



VISUALIZING LONG-TERM LIFE RESTORATION PROCESS AFTER DISASTER USING TRAJECTORY EQUIFINALITY APPROACH

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Abstract

The present case study of the Great East Japan Earthquake in 2011, examined long-term life restoration process after the disaster. Using data from retrospective and semi-structured interviews of disaster affected people, their life restoring process was analyzed. The method applied in the study is called Trajectory Equifinality Approach, one of the qualitative methods for process analysis. Activities, bifurcation points, influential factors in the process were visualized. Transformation of value over years was also clarified. The study outcomes are expected to play important roles in implementing future support system for restoring lives of disaster affected people.

Ten years have passed by 2021 since the Great East Japan Earthquake occurred. Damages in affected areas were so devastating that continuous restoration has been required. There are 44,000 evacuees in April 2020, according to the public report by Reconstruction Agency of the Japanese government. The number of those who have not achieved life restoration from the disaster, remains considerably large. It can be comprehended that restoring lives after disaster is difficult. It is essential to take long continuous efforts to grasp circumstances of affected people, and to accumulate knowledge.

The interviews targeted on two cases where interviewees had played important leading roles in their affected local communities. Some residential buildings remained after the disaster in the areas. The interviewees had tried to become promptly independent in the aftermath. Each had actively worked toward their own self-restoration, regional recovery and reconstruction. Cooperation with families, relatives, neighbors and friends was remarkable. Despite the degree of damage on their houses, which was certified as completely destroyed, their housing reconstructions were completed relatively early. It was apparent that the local communities seemed to get unified and work cooperatively to overcome extreme circumstances.

Several years had passed since the disaster, and they thought that formerly united communities had gradually fallen apart and that others had focus on caring about themselves. Dissatisfaction toward responses of municipal governments was obvious, such as stagnant town, unrestored neighbor infrastructure, unpreventable population outflow, etc. It was also indicated that they felt being inequitably treated and abandoned. Their former value of taking action to make changes transformed to that of abandonment.

Keywords: life restoration; process analysis; Trajectory Equifinality Approach; the Great East Japan Earthquake;



1. Introduction

1.1 The Great East Japan Earthquake in 2011

The Great East Japan Earthquake with a magnitude of 9.0 occurred in March 2011. Eight prefectures in the Kanto and Tohoku regions experienced seismic intensities above 6 lower [1]. The trench-type earthquake had caused a large-scale tsunami, resulting in enormous damage to the Pacific coast of the Tohoku and Kanto regions. The tsunami caused the Fukushima Daiichi nuclear powerplant accident, and its dreadful impact has been extremely large. The death toll is 19,729 including disaster-related deaths, and the number of missing is 2,559 recorded in March 2020 according to the Reconstruction Agency, Japan [2].

The number of evacuees was at the peak, approximately 470,000 in the immediate aftermath [3], and is still large, and more than 42,000 people continue to evacuate in December 2020 [2]. Among these, evacuees moved outwardly from Fukushima are about 29,000, while 5,000 moved from Miyagi and Iwate prefectures. Lives of the people have long been greatly affected by the disaster.

Ten years have been passed by 2021 since the disaster. It takes a long time to restore lives of the affected people and reconstruct the affected regions. The Reconstruction Agency has illustrated “the stages and prospects for reconstruction from the Great East Japan Earthquake” and has set the period up to 2021 as “the reconstruction and creation period” [3], and is focusing on reconstruction of the affected areas. Measures for restoration and reconstruction have been accelerated: public housing supply programs, community development through collective residential relocation and land readjustment projects, constructions of Reconstruction Assistance Roads, and reconstructing port infrastructure facilities, etc.

