

Environmental Politics in Taiwan:

The explosion and fire accident of the No. 6 Naphtha Cracking Project in July, 2010

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Abstract

On July 7th, 2010, a huge fire came after an explosion in the No.6 Naphtha Cracking Plant Complex in Mailiao, Yunlin. When another fire and explosion came again on 25th July, people not only woke up in the night but also started to have a feeling that this accident is more serious than what they have experienced before. Indeed, the two fire and explosions in July rapidly aroused widely public concerns and debates about contradictions between environment protection and economic development. This technology hazard also reflects the existing phenomenon about environmental politics, emergency management, and intergovernmental relations in Taiwan.

This research tries to analyze the Mailiao case in several dimensions: the emergency management system, environmental politics and democratization, and risk perceptions of local dwellers. Firstly, I issue the history of local environmental protection activities and the No. 6 Naphtha Cracking Project as background information. Secondly, I chronicle the accident that occurred in July, 2010. Then, I analyze this accident in the four phases (mitigation, response, rescue, and recovery) of the disaster management cycle. Finally, I offer suggestions to find out what can we learn from this accident and what need to be enhanced in the existing emergency management system in Taiwan.

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Introduction

On July 7th, 2010, a huge fire came after an explosion in the No.6 Naphtha Cracking Plant Complex. At first, local dwellers that live near the plant complex were not surprised at this accident. After having experienced 11 fire and explosion accidents since 2009, these local neighbors have been used to see such accidents and tended to view these as “normal” (much like we may face car accidents everyday). However, when a fire and explosion came again on 25th July, people not only woke up in the night but also started to have a feeling that this accident was more serious than what they have experienced before. Indeed, the two fire and explosions in July rapidly aroused widely public concerns and debates about contradictions between environment protection and economic development. On the one hand, industrialization helps to speed up economic growth. On the other hand, pollutions result from industrial production activity (such as air and water pollutions from industry waste) may damage the environment. Thus how to make a choice in pursuing economic development without bringing negative affects on the environment has become a core issue in Taiwanese public policy area nowadays. This technology hazard also reflects the existing phenomenon about environmental politics, emergency management, and intergovernmental relations in Taiwan.

This following research tries to analyze this case in several dimensions: the emergency management system, environmental politics and democratization, and risk perceptions of local dwellers. Firstly, I offer the history of local environmental protection activities and the No. 6 Naphtha Cracking Project as background information. Secondly, I chronicle the accident that occurred in July, 2010. Then, I analyze this accident in the four phases (mitigation, response, rescue, and recovery) of the disaster management cycle. Finally, I will offer suggestions to find out what can we learn from this accident and what need to be enhanced in the existing emergency management system in Taiwan.

Definitions

Technological disasters, as implied by the name that are disasters which come from people's actions with technology. The disasters, involve MHIs (Major hazard installation), is defined as an industrial activity which produces, processes, handles, uses, disposes of or stores, whether permanently or temporarily, one or more hazardous substances or a category or categories of hazardous substances in a quantity or quantities which is or are equal to or exceed the threshold quantity (CIMAH 1996; also see in Shaluf 2008). The typical types of MHIs are the refineries, petrochemical plants, chemical production plant, and so on (ILO 1988; also see in Shaluf 2008).

The US Federal Emergency Management Agency (FEMA 2006) defined four phases of the disaster management cycle. Each phase reflects a different stage which is interrelated with each other. These four stages are (FEMA 2006):

1. Mitigation: includes any activities that prevents an emergency, reduces the chance of an emergency happening or lessens the damaging effects of unfavorable emergencies.
2. Preparedness: planning how to respond in case of a disaster. It combines all the works that can be used to deal with disasters, crisis, and any other types of emergency situations.
3. Response: actions which are taken to save a life or eliminate the loss of poverty.
4. Recovery: after the disaster, taking actions to restore the basic living infrastructures and to maintain the basic living standard then help people return to their normal life or have a better living standard before the disaster.

In this research, I will examine governmental and industrial actions in these four stages to find out what needs to be improved for eliminating the loss of human life and property in the next disaster. Besides, they are not independent entities with one stopping and the next following (Shaluf 2008).

According to Carter (2001), environmental politics is a wide-ranging subject with

three core components:

1. The study of political theories and ideas relating to the environment.
2. The examination of political parties and environmental movements.
3. The analysis of public policy-making and implementation affecting the environment at international, national and local levels.

