Breakdown of Infrastructures and Urban Disconnection: Tokyo in Post-quake Chaos

Junko UENO

INTRODUCTION

On March 11, 2011, urban life in Tokyo experienced a fundamental shock when a devastating disaster caused severe damage in northeastern Japan. This paper will reveal the disruption process on urban infrastructures and its impact on the urban life in Tokyo after the Great East Japan Earthquake. Tokyo was disrupted both physically and emotionally in the chaos that followed the earthquake. In this paper, we will explore two questions by focusing on the breakdown of urban infrastructures: What was the experience of a "disrupted Tokyo"? And what caused the disruption?

Tokyo in the 2011 Disaster from an Outsider's View

These questions were inspired by my personal experience of the 2011 disaster. On March 11, the day the earthquake struck eastern Japan, I was at home in Osaka, the central city of western Japan. All national news programs broadcasted the terrible situation occurring in northeastern Japan (Tohoku), where the earthquake and tsunami had hit. Upon hearing the news, I felt anxious about the safety of my family and friends in Tokyo, because little information on the situation there was being provided. Only a few news programs showed scenes of people running and screaming amid fallen tiles from building walls. Viewing these scenes, I grew concerned that Tokyo was turning into a pile of debris.[1] However, when I traveled to Tokyo the next day, I was astonished to find it rather peaceful; no buildings had collapsed, and the people appeared as calm as usual, though many shops and restaurants were closed. This astonishing experience serves as the starting point of my research: How do we explain the calmness of Tokyo the day after the quake struck? What happened inside the city?

Method/Data

To paint an accurate and precise portrait of the Tokyo life in the post-quake chaos and explore the source of a physically and socially disrupted Tokyo, we will focus on the disruptions and breakdown in the infrastructure network.[2]

The disruption in the infrastructure networks will reveal the socio-spatial structure and the economic and political systems, of which citizens are often unaware in everyday life. Three aspects of infrastructures are important. First, there is the interdependence of infrastructures, which resulted in connectivity between regions. Because infrastructures connect tightly and mutually with each other, an infrastructure disruption quickly cascades beyond infrastructure boundaries to other systems (Little, 2010). After the earthquake on March 11, 2011, the disruption of the electricity supply in Tokyo had the most significant impact for causing cascading failures. Compared to northeastern Japan, which was seriously damaged by the earthquake, the tsunami, and the nuclear accident, the direct and physical destruction to Tokyo was minor. The salient feature of the post-quake experience in Tokyo was that the

Junko UENO, Department of Sociology, Momoyama Gakuin University

damage to the disaster-stricken areas affected Tokyo indirectly and intermittently due to the infrastructure collapses. Second, the infrastructure has a politicized nature. Social biases have always been built into urban infrastructure systems and their abilities to respond to crises, collapses, or disruptions, whether intentionally or unintentionally (Graham, 2010: 13). Tokyo, as an urban center with material infrastructures, has imprints of social inequality that are historically and geographically structured. The process of restoring disrupted infrastructures makes visible the social inequality embedded in urban materials and causes citizens to be aware of the actors and systems that have maintained the infrastructures. Third, the material infrastructure is permanent. Infrastructures can not only promote economic activities but also be a barrier to it when the infrastructure becomes outdated.[3] As the economic activities and the political regulating systems change from those that originally constituted the infrastructure, they become inconsistent with the infrastructure because of its enduring qualities. This inconsistency can worsen the situation of the infrastructure disruption.