1.2 Literature Review

The 2001 Kobe Panel Survey was conducted on disaster-affected residents of the Great Hanshin-Awaji Earthquake in 1995. Problems experienced in their life restoration process were summarized into seven elements, and “the seven critical element model of life recovery” was proposed [4]. Those elements were “housing, social ties, townscape, physical / mental health, preparedness, economic / financial situation, and relation to government” [4]. Matsukawa et al. (2015) analyzed data of a life recovery assessment workshop of the disaster, applying the model. In conclusion factors of challenges and difficulties were indicated by 4 residential types: prefabricated temporary housing, designated temporary housing, home evacuees, reconstructed housing [5]. The results have clarified the framework of the essential elements in restoring lives of disaster-affected people. These studies, however, have not sufficiently provided perceptions in regard to visualizing pathways in the process.

Koumoto (2019) had analyzed interview data of an elderly disaster-affected person by the Great East Japan Earthquake and visualized flows of the life restoration activities [6]. The case had financially suffered after its family member's move-out with job change. It remained uncertain in regard to when housing repair could be completed. In addition to that he was unable to receive various support, resulting in a vicious cycle of poor health and negative thoughts. Watanabe (2014) marshaled ordinary problems of single and low-income elderly households and indicated basic issues related to food, clothing, housing, and social relations [7]. These tendencies may become more conspicuous after a disaster.

It is necessary to accumulate qualitative research data as well as quantitative results to understand long-term life restoration process after disasters and to cover all various types of decision-making pathways and different characteristics of each generation. This will ultimately lead to reveal a current situation and create a model of life restoration process after disasters.

1.3 Objectives

The present case study examined in details the long-term life restoration process of disaster affected people after the Great East Japan Earthquake in 2011. The purposes were to clarify various bifurcation points of



decision makings and elements which had influenced on the behaviors, to visualize actual and potential pathways toward restoration, and to elucidate internal transformations of individuals.

2. Research Methodology: Trajectory Equifinality Approach

The present study adopted a methodology called Trajectory Equifinality Approach (TEA) [8]. It is for expressing cultures, dynamics, and trajectories of human lives moving toward destinations with irreversible time. The method consists of 3 components: Historically Structured Inviting (HSI), Trajectory Equifinality Model (TEM), Three Layers Model of Genesis (TLMG). Explaining in order, HSI is a sampling where researchers target on interviewees who had experienced equifinal destinations of their interest. TEM is the essence of TEA and is capable of depicting pathways and elements of human lives toward destinations or equifinality points. Its image of multilinearity toward equifinality points through bifurcation points is shown in Fig.1 [9]. It is important that logically potential paths with dotted lines can be indicated in the model. TLMG visualizes internal transformation process by interacting with 3-layer levels: level 1 as behaviors, level 2 as promoter signs, and level 3 as value and belief. People take behaviors in receiving and selecting input information in level 1. Some information reach to the level 2 and turn to be promoter signs in contextual frame [9]. It is where individual behaviors are systematized and transformed to another. Some information reach level 3, existing value and belief are transformed to new ones which influence habitual customs [8].

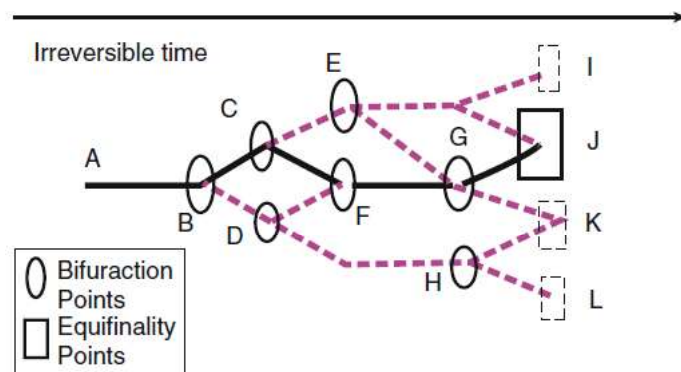


Fig. 1 – TEM image (Source: Sato et al., 2009, p.227) [9]

By applying HSI to interviews of this study, two interviewees were focused. Both of them had lived along the Pacific coast at the time of the Great East Japan Earthquake, and their houses were judged as severely damaged on municipal building damage inspections. The interviewees had been engaged in activities of their local communities, taking important roles of coordination in the post-disaster response. Although it is recommended in HSI to carry out interviews 3 times [8], interviews were conducted in once or twice, with approximately 2-3 hours each (Table 1). Topics were regarding experiences after the disaster towards life restoration, what they did and how they felt during the process.