In Taiwan, environment politics is highly related to the development of democratization process and local politics. Environment protection issues have been widely used by the opposition parties as a critical and controversial topic to debate and to against the ruling party's economic development policies in recent decades. Such issues even act as roles to promote the political opposition movements and attribute to achieve the first party transition in Taiwanese central government in 2000. In the fire and explosion that occurred in July, 2010, when the local government (Yunlin County) and central government are held by different parties, this accident soon aroused political debates and party oppositions. Thus, analyzing this case in a political perspective may help us have a more comprehensive view about what can we learn and what are the effects from this accident.

Relation between local environmental activities and politics

Taiwan's environmental movement started with grassroots protests by the victims of pollution (Tang 2003). The history of local environmental activities is highly related to the democratization process in Taiwan. With the democratization efforts, Taiwanese people learn how to show their demands by creating political pressures to force government officials. Among all the ways to create political pressures, making protests is a simple and powerful one to citizens. Local politicians also view protests as accesses to get people's support and political interests. They cooperate with local environmental activists to assemble local people and resources as a strong interest group to present their

demands and attitudes toward issues like NIMBY (Not In My Back Yard). The early environmental activities can be traced in 1980s as following arguments by Tang (2003):

Although Taiwan was still under authoritarian rule at that time, the victims' anger and sense of injustice had helped the local residents overcome their fears and inertia to mobilize aggressive protests. Partly because of the legitimacy behind the protesters' efforts to seek fair treatment and partly because the political opposition movement had become a much greater threat to the KMT's (Kuomintang) ruling status, the KMT government tolerated these protests and conceded various compensation schemes to the protesters. After several successful examples of such protests, "self-salvation movements" became a typical pattern, and the protesters' demands ranged from seeking compensation to preventing the establishment of such unpopular facilities as rubbish tips, incinerators, nuclear waste treatment plants and other polluting industries. At this stage, the political opposition movements went hand in hand with environmental protests.

With the authoritarian rule by KMT has been weakened in 1990s, people have had more awareness in environment protection and human rights. At the same time, the developing opposition party DPP (Democratic Progressive Party) leaders viewed it is a chance to challenge KMT's ruling and made efforts to organize and cooperated with local environmentalists. At the local government level, DPP politicians organized protests against unfavorable local industry investment projects which may cause significant pollutions. Hence, Taiwan's business community is being pressured to clean up the by-products of its huge industrialization program (Rubin et al. 1990). An active grassroots environmental movement has emerged, and in several incidents local residents

surrounded factories and forced their owners to pay compensation for damage that the residents say has been caused by pollution. In addition, a number of industrial development projects have been canceled in the planning stage or moved offshore due to local resistance (Allen 1990, also see in Sheng et al. 1994).

For example, when the Formosa Plastic Group firstly announced the No.6 Naphtha Cracking Plant Complex project will locate in Lizi, Yilan County in 1986, it had roused widely public debates and protests in local area. Although this project was strongly endorsed by the central government because it fitted well into production processes of the petrochemical industry and the economic development plans of central government, strong political pressure from local residents and local government leaders finally led the Formosa Group withdraw the plan and try to choose another place as the site of complex. In 1990, this project was been withdrawn by the same reason in Guanyin, Taoyuan County.

On the other hand, such environmental activities do not exist everywhere in Taiwan. The business's lobbying in policy making process still strong in affecting the decision makers' choices between environment protection and economic development policy goals. As Ho (2005) argues "While environmentalists have gained important access to policy decision-making, pro-developing counter-mobilizations were also on the rise, and government policy shifted to a more pro-business stand consequently." With the development of democracy, pursuing economic prosperity has also become another main theme in Taiwanese local public policy field. Acquiring big business investment projects not only creates more jobs but also attracts more business opportunities in local areas. Thus, creating a more attractive environment for business has become a critical task of local government leaders, especially for those in lower-economic development areas. After the project had been abandoned twice in 1986 and 1990, Yunlin County welcomed the project in 1991. When the County government granted a zoning permit, tens of

