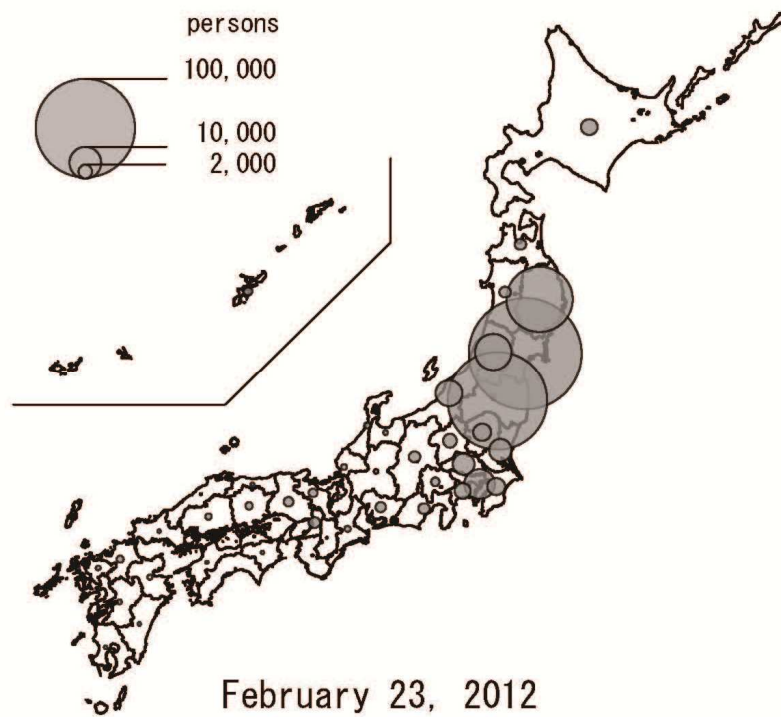
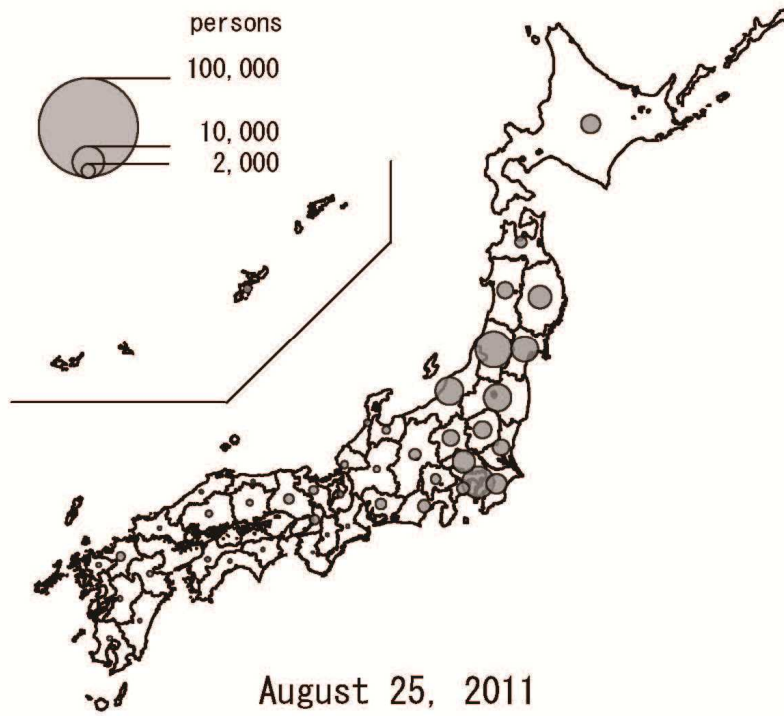


Fig. 2 Evacuation destinations by prefecture  
 Source: The Cabinet Office and Reconstruction Agency

## **Difficulties of Refugees and Damaged Areas**

Next, we briefly discuss the difficulties of the refugees and the disaster areas chiefly based on newspaper articles. Unlike voluntary migrants, displaced migrants faced the following difficulties.

First, a certain portion experienced multiple traumatic movements from their original residences due to the changing situation of the receiving organizations and municipalities or their policies of closing small shelters and merging them into larger ones (Nihon Keizai Shimbun, 2011a, b). However, such cases may be acceptable if the refugees are eventually able to return to their home addresses or municipalities.

Second, evacuation was especially difficult for elderly evacuees, since they tended to suffer the most relocation damage. This deteriorated health and even resulted in death. As Isoda (2011a) mentions, senior citizens constitute a distinct class of disaster victim. In Minami-sanriku Town, Miyagi Prefecture, which was devastated by the tsunami, more than 20% of the elderly suffer from symptoms of disuse syndrome (Kahoku Shinpo, 2012). Elderly evacuees who were separated from other members of their community tend to feel loneliness, leading to alcoholism, deepened dementia, and even a lonely death (Iwate Nippo, 2011).