Table 1 – Interview schedules

Interviewee	Age	M/F	Region	Date	Site
A	58	Male	X	1 st : 29 th Sep. 2018, 9:00-12:00	A's home
B	62	Male	Y	1 st : 8 th Sep. 2018, 13:00-16:00	B's home
				2 nd : 19 th Jul. 2019, 14:00-16:00	



Using text data from the interviews, time series and content were coordinated, elements of TEM were identified and arranged to depict the process. TEM which had been created by the author was provided in the 2nd interview of case B as a trans-view, a mediator to amalgamate perspectives of an interviewer and an interviewee [8]. TEM legends of the present study are shown in Table 2.

Table 2 – TEM legends

Signs	Terms	Details
	Obligatory Passage Point (OPP)	- Institutional: Laws, regulations, compulsory education, etc. - Customary: What is customary or considered to be done - Resultant: Common experiences and situations many people have
	Equifinality Point (EFP)	A point where multiple pathways reach. Based on the idea that even if an individual follows a unique path, each will eventually reach an equal (equi) and final point.
	Polarized EFP (P-EFP)	A point that can be considered as the opposite of EFP, set by researchers. Interviewees may have different P-EFPs.
	Bifurcation Point (BFP)	A point where a pathway bifurcates. These points are not always visible in life paths. Points where social factors (SD/SG) compete with each other
	Promoter Signs	Conscious or unconscious, behaviors are selected through these "symbols" while taking into account situations and contexts. Subsequent behaviors are prompted by this sign.
	Behaviors & Selections	Other behaviors and selections
	Social Guidance (SG)	Social power that works positively, and helps behaviors and selections in heading for EFP
	Social Direction (SD)	Social power that works negatively, and hinders behaviors and selections in heading for EFP
	Solid arrow	Pathways obtained from the narrative
	Dotted arrow	Pathways considered to exist theoretically, different from the ones actually taken

(Created by the author with reference to [8])

3. Results

3.1 Life Restoration Processes

TEMs of the present study start from the bottom, the Great East Japan Earthquake, set as OPP (Fig.2, 3). Trajectories of case A is largely categorized into 2 vertical groups: community, and home and family. The process consisted of 4 stages: interpersonal cooperation as stage 1, multiple illnesses as stage 2, home reconstruction as stage 3, and struggled and exhausted as stage 4 (Fig.2).

The house was located on the mountain side in this case, and they had access to drinking water sources. Some people were refused to stay in a public shelter because they had their flooded houses remained. Therefore they gathered together on the mountain. It was mentioned that there had been more than 100 evacuees, and the interviewee had coordinated incoming distribution of relief supplies at the site. Despite his job dismissal at the end of stage 1, the family tried and lived somehow over a year, meanwhile his health condition had deteriorated during stage 2 (Fig.2).

Characteristics of the case can be seen in stage 1 and 2. There were more social factors (social guidance, SG), which positively work for restoring lives compared to those which negatively work (social