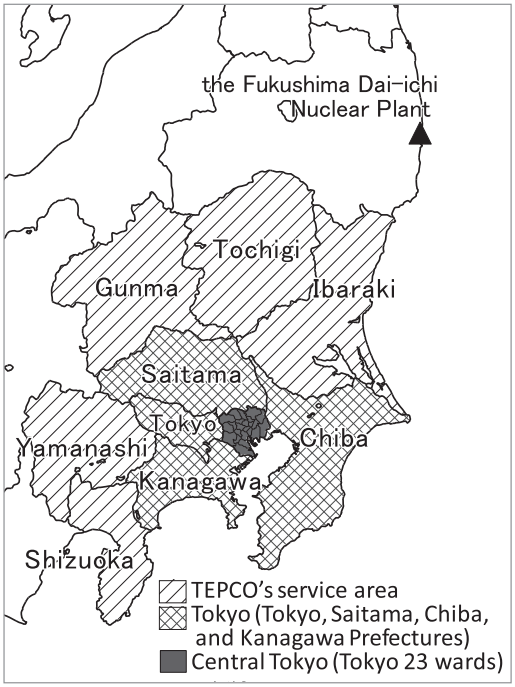

Figure 1. Map of Tokyo, TEPCO's service area and the Fukushima Dai-ichi Nuclear Plant
Note.
TEPCO's service area includes Tokyo and its surrounding prefectures.

Before starting the analysis, we will define the geographical regions in this paper. We focus on the Southern Kanto region, which includes Tokyo, Saitama, Chiba, and Kanagawa Prefectures, as the subject of analysis (hereafter, "Tokyo"). Tokyo's 23 wards will be referred as central Tokyo, and the Southern Kanto region with the exception of these wards will be referred as the periphery areas.

The analysis used data from the "The Great East Japan Earthquake Chronicle"[4] as well as documents released by the Tokyo Electric Power Company (TEPCO) and the Japanese and local governments.

Section 2 will reveal that the experience of a "disrupted Tokyo" comprises four phases, of which the first three are described in detail. Section 3 will examine the social biases embedded in the handling of the disaster and the inconsistency between infrastructures, the industrial structure, and the political system by focusing on the rolling blackouts. In Tokyo, the degree of damage, recovery, and burdens varied between the central Tokyo and the periphery areas. The political regulating system had no function in ensuring the fairness and efficiency of Tokyo urban life.

DISRUPTION OF TOKYO

Outline

Tokyo's prosperous daily life has been maintained via stable supply sources from its surrounding area. Most damage to Tokyo was caused by its historical connection with Tohoku, which has long supplied Tokyo with farm and marine products, manufactured products, workforce labor, and especially electric power. The electricity-generating capacity of TEPCO amounted to 68 million kW in 2010, of which 30

million kW were supplied from outside of TEPCO's service area (Ito, 2011). The disaster exposed the vulnerability of the highly complex supply and distribution systems that maintain the urban life. The confusion inside Tokyo did not end the day the earthquake caused direct damage, and the whole city was plunged into further turmoil as supply networks disrupted in the stricken areas.

The earthquake and tsunami caused failures in different infrastructures in four phases, causing a major disruption in Tokyo. Phase 1 is the day the quake struck, March 11, 2011. The earthquake caused simultaneous failures in multiple infrastructures and stranded millions of commuters. Phase 2 is a motionless phase that occurred in the two days following the earthquake, March 12 and 13. Phase 3 features the cascading disruptions triggered by the nuclear accident and rolling blackouts, which ended on March 28. In Phase 4, people gradually became accustomed to uncertainty; the end of Phase 4 is obscure. We will describe Phases 1, 2, and 3 in detail.

Phase 1: The Day of the Great East Japan Earthquake —March 11, 2011

Phase 1 is the day the earthquake struck eastern Japan, causing simultaneous failures in multiple infrastructures (Figure 2). These included water, gas, and power outages; suspension of rail and airline services; and damage to the Fukushima Dai-ichi nuclear plant. The national and local governments focused their efforts on saving Tohoku from the destruction caused by the earthquake, tsunami, and nuclear accidents. Compared to Tohoku, Tokyo experienced little damage. Thirteen houses were completely or partially destroyed, and 351 houses were damaged in Tokyo Prefecture. In the Tokyo metropolitan area, 11,557 houses were completely or partially destroyed.[5] In Tokyo Prefecture, electricity was cut off to approximately 120,000 houses (approximately 3.9 million houses in the Tokyo metropolitan area); there was no water in approximately 20,000 houses (about 0.9 million in the Tokyo metropolitan area); and no houses were without gas (47,056 houses in the Tokyo metropolitan area) (MLIT, 2011). The damage in the Tokyo metropolitan area was concentrated in the northeastern part, which is adjacent to Tohoku.