Third, the movement from shelters (in particular, type A in Table 1) to temporary houses was considered an important step in the refugees' self-help. However, some refugees were reluctant to make this move, because temporary housing dwellers cannot receive free food service and have to pay for electricity, gas, and water. Some temporary houses were constructed away from the coastline at higher and less accessible locations, which are inconvenient for shopping and hospitals, and have poor reputations for their narrow, insufficient heating and baths (Nihon Keizai Shimbun, 2011e; Asahi Shimbun, 2012b).

Finally, a crucial concern for evacuees is whether they can eventually return to their original residences. Unfortunately, a significant portion have very poor or no prospects of doing so. Although refugees can only remain in temporary housing for two years, many have little hope after being forced to leave such houses. This especially applies to the refugees from Fukushima's coastal areas, which experienced high radioactive contamination (also see Isoda, 2011b).

Furthermore, here are the major problems of the devastated areas. Most of the fishing boats and ports along the Pacific Ocean were badly damaged, and a considerable part of the flatlands along the coastline of Miyagi and Fukushima Prefectures were affected by the tsunami and nuclear power plant disaster. It will be very difficult to sufficiently regenerate agriculture and fisheries as basic industries. In addition, there is a



great lack of employment opportunities in the damaged areas. Some small fishing villages washed away by the tsunami will be reconstructed, but others may simply disappear forever (e.g., Nihon Keizai Shimbun, 2011d).

Even before March 11, 2011, the coastal areas of the three prefectures had experienced depopulation; the serious damage caused by the tsunami will probably further accelerate this trend. In fact, very recent out-migration has been reported from these areas. According to the latest Report on Internal Migration in Japan Derived from Basic Resident Registers, Iwate, Miyagi, and Fukushima prefectures exhibited a net out-migration of more than 40,000 persons during the period 2010-11 (Asahi Shimbun, 2012a).

Meanwhile, there is also a heartening recent topic implying the return of residents to the damaged prefectures. According to Fig. 3, which shows the monthly net migration of the three prefectures since January 2010, net out-migration in Iwate and Fukushima and a slight net in-migration in Miyagi with the regional capital Sendai City were confirmed by February 2011. March and April 2010 witnessed large net out-migration, because they correspond to year-end and new-year months in the fiscal/academic year in Japan. The tsunami and the nuclear plant accident on March 11 gave rise to large net out-migration of 1,800 persons in Iwate, 4,400 in Miyagi, and 5,900 in Fukushima, and the numbers in these prefectures rose in April.

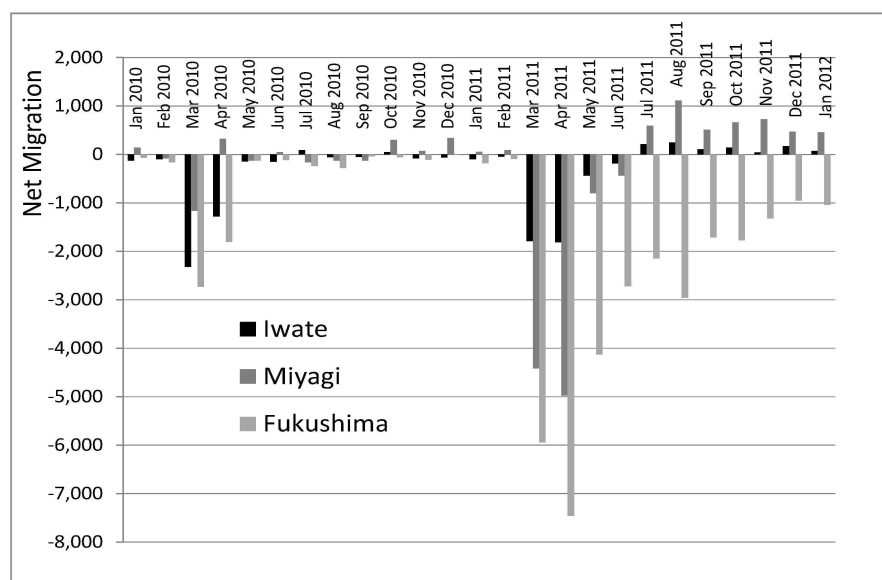


Fig. 3 Monthly net migration of three prefectures

Source: Report on Internal Migration in Japan Derived from Basic Resident Registers

However, the net out-migration of Iwate and Miyagi began to shrink from May 2011 and has continued to show a net in-migration since July 2011. This reflects the return of refugees, who evacuated to other prefectures after the tsunami. Quite regrettably, a net out-migration continues in Fukushima, although the number has been reducing. Therefore, Fig. 3 suggests a big difference of displacement between Iwate/Miyagi and Fukushima.

### **Concluding Remarks**

The damage caused by the tsunami and the nuclear plant accident was devastating. If we consider the return of evacuees to their previous residences as a criterion of the termination of the disaster's negative impact, at this stage there is no or little prospect for solving the displacement, especially for evacuees from the coastal areas of Fukushima due to their high radioactivity. We have to keep paying great attention to this displaced human mobility and pursue a careful comparative study between the situation observed over the past year, especially in the three damaged prefectures in Japan, and that of other displacement migrations throughout the world including the Great Hanshin Earthquake in 1995.

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