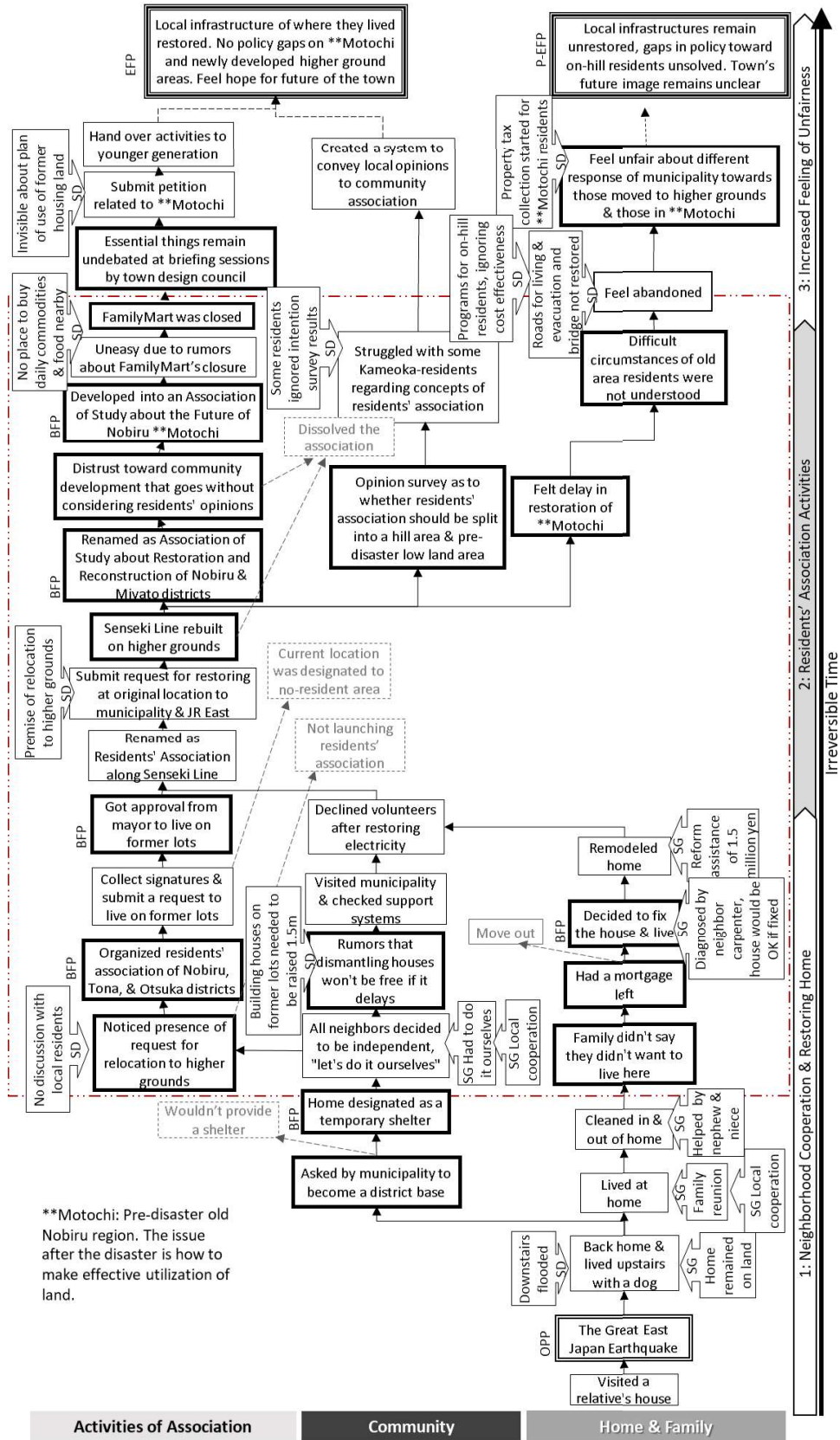


Fig. 3– TEM of Case B



direction, SD), to support decision-makings at BFPs. Participation in community activities had been carried on, even when he was disemployed. After having been hospitalized several times, SDs successively occurred toward the end of the stage 2. The family finally decided to buy a tsunami-flooded house from a relative while postponing the decision for a year since the first contact from him. They cleaned and restored the damaged house by themselves, and the housing restoration was accomplished in stage 3 within 3 years after the disaster, although exterior of the building and outside walls were left unrepaired. Accumulative stress and difficult financial circumstances elicited a spirit of abandon in stage 4 (Fig.2).