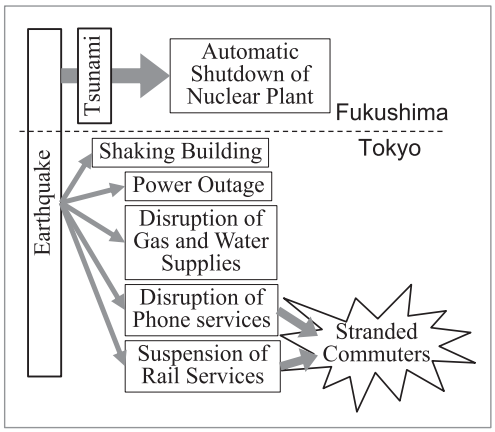

Figure 2. Phase 1: The day the quake struck, 11 March, 2011

Tokyo's problems lay mostly in the large number of stranded commuters. In the Tokyo metropolitan area, approximately 7.9 million people commute to work and school daily by train, and most commuters from Chiba, Saitama, and Kanagawa Prefectures travel to central Tokyo (MLIT, 2012a). Overconcentration in central Tokyo worsened the situation for stranded commuters. Most railways in the Tokyo metropolitan area suspended service immediately after the earthquake.[6] When Yukio Edano, the Chief Cabinet Secretary, held a press conference at around 17:30, it was too late to stop the commuters who were already struggling to return home. Almost half of the people who were at work or school at 14:46, the moment the earthquake hit, left to go back home before 17:00 (Cabinet Office, 2011). To support the commuters who were on their way home, local governments provided 1,000 temporary shelters. They also asked convenience stores and restaurants, which volunteered to cooperate in a time of disaster, to provide water, toilet facilities, and information. It was

estimated that the peak time was 19:00, four hours after the earthquake hit, when about 3 million pedestrians were walking through the Tokyo metropolitan area (Mitsubishi Research Institute, Inc., 2011). The main roads were full of pedestrians and cars stuck in traffic jams. Consequently, more than 5 million commuters were unable to return home that day (Cabinet Office, 2011).

This problem of stranded commuters originated from the overconcentration of commuters in Tokyo. An enormous number of commuters spend an extremely long time commuting from their suburban homes to central Tokyo every day.[7] The problem of stranded commuters during disaster will not be solved fundamentally unless there is change in the excess population of Tokyo and their commuting style.

Phase 2: Temporary Peace and Creeping Uncertainty —March 12–13

In Phase 2, the people in Tokyo enjoyed a temporary respite from the post-quake confusion. Although some railway services resumed and the stranded commuters returned home, disruptions in water and gas supplies continued in the periphery areas. On March 12, an explosion occurred at the nuclear plant in Fukushima. Then, on Sunday, March 13, TEPCO announced that it would implement its first-ever rolling blackout from Monday, March 14 until April, to deal with the shortage of electricity.

Phase 3: The Nuclear Accident, Rolling Blackouts, and Cascading Disruptions — March 14–28

In Phase 3, the nuclear accident triggered cascading disruptions (Figure 3). This phase distinguishes the Great East Japan Earthquake from other disasters and characterizes the "disruption" of Tokyo. A convenient urban lifestyle and highly concentrated economic activity in Tokyo are sustained by material

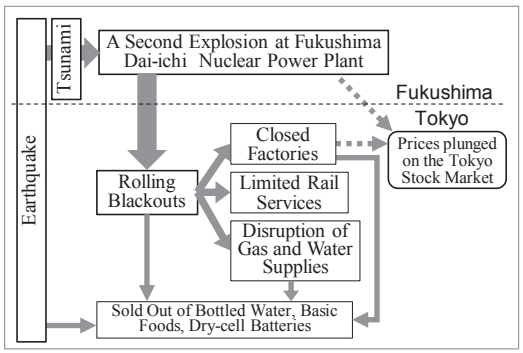

Figure 3. Phase 3: The nuclear accident and cascading disruptions, March 14- 28

infrastructures that are mutually connected. Cascading infrastructure failures induced by the nuclear accident in Fukushima made visible the complex infrastructure network and led us to realize how deeply the Tokyo urban life depends on its surrounding areas.

