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CHALLENGING RIVIVAL CITY PLANNING TASKS FOR A SAFE AND SUSTAINABLE CITY: A Case Study of Naka-Akasaki Area in Ofunato

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Abstract: Naka-Akasaki is one of the worst hit areas by the Great East Japan Earthquake and Tsunami thus still under critical development stage. “Prevention from future Tsunamis” has now been identified as the main theme for every reconstruction and recovery process. Identifying the ongoing city planning process, challenging city planning tasks and possible future problems is the main objective of this study. Unconfirmed regulations of inundation zone demarcation are directly slowing down the whole process of post tsunami reconstruction and recovery. Building proper town ships and enhancing the livability of Naka-Akasaki while creating a sound connection with the proposed inland housing areas in the city has become the most challenging task at present. A residents’ gathering which is called as Akasaki revival team has actively being participating in recovery efforts.

Keywords: Inundation Zone, Relocation, Community Viability, City Planning Tasks, Disaster Risk Reduction

1. INTRODUCTION

The unpremeditated occurrence of the Great East Japan Earthquake and Tsunami on 11/03/2011 brought the post Tsunami city planning to a most challenging and risky task. The main objective of this study is to identify the ongoing city planning process, the challenging city planning tasks and possible future problems.

Naka-Akasaki is one of the severely struck areas from the Great East Japan Earthquake and Tsunami. Although post disaster reconstruction and recovery programs have been started promptly, the disaster stricken area is still under critical development stage.

In this research, well balanced Disaster Risk Reduction (DRR) aspects and long term community viability aspects are considered as the prior aspects in post tsunami city planning as well as in developing a sustainable city. The Naka-Akasaki area is under the governments’ Two Level Plan (Level 1 and Level 2) which is to demarcate the unsafe inundation zone, building restriction zone and safe areas/building promotion areas, assuring to promote the post tsunami reconstruction and recovery in a safer way for the whole affected area. Therewith this process is under the Ofunato comprehensive plan and recovery program which is proposed by the Ofunato local government.

The residents’ gathering known as Akasaki revival team is now actively participating in town planning, housing reconstruction and recovery.

Several field visits and interviews have been done in Akasaki including 3 major visits during 11/07/2013-13/07/2013, 02/08/2013-04/08/2013 and 22/03/2014-23/03/2014 periods.

2. Location, Community and Tsunami Affects

2.1 Location and Community Situation before Recent Tsunami Affect

It consists of five villages known as, Atohama, Oikata, Yamaguchi, Ohora, and Nochinoiri. Geographically, low level planes are situated near the coastline, and inland areas are surrounded by mountains, a river flowing to the sea alongside the areas-(Fig.1 and Fig.2). Prefectural Route 9 road crosses the area close to the sea and Sanriku Railway South Rias Line, and its embankment crosses the inside area.