Trajectories in TEM of case B is categorized into 3 vertical groups: activities of association, community, and home and family (Fig.3). Time-series flow consists of 3 stages: neighborhood cooperation and restoring home, residents' association activities, and increased feeling of unfairness. This case was marked by a prompt residential reconstruction accomplished within 4 months in the post-disaster period. Positive attitude "let's do it ourselves" was seen in stage 1, which enabled the local community to cooperate altogether toward their life restorations. The case was also characteristic of its activities of local community and residents' association at stage 1 and 2. While coordinating neighbors soon after the disaster, the interviewee found out that a request for relocation to higher ground was presented to the municipality from a town development council. Those whose houses had remained did not hear anything regarding such request. Therefore, the interviewee of the case B launched and organized the residents' association to pull together local opinions and to report them to the municipality. They had made several representations to the city throughout the process regarding local restorations and future programs of the town development.

The municipality actually acknowledged it as one of the successful examples of residential group relocation to high grounds after the Great East Japan Earthquake [10]. It is apparent that situations vary by region. Conflicts and dissensions among local residents, those willing to be relocated to higher grounds, and those having reconstructed home and staying in the flooded area, were described in TEM throughout the process (Fig.3). It took more than 6 years before the high ground construction completed, and some of those willing to relocate, could not wait and rebuilt their houses at previous residential sites. Others moved out of the area over the years [11]. Such cases were also heard in the interviews. Restoration of local infrastructure did not progress as expected. The residents' association worked on the municipality to open a store to purchase daily necessities in the local region, and FamilyMart, a convenience store, was opened at tsunami affected former station building in the neighborhood in 2014 [12]. It was closed after 5 years of operation [13], and the request for continuing business by the association was submitted to no avail. Meanwhile the interviewee considered that various measures for high ground relocation had been adopted regardless of cost-efficiency. Through the activities of the association, the interviewee thought and experienced sufficient explanations and discussions had not been shared to the residents who restored and continued to live in the flooded houses. Despite the early residential reconstruction of this case, by looking at neighborhood where restoration seemed slower than other affected areas, he started to feel abandoned and could not figure out future images of the town (Fig.3).

3.2 Internal Transformations

TLMGs of the present study were focused and analyzed with regard to the range surrounded by orange dotted squares in TEMs (Fig.2, 3). The range was determined where bifurcation points and social factors gathered. TLMGs focused on relations between behaviors and feelings in level 1 (Fig.4, 5). Speech balloons in the figures are located in that level, which were derived from narratives of the interviews. TLMGs of this study start from upper left box. It was apparent in both cases that cooperation and coordination of communities already existed or temporarily arose in the post-disaster period.

Collaborative behaviors and mutual assistance with the local community were explicit in case A (Fig.4). It seemed that job dismissal triggered his illness for being stressed out, and struggle toward survival continued. These financial and physical difficulties had affected and negatively transformed the value and belief. It was implicated that institutional problems including pension system and health expenditure undermined this case.