thousands of people paraded on the streets to welcome the project, which the media described as the community's first step toward industrialization (Tang & Tang 1997). When people have to make a choice between environment protection and economic development, how to make a balance between these preferences has become a critical issue in Taiwanese public policy arena. Although some local politicians could get political interests from supporting environment activities, others still could be benefited by implementations of industry investment projects, especially for the local governments who do not have a strong financial base. In the discussion about why Yunlin County held different attitude toward the project in 1991, Tang and Tang (1997) argue that "For many local residents, industrialization appeared to be the only way for the County to prosper, and pollution problems arising from it were not an immediate concern for them...Even though some 10,000 fishermen and aquafarm owners stood to suffer from the pollution to be created by the plant, efforts by nationwide environmental groups and outside DPP politicians failed to mobilize them into an effective protest organization because no local leaders were willing to help activate the social networks needed for the purpose." But it is worth noting that in 1991, KMT was the ruling party in Yunlin County and both Yilan and Taoyuan County are held by DPP County commissioner. This may offer another evidence to show the interdependent relationship between local environmental activities and party politics.

Introduction of the No.6 Naphtha Cracking Plant Complex.

The No.6 Naphtha Cracking Plant Complex was built by Formosa Petrochemical Corporation. It is a branch of Formosa Plastic Corporation (the Formosa Group as following), the biggest industrial group in Taiwan. Formosa Group was founded in 1954, the smallest PVC plant in the world at that time. Now, it is the largest private enterprise in Taiwan. The group includes Formosa Petrochemical Corporation, and more than 20 other

investments in Taiwan, US (in Point Comfort, TX), China, and Indonesia. After twice changed the site, the project finally settled down successfully in the off-shore industrial zones in Mailiao, Yunlin County.

The project includes building up an oil refinery plant with an annual capacity of 25 million tons of crude oil, naphtha cracking plants for producing 2.94 million tons ethylene per annum, and other petrochemical plants, heavy machinery plants, a co-generation plant, and the Mailiao Industrial Harbor. The total investment in this project was US\$17.7 billion. Now the project has completed and already begun its production. A total of 61 plants were built in a single complex, the entire complex totals 6,432 acres. 3,875 million cubic feet of sand were poured to create land. The total area of reclaimed land is 5,572 acres.

According to the report by Formosa Group, the total annual capacity of the plant complex is about 25 million tons of crude oil. Besides, the naphtha cracking plants produce 2.94 million tons ethylene per annum. In order to eliminate the possible pollutions to the environment and human life, the project adopts the Best Available Control Technology (BACT), which is a pollution control standard mandated by the United States Clean Air Act. When a BACT is determined, factors such as energy consumption, total source emission, regional environmental impact, and economic costs are taken into account. It is the current EPA standard for all polluting sources that fall under the New Source Review guidelines and is determined on a case-by-case basis. The total invested budget for pollution control and prevention is about US\$2.95 billion.

The chronicle

Several important dates and events of the two fire and explosion accidents are put together in the following table.

Table 1 The chronicle of the explosion and fire accident in No.6 Naphtha Cracking Plant Complex

Date	Event
July 7 th , 2010	The first fire.
July 25, 2010	Fire and explosion occurred again in the night.
July 26	Local protesters surrounded the plant.
Date	Event
July 29	Yunlin County Commissioner Su, Chih-Fen led a protest in Taipei.
July 30	The Prime Minister Wu announced that the exploded plant shuts down immediately.
September 2 nd	The compensation agreement was made.

On July 7th 2010, a fire and explosion occurred in the plant. It was the 12th accident occurred in the plant since 2009. At first, the neighbors did not feel so surprised with this accident. They viewed it as a “routine” accident like other 11 ones before. However, when the fire and explosion came again on July 25, the huge fire in the night not only irradiated the sky but also aroused people’s anger and fear. After the plant began to operate, local dwellers have been suffered from inconvenience and property loss caused by the pollution from the plant. Not only the fishing industry but human health have been suffered from the pollution. According to a research report (Liu et al. 2010), the possibility of liver cancer in Mailiao is about double the possibility in other townships in Yunlin County. Thus, the angry dwellers protested around the plant on July 26. They were lead by local politicians and urged that the plant has to be shut down immediately. On July 29, Yunlin County Commissioner Su, Chih-Fen led a protest in Taipei. Local dwellers, politicians and Commissioner Su kneeled down in front of the Executive Yuan,