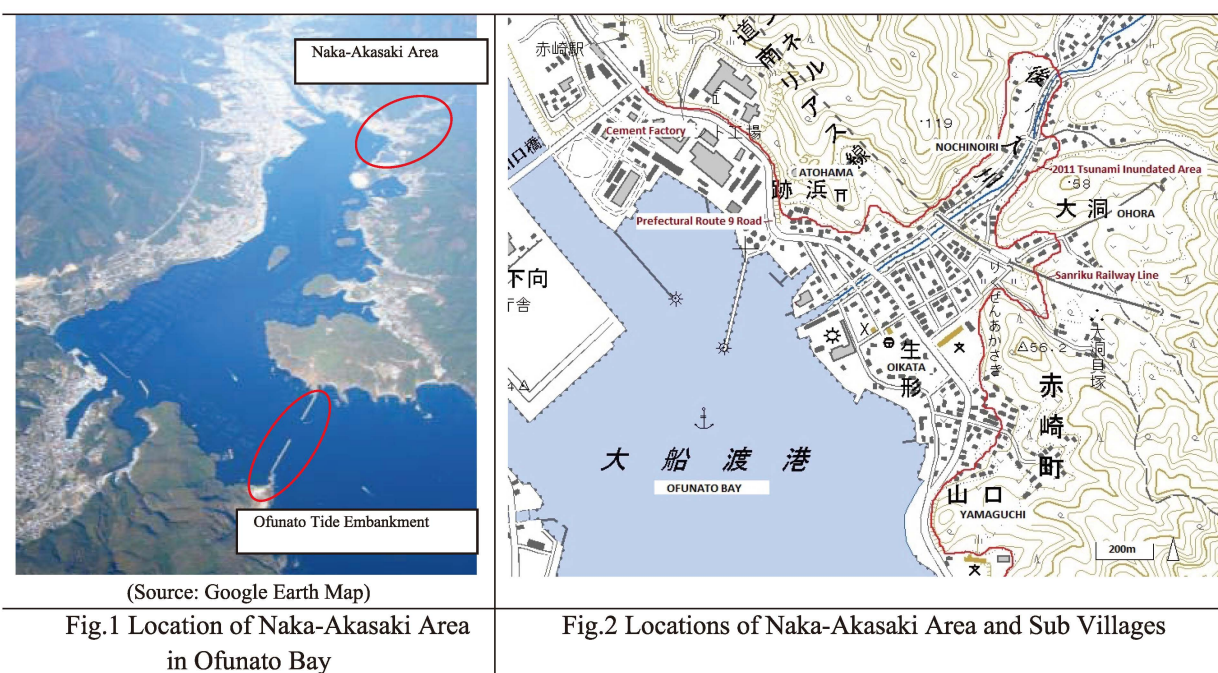
1,767 housing and 5,164 population were recorded before the Great East Japan Earthquake and Tsunami. 758 houses had been totally or partially damaged by the earthquake and tsunami. Livelihoods of the community were not much related to the sea since fishing right of Akasaki was abandoned in 1997, with the replacement of coastline factory zone approval by Ofunato local government and establishment of the adjacent cement factory. There after most of the residents started to engage with the cement factory or any other private businesses inside Naka-Akasaki or Ofunato city.

2.2 The History of Past Tsunami Affects and Preventive Measures Occurred

Ofunato is situated fairly close to an ocean trench and used to suffer from frequent earthquakes of various scales. The Sanriku earthquake (1933) had a magnitude of 8.4 and caused a 28 m tsunami, resulted in 1,522 casualties just in Sanriku area and 3 casualties and 51 properties were damaged in Naka-Akasaki area. In 1960 Chile earthquake and tsunami caused 2 casualties and 83 losses of properties in Oikata and Atohama villages in Naka-Akasaki.

Such destructive experiences raised the urgency of proper hard-measures to prevent from future tsunamis. The Ofunato tide embankment (*Ofunato wankobohate*), one of the Japans' large scale tide embankments was built in Ofunato bay 3 years after the Chile earthquake and tsunami, as one of the major preventive measures in the recent past-(Fig.1). Following such large scale tide embankment projects, several other coastline areas enhanced their community safety by constructing small scale tide embankments. Simultaneously small scale tide embankment constructions and land readjustment projects were undertaken in Naka-Akasaki area.

The residents had been taught the importance of soft-measures as by the past tsunami experiences. The community of Naka-Akasaki has been conducting a well-organized annual emergency evacuation drill since 1996. It was a neighbourhood level life saving method which has showed the highest escaped rate from 2011 tsunami effect.



2.3 Damage by the Great East Japan Earthquake and Tsunami 2011

Ofunato was heavily damaged and the waves were estimated to have reached 23.6m in height and continued inland for 3 kilometers. In Naka-Akasaki the highest damage was occurred in Oikata village, a flat land area located close to the sea. In low land areas of other villages known as Atohama, Yamaguchi, Ohora and riversides of the Nochinori, substantial damages were occurred. Naka-Akasaki community center (*Nakaakasaki kominkan*) listed 24 casualties in Naka-Akasaki area while 9 casualties (5 dead and 4 missing persons) were recorded in Oikata. Among the other villages, Oikata has showed the highest participating rate in annual emergency evacuation drills as it was the most affected village from past earthquakes and tsunamis of Naka-Akasaki area. At the same time it too showed the highest escaped rate from the Great East Japan Earthquake. Moreover in Nochinori, located backwards in the area, was unable to carry out any emergency drill. Mainly the properties in Oikata and other affected areas of the other villages were fully damaged. On the day of the earthquake 320 people who escaped to community center (located on highland-Fig.4 & Fig.11) and other mountainous areas could save their lives while those who could just escaped to 2nd floors were failed.