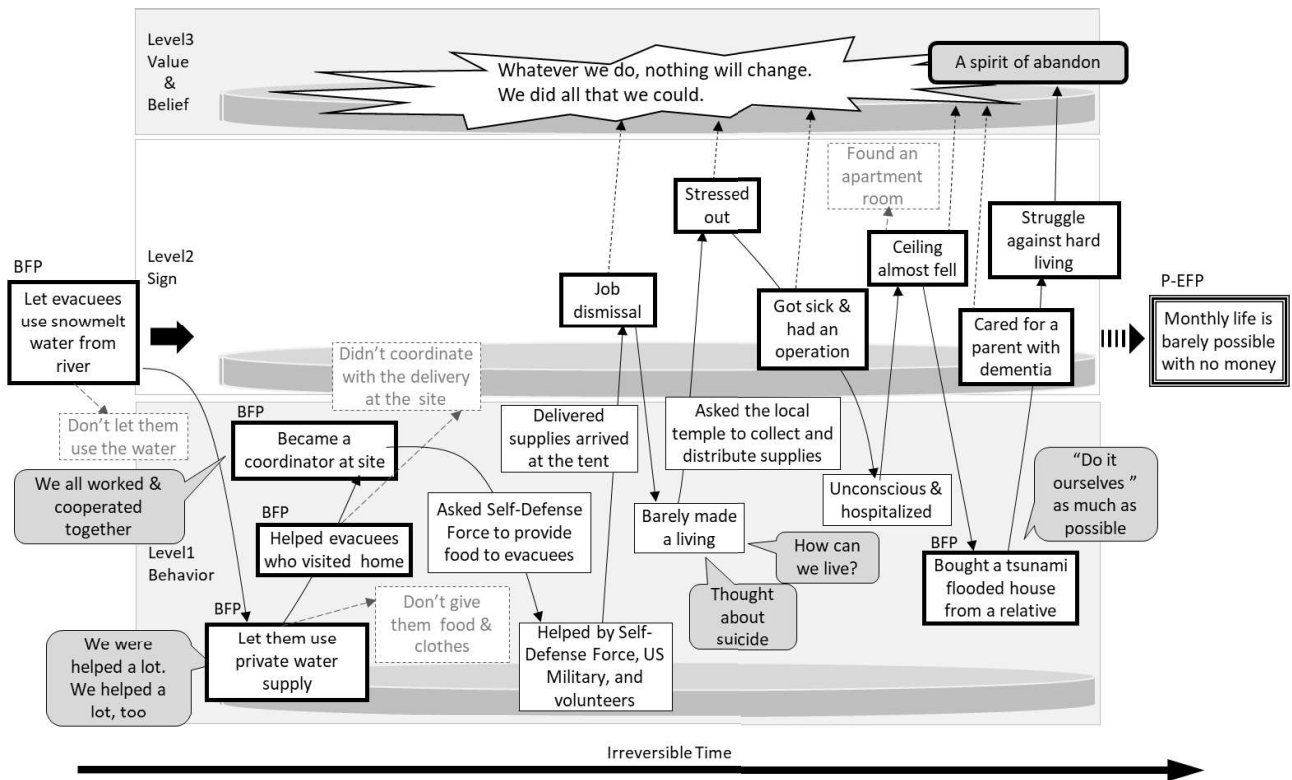


Fig. 4-TLMG of Case A

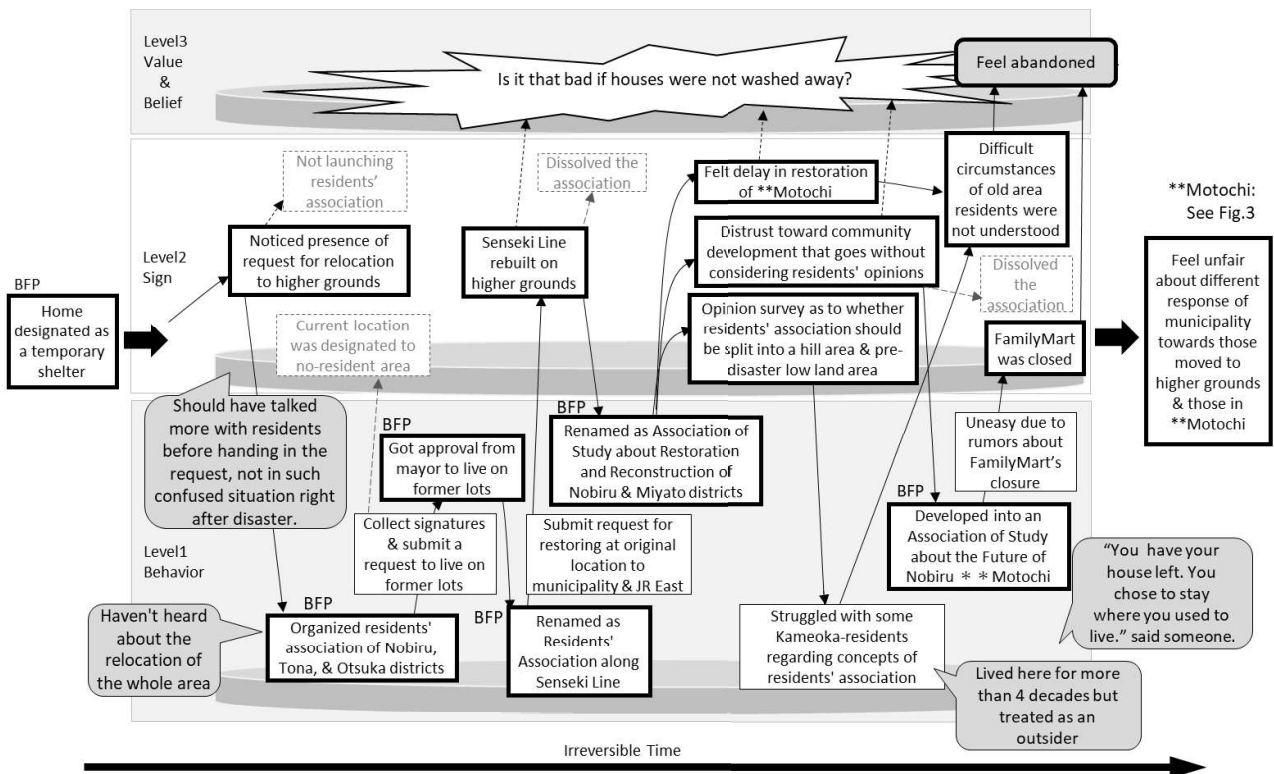


Fig. 5-TLMG of Case B



In case B, originated in the request for relocation to higher grounds, rash judgement of town development had become a trigger for future serious problems of the communities (Fig.5). The interviewee thought that there had not been adequate, satisfactory explanation nor communication between the local government and the residents' association regarding countermeasures to ameliorate treatment of residents who remained in the flooded area. He kept facing discouraging responses from local government for several years and felt fragmentation among local residents.

Each interviewee actively dedicated to his own restoration and devoted to local revival. A series of promoter signs, however, was accumulated and led to reach the level 3 to transform value and belief toward negative ones: a spirit of abandon in case A, and feeling abandoned in case B. Therefore, long-term life restoration eventually encountered internal transformations and changed their wills to senses of abandonment.

4. Conclusions

The present study

- 1) indicated that both cases took important roles in local restorations. They had proactive approach to their own residential reconstructions as well as local restorations. This can be symbolized by the phrase as their motto “do it ourselves”.
- 2) proved that TEMs in the study showed their local cooperative behaviors and that there were more factors of social guidance to positively support them in the aftermath of the disaster. Several years had passed, however, and they seemed to head for polarized equifinality points in their long-term life restorations.
- 3) identified that the interviewees faced internal transformation in the long process. Different social and institutional factors affected the transformation.
- 4) considers it essential to utilize post-disaster collaborative energy among residents for positive direction in local restoration and town development. It is undesirable for affected communities that cooperative and supportive-minded residents as in the cases of this study experienced negative internal transformations.

This study was limited to life restoration process of 2 cases from the Great East Japan Earthquake. Future studies will target other age-groups, genders, damages, and disasters to ascertain patterns of post-disaster long-term life restoration process.