the highest administrative agency in Taiwan, to protest central government's industrial and environment protection policies. This action soon aroused national wide concern and debate. The next day, after visiting the plant, Prime Minister Den-Yih Wu announced that the exploded plant will shut down immediately and it will not reopen until passing the safety check by central government. On September 2nd, the compensation agreement was made. In the agreement, Formosa Group agreed to offer free health examination operated by Chang Gung Hospital, the largest medical cooperation in Taiwan and it is also a branch of Formosa Group. Besides, NT\$ 250 million first-year compensation will be paid by Formosa Group. Still, all the residents live in Mailiao will receive NT\$ 7,200 per person as annual compensation from the second year. It is interested that after the compensation agreement had been approved and announced, Mailiao becomes the only local area in Yunlin County which has a growth in population. In September, the population has increased 566 than August.

Emergency management system in Taiwan

Located in the East side of Asia, the population in Taiwan was estimated in October 2010 at 23,150,923 (ROCMOI 2010) spread across a total land area of 35,980 km², making it one of the most densely populated country in the world, with a population density of 639.7 people per km². Thus Taiwan is an island with high risks in natural disasters. In 2005, the report entitled "Natural Disaster Hot spots—A Global Risk Analysis" issued by World Bank indicated: "Taiwan might be the most vulnerable to natural hazards on Earth, with 73% of land and population exposed to three or more hazards (Lin 2008)." The five major natural hazards in Taiwan are: typhoon, earthquake, landslide, flood, and debris flow (Lin 2008).

The history of the development of Taiwanese emergency management system can be traced to 1965. After suffering from the 1964 Paiho Earthquake, the government was

forced to create an effective disaster response and recovery mechanism. Thus, the Standard Procedure for Natural Disaster Assistance (SPNDA) was created in 1965 as the guideline of government actions before disasters. The 1999 Chi-Chi earthquake not only caused huge damages and inflicted heavy losses in human life and poverty in Taiwan, but also aroused public concerns about the needs of enhancing the existing emergency management system. After the earthquake, the Disaster Prevention and Response Act (DPRA) was passed by Legislative Yuan, the Congress of Taiwan, and promulgated in 2000. DPRA is the first disaster management related fundamental law in Taiwan, which integrates the management mechanisms for natural and technological disasters and covers all four phases of the disaster management cycle: mitigation, preparedness, response and recovery. The SPNDA was suspended after DPRA was promulgated (Chen et al. 2006). The current emergency management system in Taiwan is shown as figure 1.