3. Revival City Planning, Recovery Plans and Progress

3.1 Local Government Plan

3.1.1 Disaster Risk Zones and Building Restrictions

The local government designated the disaster risk zones and building restrictions based on the simulations of historical maximum flooding on 11/03/2011-(Fig.4). In that task, the whole flooded area from the Great East Japan Earthquake was designated as disaster risk zones. Subsequently three main Zones (class 1, 2A & 2B) were

divided and regulated within the flood zones. The applicable structures were proposed under two main categories as structures for living and social welfare facilities.

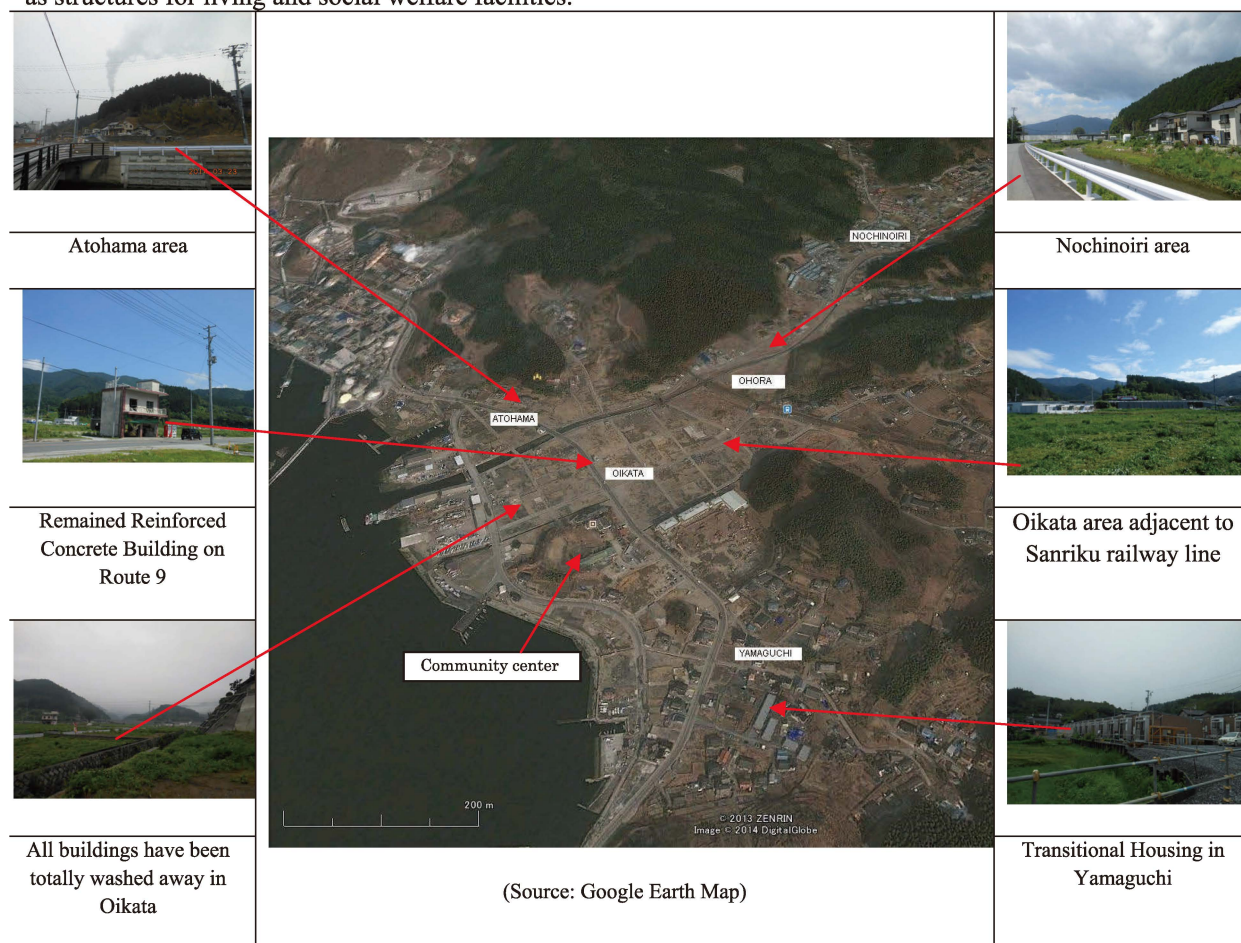


Fig.3 Damage by the Great East Japan Earthquake and Tsunami 2011 and Situation in 2013

3.1.1 Ofunato Recovery Program