On the morning of Monday, March 14, a second explosion occurred at the Fukushima nuclear plant. As a result, prices plunged on the Tokyo stock market.

Rolling blackouts, the first ever in Japan, also began on March 14. Because of the power cuts, many manufacturers such as Toyota, Honda, and Sony closed their factories. In addition, rail services were drastically scaled back across Tokyo. For example, Tokyo Metro Co. Ltd. ran all its lines at 50–90% capacity. East Japan Railway Co. ran its nine busiest lines at about 20% capacity and stopped the other 29 lines. Every station was packed with commuters. To avoid any problems, over 1,000 schools suspended some or all classes in the areas served by TEPCO. On the first day, power outages were implemented shortly from 17:00 to 18:30, affecting 110,000 households in Ibaraki, Chiba, Shizuoka, and Yamanashi Prefectures (The Denki Shimbun, 2011: 301). As many factories, stores, and restaurants were closed, economic activities and social life in Tokyo degenerated into chaos all day long.

Figure 4 shows the actual electricity demand and the implementation time of power outages. On

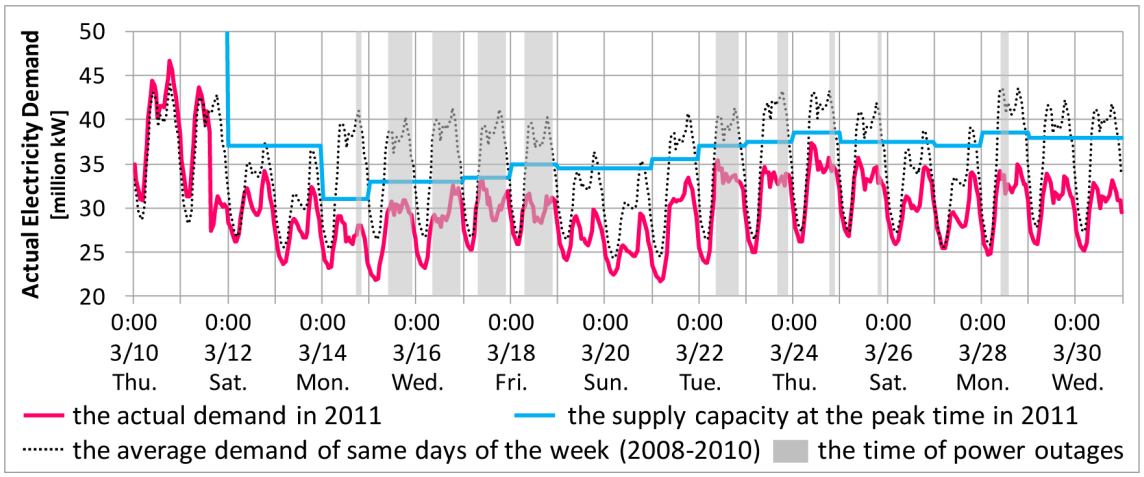

Figure 4. Actual electricity demand and the implementation time of power outages

Note.
March 21, 2011 was Spring Equinox Day (春分の日), a public holiday in Japan.
Source: Based on TEPCO ("Past electricity demand data" and "TEPCO electricity forecast").

the weekdays of the first week, electricity was cut randomly around TEPCO's service area. In total, rolling blackouts were implemented for 10 days and affected 70 million households (The Denki Shimbun, 2011: 306). People put up with the inconvenience to them as the frequency of trains was reduced and the lighting on the streets and stores was switched off to save energy. Power shortages also impaired industrial productivity. The material industry, especially the semiconductor industry, was the most damaged because their facilities required a stable electricity supply to manufacture good. Industrial recovery from the earthquake and tsunami was delayed, and national supply chains were disrupted. The planned power outages have since been remembered as symbols of the chaos after the earthquake.