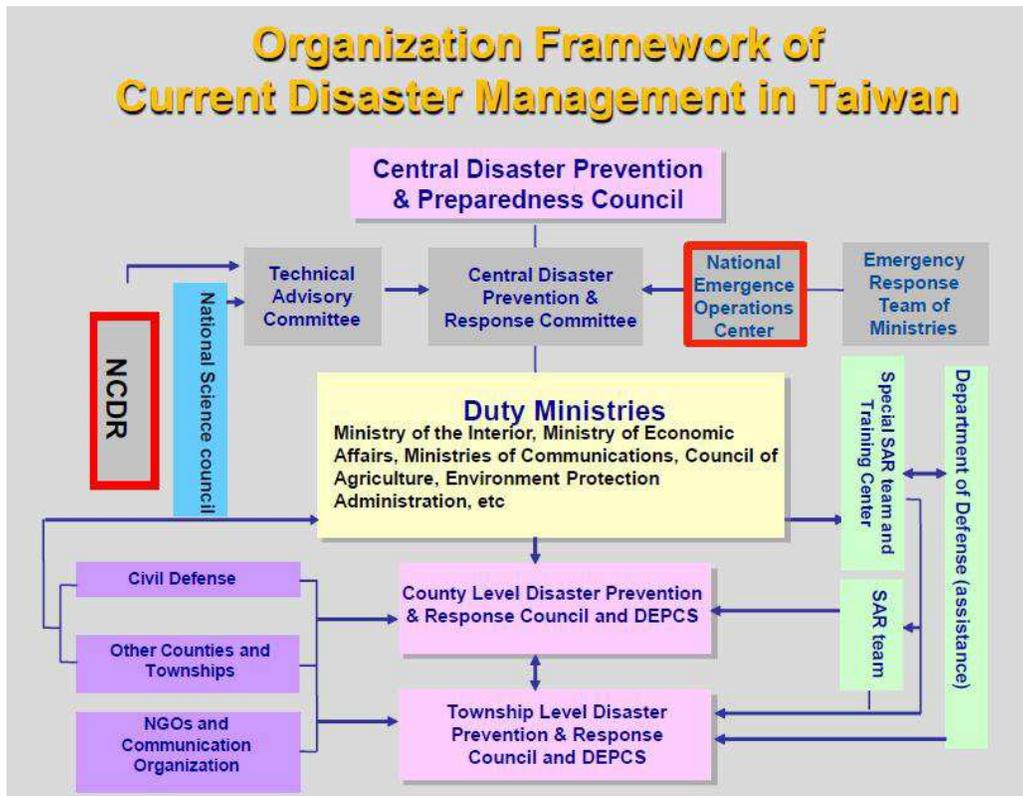


Figure 1. Taiwan Emergency Management System (Lin 2008)

According to DPRA, the current disaster management system consists of four governmental levels: the Central, Municipality, County, and Township. Every level of government is required to establish a DPRC (Disaster Prevention and Response Council). The DPRC is responsible for making and implementing relevant disaster management policies and plans. Since the DPRC itself is a task force style organization, it doesn't take responsibility for policy implementation. The specific agency, Disaster Prevention & Response Communities (DPRCM) under the DPRC, takes charge of overseeing and implementing disaster related policies and plans. During an emergency, each level of government is required to establish a disaster EOC as the command center in disaster front-line. Not only government officials but also armed force, militia corps, non-governmental organizations (NGOs), and community organizations are included in the comprehensive emergency management network (Chen et al. 2006).

When the fire and explosion occurred on 25 August, Yunlin County Government immediately opened EOC as the command center. As the front-line commander, Commissioner Su took charge of directing rescuing actions, coordinating rescuing forces from nearby cities counties, and corresponding with central government for asking a help. At the same time, she also organized local residents to negotiate with Formosa Group and central bureaus to make the compensation commitment and other recovery activities. From this case, we can see the different roles and tasks of local leaders in dealing with disasters. On the one hand, they are commanders to direct rescuing and recovering actions, they communicate with other government agencies, NGOs, civic organizations or individuals, and to coordinate these different forces to make an effective response to the disaster. On the other hand, they may organize local opinions to force the central government taking actions to response or to satisfy their demands. These local leaders could gain benefits and accumulate their political capital at that time. But they may be harmed at the same time if they have poor performances in dealing with disasters. For

example, after the 911 tragedy in 2001, New York City Mayor Rudy Giuliani had been highly praised for his directing. He won extensive support and named as Person of the Year for 2001 by Times magazine and called “America’s Mayor” by Oprah Winfrey and it soon become his global icon. At the same time, Taipei City Mayor Ma, Yin-Jeou and city government officials was been highly criticized for the huge amount of poverty losses caused by Typhoon Nari in September 2001. Thus the role of government leaders is critical in analyzing disasters and emergency management system in Taiwan.

Disaster politics

During the development of democratization before 2000, environmental protest movements have become critical political challenges to KMT’s rule. The KMT regime has become the target of increasing numbers of environmental protests, many of which were supported by elected local officials and opposition parties. Although these local politicians may not necessarily have any common interest with those who suffer from local environmental hazards or disasters, many of them seek to gain visibility and other political capital by helping to organize protests on behalf of local residents (Tang & Tang 1997). In this case, Yunlin County Commissioner Su and her DPP colleagues organized and helped local protesters to express their demand and to negotiate with Formosa Group to make the final commitment. In most of the similar cases in Taiwan, local government leaders and politicians usually bear a burden that they have to win a satisfied compensation from the industry. On the other hand, local government leaders have to take responsibilities for developing local economics. Facing a huge and important industry project like the No.6 Naphtha Cracking Plant Complex, how to make a balance between different preferences has become a dilemma for local government leaders.

Tang (2003) used the concept of “regime” to analyze the urban politics and different attitudes between political and business elites toward public policy issues as follows:

Taiwan's urban politics over the past few decades can be largely described in terms of an urban regime theory supplemented by a sociological understanding of informal exchange networks in the public policy process. By "regime" it refers to a set of informal arrangements that can supplement formal political rules to make and carry out governing decisions. A regime emerges when political elites find themselves seriously constrained by the deficiency in resources to govern the city effectively, and thus seek an alliance with strategically positioned economic elites. In contrast, business elites have a strong interest in maintaining pro-growth public policies because of the financial gain, compelling their alliance with the elected politicians. These allied political and economic elites share the same vision of the city's future in accordance with their own interests and implement that vision forcefully...every city leader has to manage the fragmented sources of political powers in a check-and-balance democratic system and to satisfy the conflicting demands among different sectors of electorates, a unified business elite with their rich resources to satisfy different stakeholders becomes the essential governing partner that different electoral politicians want to ally with.