The Ofunato recovery program was formulated on October 2011 and it covered a broad area of city planning. This recovery program based on the Ofunato Comprehensive Plan (the top plan of Ofunato municipal government) and other fundamental plans. It introduced the fundamental views of revival, the subjects in revival, targets, plans, measures and promotion of revival to practice safe and well organized city planning in tsunami affected areas. All the city planning and recovery steps occurred in Naka-Akasaki area were bound to be under this plan. This recovery program explains its major aim as to promote a city planning which does not stop at mere restoration and not to practice a plan which does not suit a disaster again like in 2011, by making the measures and collaborating with citizens, administration, etc. into a driving force and employing experience and teachings of disaster efficiently.²⁾

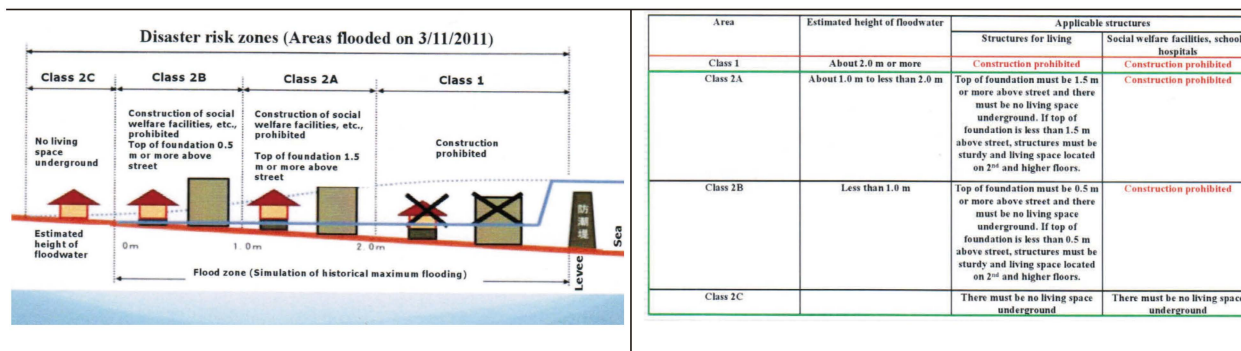


Fig.4 Conceptual view of Disaster Risk Zones and Building Restrictions by Government