Residents of Tokyo coped with this situation in one of the following two ways: they either adjusted to their disrupted way of life or they evacuated. Anxious consumers stockpiled bottled water, basic foods, dry-cell batteries, and fuel and cut back on spending. On March 14, the Minister of State for Consumer Affairs explained that there were a large stock of daily necessities and asked the public to stay calm and not accumulate a stockpile. Even so, bottled water and foods like breads that could be eaten without cooking during blackouts became scarce in stores. On the contrary, some companies and people, mainly foreigners and families with babies, fled Tokyo because of the fear of radiation and blackouts. Many foreign embassies including those of France, the United Kingdom, and Germany advised their nationals to leave; thirty-two embassies were shut (28 of them reopened as of April 29, 2011). At the same time, the number of foreign visitors declined. Although number of foreign visitors to Japan was the highest number in 2010, it decreased by nearly 30% in 2011 from the previous year (JNTO, 2012). All these events combined to result in the economic and social stagnation of Tokyo, which deepened after March 23, when Japanese officials warned that radiation levels in the Tokyo tap water exceeded the safe levels for babies.

UPROAR OVER THE ROLLING BLACKOUT AND ITS ALTERATION PROCESS

Central–Peripheral Split in Rolling Blackouts

In this section, we will examine the socio-spatial disparities in the disaster response by focusing on the rolling blackout schedules. TEPCO divided its service area, which included Tokyo Prefecture and its surrounding eight prefectures, into five groups and assigned each group a schedule of blackouts that would last for three to six hours.

The first-ever implementation of blackouts on March 14 proved that TEPCO had not considered the stricken areas. The power outages were conducted only in two groups, which included the areas hit by the earthquake and tsunami. For example, Asahi in Chiba Prefecture, where 11 people had died and a few were still missing, was included. The governors of Chiba and Ibaraki Prefectures formally complained about the implementation of blackouts in areas affected by the disaster. Although TEPCO apologized the next day and announced that Ibaraki Prefecture and the affected areas of Chiba Prefecture would be spared future power cuts, Urayasu in Chiba Prefecture, one of the seriously affected areas, experienced blackouts again on March 17.

Anger mounted against TEPCO not only over its mismanagement of rotating blackouts but also over their unfair assignment. TEPCO had excluded most of central Tokyo from power cuts, as central government offices and many company headquarters are housed there. The original assigned area included eight wards and was limited to four wards starting March 17. After March 22, only 2 of 23 wards, Arakawa and Adachi, were assigned rolling blackouts. Both ward mayors lodged a formal complaint against TEPCO, arguing that blackouts should be rotated fairly and affect all areas equally. These two wards are located on the northeast side of central Tokyo. They are part of the Tokyo industrial belt, where many blue-collar workers live and where the average income is relatively low among the 23 wards (Kurasawa and Asakawa, 2004; Ueno, 2008). There was some speculation that TEPCO assigned rolling blackouts intensively to socially marginalized areas.

The opaque handling of rolling blackouts by TEPCO fostered a sense of unfairness. Some communities in suburban and rural areas experienced rolling blackouts twice a day. Both areas with and without power outages existed, even within the same community because the rolling blackout was assigned according to the electrical substation and not the community's address. The TEPCO call center was inundated with complaints and protests from businesses and residents in periphery areas, especially the area adjacent to central Tokyo.