These arguments explain the central and most of local government officials' basic attitude toward the industry. Local politicians have to appeal to investments as many as possible because these investments could bring huge economic benefits like working opportunities and extra consumptions along with these new coming employees. With the development and prosperity in local areas, the possibility of winning the re-election also grows. Furthermore, if we use a wider view to reexamine the relationship between political and business elites, Tang and Tang (1999) argue that the political system tends to be resistant to some major demands by environmental groups, especially when their

demands conflict with the central government's economic development plans or with vested interests of powerful coalitions between politicians and businesses.

On the other hand, Ho (2003) argues that KMT has taken credits for fostering economic growth in Taiwan from the very beginning and, for remarkably piloting Taiwan safely out of the Asian financial crisis. But KMT also has been criticized with its cronyism with big business persons, local factions, and even organized gangsters. When Taiwanese people were gradually less tolerant of KMT's ruling, this phenomenon caused KMT's fell in the presidential election in 2000. The regime was transferred from KMT to DPP at that time. Nonetheless, with the economic situation got worse and several serious scandals arose from President Chen, Shui-Bian and his family, Taiwanese people made the second democratic turnover in 2008. KMT candidate Ma, Yin-Jeou was elected as the President. After DPP returned to be the opposition party in 2008, their politicians decided to choose environment protection and anti-pollution as one of their core issues to fight against KMT as the past. According to their past experiences, the political fate of the environment protection and fear of pollutions has become tightly bound with the electoral success of DPP in local elections. Since the bad economic performance was the key factor which determined the election result in 2008, KMT leaders obviously view facilitating economic development as more advantageous than other values in their policy agenda. Thus, KMT elites' preferences highly overlap with business elites'.

From the history of democratic development, Taiwanese democracy transition not only opens channels for public opinions, reduces state control power on society and enhance democracy development, but also creates opportunities and incentives for lobbying the government officials. Thus, government policy makers have become more vulnerable to business interests. Although KMT traditionally tends to hold a pro-business and less focus on environmental protection attitude toward economic development policies, but it does not mean that DPP inevitably always stands on the opposite side.

According to Ho (2005), in DPP's ruling era (2000-2008), the poor economy strictly limits policy choices for DPP leaders. Such situation makes DPP government more vulnerable to business interests. The weak state power in DPP regime forces its leaders to make compensations to the environment protection ideals they hold before (winning the Presidential election in 2000). In July, 2001, when the Energy Commission unexpectedly rejected a large-scale investment proposal for a wind-power plant, which had been promoted by DPP leaders and environmentalists for a long time as alternative energy source for replacing the highly debating nuclear power in Taiwan. Such rejection was criticized by environmentalists as DPP government's huge concession to business interests. DPP government also gave green light to several industrial investment projects that may increase threat to local environment. In 2002, DPP government approved an expansion plan for the petroleum refinery plant in Kaoshiung. This plant had been promised by DPP leaders to be removed in 1990. In 2000-2008, even the local DPP politicians may oppose central government's environment policies in order to satisfy local business interests. In 2001, local DPP legislators supported refining business to disobey central government's new policy to remove illegal refining facilities. Local DPP politicians criticized that such policy may worsen the local unemployment problem (Ho 2005).

The concept of "party dependence" refers to the situation where the fate of a social movement is bound to the electoral performance of a certain political party. Dependence means an unsymmetrical relation between these two social organizations (Ho 2003). This idea helps us to analyze the different attitudes between local political elites (such as Commissioner Su), KMT political elites, and business elites (Formosa Group) toward the accident occurred in July 2010. In 1986 and 1990, DPP local leaders (Yilan County Commissioner, Chen, Ding-Nan and Taoyuan County Commissioner, Annette Lu) acted as the leader to oppose the project. As for Su, Chih-Fen, she both acts as the bridge and