(Source: International Recovery forum 2013, K.Toda)³⁾

Table 1. Classification of Ofunato Recovery Program

1. DRR Aspects	Identified Plans and Measures in different Targets as relevant to Disaster Prevention City Planning	Remarks
Safety evacuation procedures	<ul style="list-style-type: none"> - Disaster prevention education and emergency drills are promoted vigorously. (P) - An emergency drill is conducted for the city whole region or every area. (M) - Strengthen the disaster prevention functions of the coastal area, securing the evacuation areas of upper levels/high-rise evacuation. (M) 	Given attention
Safety awareness	<ul style="list-style-type: none"> - Establishment (soft measures) a refuge route and implementation of an emergency drill which cooperate effectively. (T) - Promote a system of citizen himself (self-help) raises awareness of disaster prevention.(T) - Hard measures are gone under the maintenance of disaster prevention institutions. (T) - A new disaster prevention system is prepared taking advantage of teachings of last time tsunami. (P) - Saving the records of the disaster this time and hands down to future generation. (M) - An educational activity about disaster prevention is carried out to citizen. (M) - The enterprise for aiming at the upsurge of awareness of disaster prevention widely on a day is undertaken on 11th March. (M) 	Given attention
Community safety	<ul style="list-style-type: none"> - Self-help (perform your thing yourself) by citizens and mutual aid (help each other mutually). (T) - Maintenance and enhancement of area community function. (P) - Training and strengthening of independence disaster prevention organization, volunteer organizations are supported. (M) - The disaster prevention system for vulnerable groups (elder, disable) is prepared. (M) 	Given attention
Future safe city	<ul style="list-style-type: none"> - Fixing breakwaters and tide a embankment to large-scale tsunami especially. (T) - Support for housing reconstruction of disaster victims' and secure the safe living environment and formation of the local community. (P) - A safe living environment which suits for disasters such as tsunami is improved by height relocation, padding of housing site, etc. (M) - Promote disaster resistant structures. (M) 	Given attention
Possible risk	<ul style="list-style-type: none"> - Reservation of an alternative or strengthen lifeline. (T) - A broad-based and many-sided disaster support system. (T) - Functions such as lifeline, traffic are strengthened. (P) - Disaster prevention system from landslides. (M) 	Given attention
2. Long term Community Viability		
Continuation of former balance of the arrangements of coastal communities	<ul style="list-style-type: none"> - Formation of the local community is secured. (P) 	Need attention
Consideration of original city pattern and communities order	<ul style="list-style-type: none"> - The historical and cultural resources which shared by citizens are utilized. (P) 	Need attention
Building townships		Need attention
Easiness in continuation the livelihoods	<ul style="list-style-type: none"> - Early reconstruction of economic activity/reservation of employment aimed at is supported. (P) - Industry and economy are activated according to the vitality of specific local industry.(P) 	Given attention
Safe and easy accessibility	<ul style="list-style-type: none"> - Urban infrastructure is improved after examining the state of land-use plan. (P) 	Need attention

(T) - Target

(P) - Plan

(M) - Measure

3.3 Classification of Ofunato Recovery Program

The DRR (Disaster Risk Reduction) aspects and long term community viability aspects are considered as the prior aspects in post tsunami city planning in our research. In the development of a sustainable city, both expectations must be met with a proper balance.¹⁾

In such a view point we have summarized content of Ofunato recovery program in the table 1 to find out how it has dealt with the DRR aspects and long term community viability aspects. It is understood that more consideration could be identified on DRR aspects and less consideration on community viability aspects through the classification.

3.4 Process of Land-use Planning in Akasaki

Naka-Akasaki land-use planning map has been released by Ofunato local government in 2012-(Fig.5). Although the local government has conducted the discussions with resident representatives in order to finalize the city planning and reconstruction plan, the decisions are still under debate.