The Modification Process of Rolling Blackouts

The confusion over rolling blackouts revealed the absence of cooperation between the Japanese government, bureaucrats, the business community, and TEPCO, though these groups had historically enjoyed a strong relationship described as the "iron triangle".[8] The lack of coordination resulted in the stagnation of urban economic activity and the abandonment of the periphery areas. The schedule for rolling blackouts was made hastily while most staffs of TEPCO and the Japanese government had devoted their attention to responding to the nuclear accident. Considering that the first rolling blackout was implemented in the disaster-stricken area, it is obvious that the company automatically cut electricity in the periphery areas.

The implementation plan of the rolling blackouts was steadily modified. Three points in the

modification process are notable. First, the railways were exempted from the rolling blackouts. On requests from the railway companies and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), TEPCO exempted the electrical substation for railway trains from rolling blackouts after the early morning of March 15.

Second, the business community had a communication problem with TEPCO. Although the business community requested several times that the rotating blackouts be stopped, TEPCO maintained its policy of rotating power outages for nine prefectures. On March 15, Keizai Doyukai (Japanese Association of Corporate Executives) proposed that power delivery cutbacks in contracted amounts and other forms of gross restriction were more effective than blackouts that lasted several hours (Keizai Doyukai, 2011). The next day, Keidanren (Japan Federation of Economic Organizations) decided to ask TEPCO for a separate implementation plan for the industrial sector from the residential sector. Nevertheless, TEPCO refused these alternative proposals of rotating power cuts by the business community.

Third, the Japanese government had little control over TEPCO. While the government appealed immediately to the public and the industrial sector for full cooperation in conserving electricity and cooperating in the rolling blackouts, it sought TEPCO to modify the implementation plan of the rolling blackouts only few times.[9] The electricity supply–demand emergency response headquarters was established in the cabinet office and held meetings on March 13, the day before the implementation of the rolling blackouts, and on the next morning of March 14. No meetings were held until March 25. During this period, the main government officials such as Prime Minister Naoto Kan, Chief Cabinet Secretary Yukio Edano, and Minister of Economy, Trade, and Industry Banri Kaieda devoted all their energy in stabilizing the Fukushima Dai-ichi nuclear power plants (The Independent Investigation Commission on the Fukushima Nuclear Accident, 2012). The government and TEPCO were too busy to consider fairness in implementing rolling blackouts. The only thing they could do was try to avert an unforeseeable large-scale blackout.

The process of modifying the scheduled blackouts was influenced by the industrial structure of Tokyo. Both TEPCO's exemption of the railway and its refusal of the business community's request in order to prevent damage to the manufacturing industry imply that manufacturing industries were no longer preferred recipients of the electricity supply. Fukushima Prefecture, where the nuclear accident occurred, has been a major electricity supply area for the Tokyo metropolitan area since before the Second World War (Kainuma, 2011). Its main purpose in providing electricity was to promote industrial production in the Keihin industrial area around Tokyo and Kanagawa Prefectures. Along with

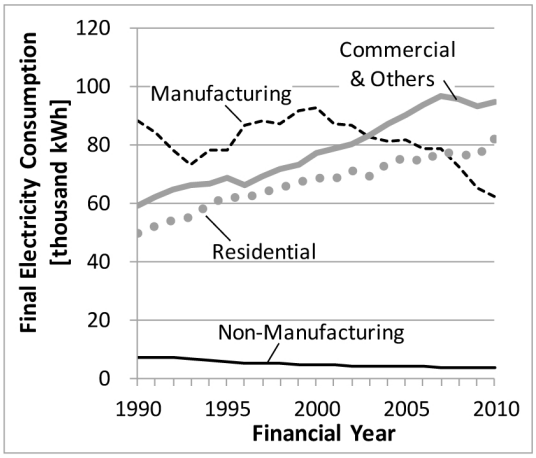

Figure 5. Final electricity consumption by sector in Tokyo (Tokyo, Saitama, Chiba, and Kanagawa Prefectures)
Note.
1 "Non-manufacturing" sector includes agriculture, forestry, fishery, construction, and mining.
2 "Commercial & Others" sector includes the service industries except transportation.
Source: Agency for Natural Resources and Energy, 2012, "Energy Consumption Statistics by Prefecture."