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6. References

- [1] Disaster Countermeasures Headquarters, Fire and Disaster Management Agency, Japan (2020): The 2011 off the Pacific coast of Tohoku Earthquake (Great East Japan Earthquake) (160th report) <https://www.fdma.go.jp/disaster/higashinihon/items/160.pdf> (in Japanese, accessed in Jan, 2021)
- [2] Reconstruction Agency, Japan (2021): Number of evacuees nationwide https://www.reconstruction.go.jp/topics/main-cat2/sub-cat2-1/20201225_kouhou1.pdf (in Japanese, accessed in Jan, 2021)
- [3] Reconstruction Agency, Japan (2021): Current status and efforts of reconstruction https://www.reconstruction.go.jp/topics/main-cat1/sub-cat1-1/2021.1_michinori.pdf (in Japanese, accessed in Jan, 2021)
- [4] Shigeo Tatsuki and Haruo Hayashi (2002): Seven Critical Element Model of Life Recovery: General Linear Model Analyses of the 2001 Kobe Panel Survey Data, Proceedings of 2nd Workshop for Comparative Study on Urban Earthquake Disaster Management



- [5] Anna Matsukawa, Aya Tsujioka, and Shigeo Tatsuki (2015): Life Recovery Processes and the Challenges of Four Types of Dwellers: Life Recovery Assessment Workshop in Natori City in Miyagi Prefecture, Journal of social safety science, Institute of Social Safety Science, **25**, 23-33 (in Japanese)
- [6] Hiroko Koumoto (2019): Analyzing Life Restoration Process of a Home Evacuee -A Case of Ishinomaki, Miyagi Prefecture, after the Great East Japan Earthquake Using Trajectory Equifinality Approach, poster presentation, 16th Conference of Japanese Association of Qualitative Psychology, Meio University in Okinawa, Japan (in Japanese)
- [7] Chika Watanabe (2014): A Study about the Conditions of Support for Low Income Elderly Living Alone, Bulletin of Tokyo Seitoku University-Faculty of Humanities / Faculty of Applied Psychology, **21**, 89-97.
- [8] Edited by Yuko Yasuda, Akinobu Nameda, Mari Fukuda, Tatsuya Sato (2015): *Theory of TEA: Learning the basics of Trajectory Equifinality Approach*, Shin-yo-sha (in Japanese)
- [9] Tatsuya Sato, Tomo Hidaka, Mari Fukuda (2009): *Depicting the Dynamics of Living the Life: The Trajectory Equifinality Model*, Chapter 10, Dynamic Process Methodology in the Social and Developmental Sciences, Springer.
- [10] Architectural Institute of Japan (2015): WEB version Architectural Debate, **3**, 4th KENCHIKU-TORON, <https://www.aij.or.jp/jpn/touron/3gou/touron4.html> (in Japanese, accessed in Feb, 2021)
- [11] Yoshiteru Murosaki (2014): Life Reconstruction after the Great East Japan Earthquake, Japanese journal of human welfare studies, 6 (1), 9-18 (in Japanese)
- [12] Sanriku Kahoku Shimpo Publishing Co. (2019) Convenience store residents' requests realized at Former Nobiru Station Utilization of Higashi Matsushima City Regional Exchange Center, NEWS Ishinomaki Kahoku, May.29th, 2014, <https://web.archive.org/web/20190209124555/http://ishinomaki.kahoku.co.jp/news/2014/05/20140529t13004.htm> (in Japanese, retrieved via web.archive.org, accessed in Feb. 2021)
- [13] Sanriku Kahoku Shimpo Publishing Co. (2019) Higashi Matsushima 3.11 Disaster Recovery Memorial Museum to be expanded Former Nobiru Station Famima closed at the end of this month, NEWS Ishinomaki Kahoku, Feb.21st, 2019, <https://web.archive.org/web/20190221115645/http://ishinomaki.kahoku.co.jp/news/2019/02/20190221t13011.htm> (in Japanese, retrieved via web.archive.org, accessed in Feb. 2021)