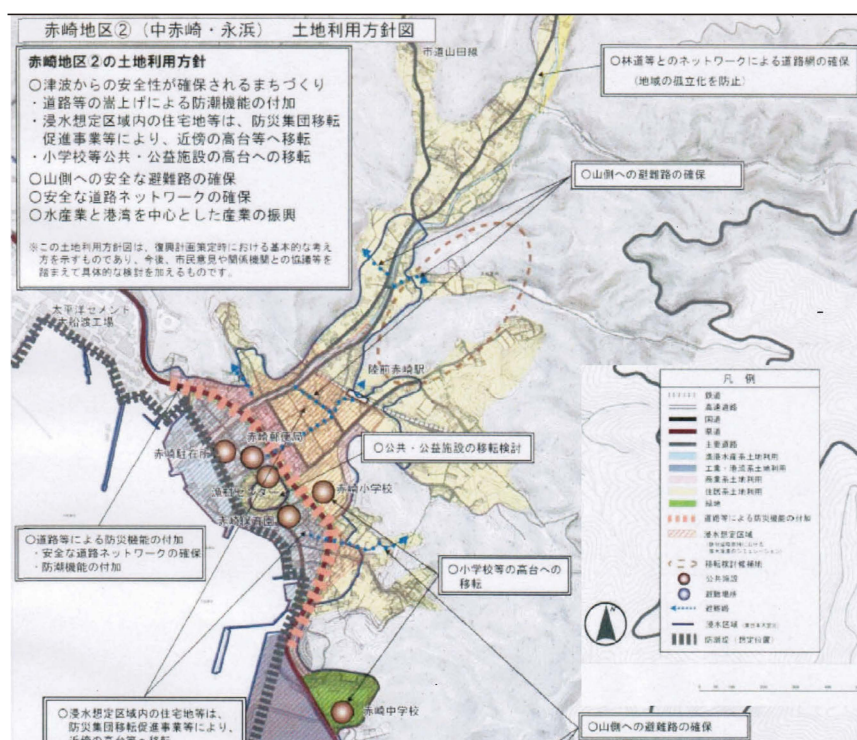


Fig.5 Naka-Akasaki Land-use Planning Map Released by Ofunato Local Government in 2012²⁾

In 2011 the local government decided to pad the prefectural route 9 up to 4-6m height and widen the road and functioned as a secondary tide embankment. According to the simulations done by the local government, the new plan for a 7.2m tide embankment and 4m padded road which results a 2m minimum inundation area with housing zone along with structural/building restrictions was released. However since local government did not agree to bear the cost of padding the private roads, the majority of the residents came out with objections. The Akasaki revival team also directly opposed to the local government's prefectural road 9 padding, similar to residents in March 2012. Residents demanded the necessity of a tide embankment more than 7.2m and non flooding roads.

In such critical situations of land-use planning, the local government could extended the flood zone/2m inundated area up to Sanriku railway line or few more area beyond the railway line, following the new simulation results in December 2012-(Fig.6). It stopped the plans of padding or widen of prefectural road 9.

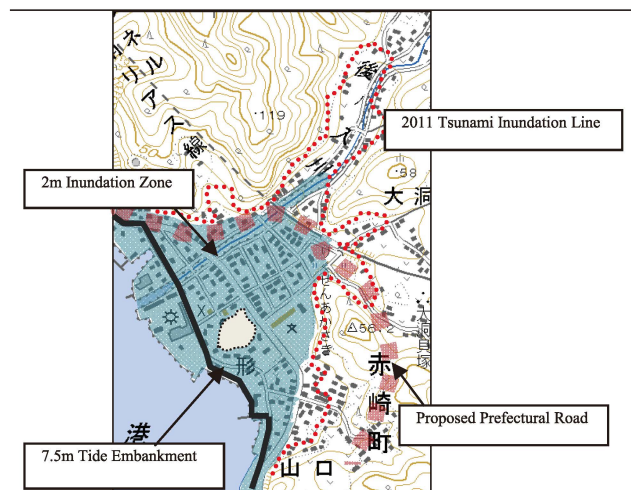


Fig.6 New Proposals of Flood Zone, Tide Embankment and Prefectural Road

3.5 Residents' Motion and Participation in Ongoing Recovery

Field visit 11/07/2013-13/07/2013- Discussions with Akasaka Revival Team



Fig.7 Discussions on permanent housing reconstruction and relocation in-between local residents and Akasaka revival team

Field visit 06/01/2014-08/01/2014 - Deliberations with Local Government



Fig. 8 Discussions among person in charge of Ofunato local government, a consultant, and a Akasaka revival team member on the residents' ideas which came out in the workshop

Fig.9 The contents of requests from Akasaka revival team
Proofing (regarding the alley in housing site, installation of a meeting place, a park, and a new road, etc.) were demanded.

An organization known as Akasaki revival team established in November 2012 for the purpose of promoting the residents participation in housing reconstruction and city planning activities with local government and giving a priority for their opinions and requests than earlier.