the shift in the industrial structure, manufacturing in Keihin has declined. In 2008, the number of business establishments in Keihin was 83,800, which indicated a decline of more than 40,000 since 1998, and the value of manufactured goods shipments was 44.9 trillion yen, which had declined by 13 trillion yen over the previous decade (TMG, 2011: 41). As a result, more importance was now placed on the value of manufactured goods shipped from the Chukyo area, where Toyota—the leading Japanese auto manufacturer—is located, than the Keihin area. In particular, Tokyo Prefecture, where small factories have accumulated, had already shown a sharp decline in manufacturing before the 2011 disaster. In Tokyo Prefecture, the value of manufactured goods shipments was 10.5 trillion yen, and the amount of added value was 3.9 trillion yen in 2008, both of which had dropped by half since 1990 (TMG, 2011: 40). The decline in manufacturing in Tokyo was exacerbated because of the supply-chain disruption and factory shutdowns due to the rolling blackouts. Instead of the manufacturing sector, the residential and commercial sectors grew in electricity consumption (Figure 5). In the 2000s, a large number of high-rise office and residential buildings were constructed in central Tokyo (Ueno, 2008). These buildings have strengthened their presence as recipients of the electricity supply.

The strong relationship between the Japanese government, bureaucrats, the business community, and TEPCO had little effect on the modification of the implementation plans of the rolling blackouts. Miscommunication between TEPCO and the government was caused partly by a change in the government. The former governing party—the Liberal Democratic Party—has received political donations from executives of electric companies.[10] TEPCO held key positions in influential business interest groups such as Keidanren and Keizai Doyukai and offered advisory posts to the ex-officials of the competent authorities such as the Ministry of Economy, Trade and Industry.[11] Though they had protected each other's interests in the regulation of business for a long time, this collusive relationship did not contribute to the smooth communication or management in the case of an emergency.

CONCLUSION

In this paper, we explored the characteristics and causes of a "disrupted Tokyo." The following are the three points of the analysis.

First, the multiple disasters of the earthquake, tsunami, and nuclear crisis complicated the process of disruption and the recovery of infrastructures in Tokyo. As infrastructures failed one after another, Tokyo residents lived through four different phases. The physical and social disruption of Tokyo did not end after the first day the earthquake struck. The damage to the stricken areas affected Tokyo indirectly and intermittently via infrastructure collapses. With respect to these four phases and the impact of the disaster on the infrastructural disruption, the experience of a "disrupted Tokyo" was distinct from those of other cities' disruptions that have been triggered by a single instance of direct damage such as a hurricane or a massive power loss.

Second, socio-spatial disparities were revealed in TEPCO's handling of the power shortage. The rolling blackouts made people aware of the heavy dependence of Tokyo on its surrounding areas such as Tohoku and brought to light the social gap as well as the geographical boundaries between central Tokyo and its periphery areas. The power of Tokyo, which has been used to exploit the resources of the surrounding areas, was also seen inside Tokyo. While central Tokyo escaped power cuts, the residents of the periphery areas were forced to live with power

cuts. Their frustrations with the blackouts turned into grudges against TEPCO, the government, and the central Tokyo residents. Therefore, to avoid becoming a fragmented society, we need measures to reconnect central Tokyo with the periphery areas as well as Tokyo with its surrounding areas, both physically and socially.

Third, the Japanese government, the business community, and TEPCO forged little effective cooperation to cope with an urban crisis in the chaotic aftermath of the earthquake. The government failed to fairly assign the rolling blackouts. The requests of the business community to give priority to the continuation of business activities were disregarded. The biggest reason for the poor cooperation between these entities was that the government and TEPCO were desperate to stabilize the Fukushima nuclear power plants. Furthermore, the strong relationship between the government, bureaucrats, and the business community was weakened by the change in the government and the shift in the industrial structure. The physical and social disruptions in Tokyo continued because of the inconsistency between the power grid, the urban industrial structure, and the "iron triangle" that has protected each entity's interests in electrical industry.