The new team had proposed a new city planning proposal consisting of disaster prevention sports-park in the inundation zone and housing in highlands in backwards and other public buildings in safer areas, etc. to the local government. Most of the proposals are in debate and still under consideration.

3.6 Community and Housing

Majority of the victims still live in transitional housing arranged in several inland sites (Nochinoiri, Yamaguchi etc.) in Naka-Akasaki area. Residents are still struggling with their day to day activities in confined living environments provided by the government and waiting for an early, positive solution. Most of the permanent housing construction proposals for victims are still at the basic stage, while few permanent housing projects in highlands of Nochinoiri (Morikko) and Ohora village are gradually proceeding. Therewith several recent reconstructions of damage houses and reopened shops in the inundated area, designated in building restriction zone could be identified.



Fig.10 Views of the Transitional Houses in Nochinoiri Village

4. Safe Living Options and Possible Future Problems

4.1 Safe Living Options in Practicing/Considering

4.1.1 Setting of Disaster Risk Zones

Setting of expanded building restriction zones could be applicable for low building density areas considering the future relocation process. In such cases the regulation of 2m inundation zone with building restrictions could be applicable for Naka-Akasaki, considering the residential and commercial building density of its' inundated area before tsunami aftermath. A detailed field work study is vital for a clear suggestion.

4.1.2 Relocation to Higher grounds

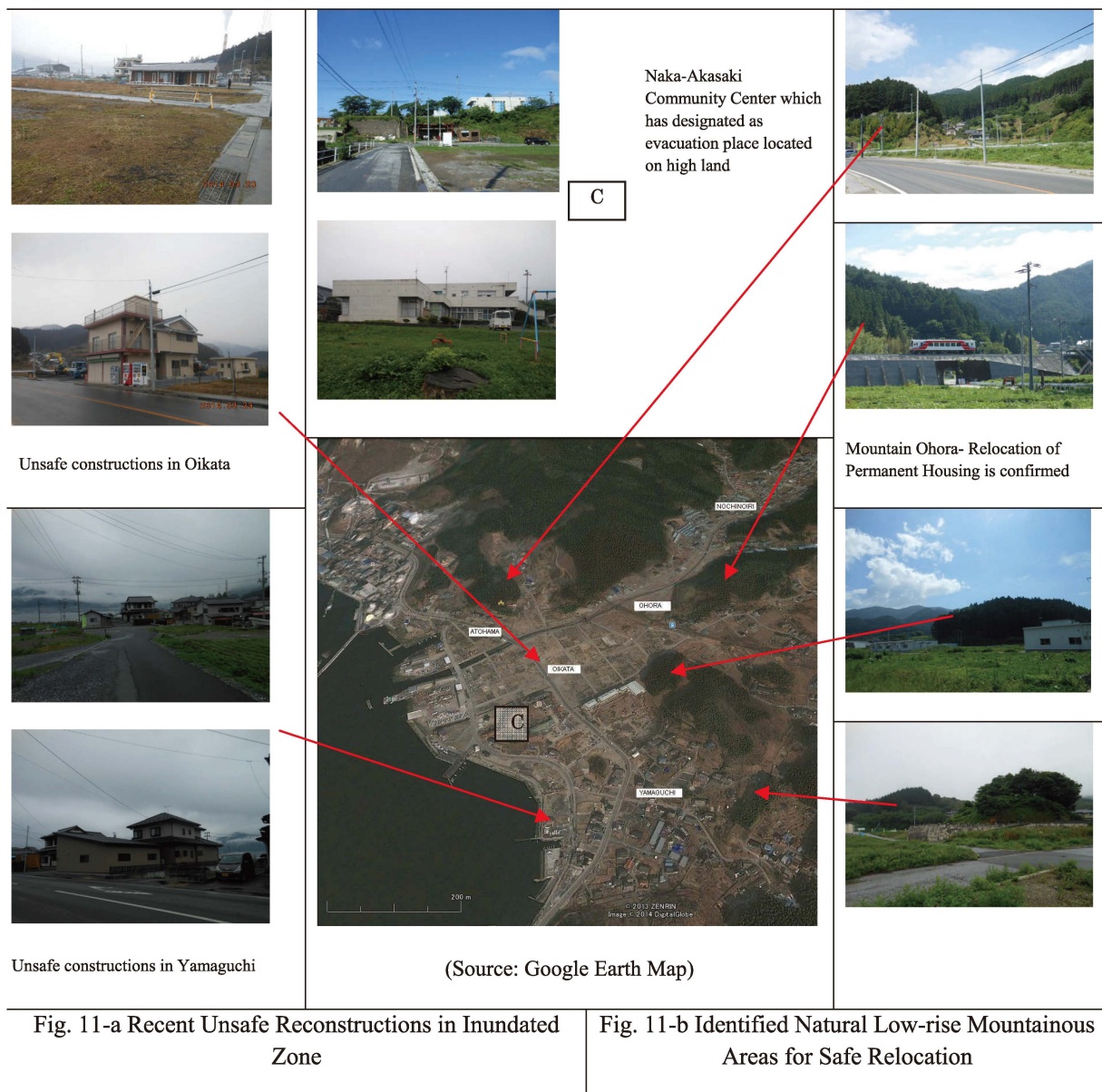
As the Naka-Akasaki area is geographically arranged with many low rises mountainous areas (Fig.11-b), the process of relocation of all kind of residential buildings and public buildings such as schools, hospitals, etc. could be a safer, cost effective and long term resolution, only if the process is done according to a strategic city/town plan which could enhance proper townships.