The experience of a "disrupted Tokyo" has changed the urban lifestyle and the popular way of thinking. Two future inquires related to our analysis still remain unanswered. The first question is whether the central–periphery split, which became apparent through the post-quake chaos, will be repaired and the two areas reunited. Civil society organizations and universities in Tokyo have shown the potential to bridge the urban–rural divide by supporting reconstruction for the areas affected by the disaster. On the other hand, the political will has grown to reform political and economic institutions in favor of metropolises (and large corporations). Metropolitan governors had formed new political parties and aimed to reform national politics prior to the great earthquake. Coupled with the push to rescale, such as establishing a cross-regional federation (広域連合) and regional decentralization, this move might deepen the urban–rural gap. The second question is how the Japanese energy policy will change by the experience of a "disrupted Tokyo." Repeated infrastructure failures presented Tokyo residents with extraordinary experiences that were combined with mixed emotions of anxiety and expectation. Sometimes they feared that their lives had crumbled from their very foundation. At other times they hoped that they would be able to create a new society on the rubble of the old politics and institutions. These mixed feelings might be the engine for an upsurge of social movements that oppose the prevailing nuclear power policy more than ever before. The "iron triangle," including TEPCO, did not perform a regulatory function during the period of the rolling blackouts right after the disaster, though this relationship was revived and again promoted nuclear power before the electricity conservation started in the summer of 2011. By the experience of a "disrupted Tokyo," it is necessary to look closely at what has been changed and what has not.

Notes

1 It is said that greater the distance that people are from a disaster-stricken area, lesser the amount of information they receive, tending to more pessimistically imagine their situation (Solnit, 2009).

2 Research on the disruption of infrastructure networks often uses the concept of "urban assemblage." Brenner et al. (2011) identified three major levels of the assemblage concept regarding its articulation with political economy: empirical, methodological, and ontological. According to these categories, our position is close to the empirical level, which "demarcates the use of assemblage as a distinctive type of research object within urban political economy" (Brenner et

al., 2011: 231).

3 Harvey (1985) suggested the double-edged nature of infrastructure for economic activity, though he used "built environment" instead of infrastructures.

4 Visit our website:
http://hermes-ir.lib.hit-u.ac.jp/rs/handle/10086/22085

5 The Tokyo metropolitan area includes eight prefectures: Tokyo, Saitama, Chiba, Kanagawa, Ibaraki, Tochigi, Gunma, and Yamanashi. TEPCO's service area is the Tokyo metropolitan area and the western part of Shizuoka Prefecture.

6 While the East Japan Railway Co. decided on a shutdown all day starting at 18:00, several private railway and subway services resumed successively from 21:00 to midnight, and some lines in the Tokyo Metro Co., Ltd. and Toei subway ran through the night.

7 The average one-way commute time in Tokyo is 80 minutes. It is eminently long compared to London and New York (43 and 40 minutes, respectively) (MLIT, 2012b).

8 The strong relationship between the Japanese government, bureaucrats, and the business community that were aiming at Japanese economic growth was often called the "iron triangle" (Johnson, 1982) or "Japan Inc." (Abegglen, 1970).

9 Besides MLIT exempting the railway from power cuts on March 15, the electricity supply-demand emergency response headquarters requested that further information be provided to the public on March 18; and Banri Kaieda, the minister of Economy, Trade, and Industry, asked for a "fair allocation of the burden" on March 23.

10 Kyodo News Service reported that current and former executives of TEPCO and eight other electric power companies accounted for 72.5% of the donations made by individuals to the Liberal Democratic Party's political management fund in 2009 (http://www.japantimes.co.jp/text/nn20110724a1.html).

11 Ex-officials of the Ministry of Economy, Trade and Industry have served as advisers to TEPCO for a long time. Before the earthquake, the former Director General of the Agency for Natural Resources and Energy obtained an advisory post in January 2011 (*Diamond Weekly* (『週刊ダイヤモンド』in Japanese), issued on April 16, 2011).

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