4.1.3 Padding

Padding could be used to enhance the safety of public facilities such as roads and railway lines. The Sanriku railway line constructed on a raised land in Naka-Akasaki is under low tsunami risk at present. The padding proposal for existing coast line prefectural road route 9 by local government has been abandoned due to the high construction cost and resident's other requests parallel to the road construction (described in 3.4).

4.1.4 Artificial Hills

Artificial hills could be suitable for unavoidable public spaces in coast lines as such constructions do cost much. The unnecessary and unavoidable functions may be captured by the detailed questionnaires from the local community.



4.2 Tasks, Possible Problems and Considerations

All most all of the ongoing and proposed reconstruction and recovery programs/proposals are mainly to eliminate the future tsunami risks by cessation of reconstruction in inundation zone which covers the wider area of the town while shifting the majority of buildings to inland areas. However remaining remote areas could create many problems with respect to the viability of communities and reconstruction costs.¹⁾ On the other hand reluctance of the majority residents on settling in inundated areas could support the cessation of reconstructions.

Moreover, in Naka-Akasaki, the compact town area and living areas are going to be expanded in accordance with the relocation plans, following the enactment of inundation zone regulations. Thereupon the reconstruction of permanent housing will be done in inland mountainous areas, separating the existing main road network and all types of coast line activity centers. Shifting the existing main road network or constructing a new road network for the relocated areas would not be cost efficient. Such high cost construction plans could delay the total city planning process and this can be unfavorable in building proper townships which is already a demanding task.

It has been revealed that the general tendency to leave the stricken areas has risen among the younger generations as a result of the aftermath. Hence encouraging young crowd to stay on home soil or bringing the leavers back has now become a sociological hurdle for both communities and local authorities. Furthermore in ongoing city planning programs, establishment of suitable planning steps which call back such young crowds is under debate and has become to another complicated task.

Reconstruction on original sites in inundation zone by the land owners who are not willing to abandon their ownership permanently, may gradually lead to a reappearance of the coast line town with unsafe buildings,

unless the government promptly takes such areas under control-(Fig.11-a). Hence ongoing and future city planning should be implemented strategically.

5. CONCLUSION

Unconfirmed regulation of inundation zone demarcation is directly slowing down the whole process of post tsunami reconstruction and recovery of the Naka-Akasaki. Eliminating the future tsunami risk by cessation of reconstruction in inundation zone could result in many complications with relevant to the community viability, building proper townships and high reconstruction costs. Finding the appropriate city planning methods for a safer and sustainable city in order to strategically face the revealed problems is more challenging but rather rewarding.

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