the opposition leader. Before the accident, she cooperated with Formosa Group to enhance the living standard in Mailiao and helped local dwellers to oversee the performance of pollution control activities of the plant. When the disaster occurred, according to Disaster Prevention and Protection Act (the constitution of Taiwanese emergency management system), the county government has to bear the burden to act as the responder in the front line. When the fire and explosion occurred on July 25th, Su called Minister of Economic, Shih, Yen-Shiang for help and complained about all the problems she face related to the plant. When she led the protest in Taipei, she also appealed having more financial and human resources to deal with such disasters and hazards in local level. She argued that due to lacking a strong financial base, the county government could not afford to deal with disasters which cause huge damages. Her argument also reflects the major problem within the existing emergency management system in Taiwan: resources asymmetry. At the same time, DPP legislators also criticized the central government that they thought KMT should be responsible for the pollution and property lost result from this accident. At the same time, DPP politicians also urged to reexamine all the economic and environmental protection policies offered by KMT. They argued that the central government's over-intimate business group attitudes and ignoring the value of environment protection are the main cause of this accident. In order to prevent this accident from causing negative political effects, the Prime Minister Wu soon announced that the exploded plant shuts down immediately and it will not reopen until passing the safety check by central government. After several weeks, less and less people discussed about this accident. It is seems that KMT rulers have passed in this accident.

Four stages in disaster management cycle

The US Federal Emergency Management Agency (FEMA 2006) offered a four-stage

(mitigation, preparedness, response, and recovery) emergency management cycle. This cycle begins and ends with mitigation. It is worth to note that these four stages are not mutually exclusive, in other words, there may have some overlaps between different stages within the cycle. For example, public agencies' response after the disaster could be existed both in response and recovery stages. When facing the threat of dam failure due to huge rainfalls, public agencies may evacuate citizens live near the dam and strengthen the dam at the same time. In this research, we will analyze the accident with this four-stage model to see how different actors (local dwellers, local government officials, the industry) response to this accident in different stages. We may find out what should be enhanced in order to have a better performance and preparedness for the next disaster in the future.

1. Mitigation

Mitigation includes any activitie that prevents an emergency, reduces the chance of an emergency happing or lessens the damaging effects of unavoidable emergencies (FEMA 2006; Shaluf 2008). According to Shaluf (2008), disaster can be prevented only if smaller and more common occupational hazards are already under control. Starbuck and Milliken (1988) offered three theories to predict the possibility of disasters in the future. Theory 1 predicts that neither a success nor a failure changes the probability of a subsequent success. Theory 2 predicts that a success makes a subsequent success less likely, and that a failure makes a subsequent success more likely. Theory 3 predicts that a success makes a subsequent success more likely, and that a failure makes a subsequent success less likely. Comparing with Shaluf's argument, it seems that Shaluf holds a similar idea with theory 3. That is: if we can control the smaller hazards successfully in the past, we may make a subsequent success more likely because we have learned how to prevent such hazards from our experiences. In this case, we can find that there has been several disasters occurred before the explosion in July 2010. The past disasters also caused life and property lost

and it seems that the Formosa Group has not learned how to mitigate the loss and lower the possibility of disasters from their past experiences. From this point, this case may offer a good support to theory 3 by Starbuck and Milliken.

2. Preparedness

Preparedness is planning how to respond in case of a disaster. Preparedness within the field of emergency management can best be defined as a state of readiness to respond to a disaster, crisis, or any other type of emergency situation. Preparedness is not only a state of readiness, but also a theme throughout most aspects of emergency management (Shaluf 2008). After the disaster, Yunlin County Government implements several disaster mitigation and preparedness actions in order to eliminate the possibility the possible loss of disasters occurring in the future. For example, Yunlin County Government held a comprehensive disaster rescuing drill on November 19. The technological disasters such as the fire, explosion, and pollutions are the main targets of this drill. The county government incorporates the local fire, police department and armed forces to create a joint disaster management mechanism. However, due to its weak financial base, lacking sufficient facilities and resources to prepare for disasters still limits the county government's performance in emergency management. Hence when facing serious disasters like the accident occurred in July 2010, the county government still has to rely on the help from the central and nearby county governments.

3. Response

Response is an action taken immediately before, during and just after a disaster or major emergency. The goal of the responder is to save lives, minimize property damage and enhance the beginning of recovery from the incident. Recovery is accomplished through some of the following methods: warnings, evacuation, and sheltering (Shaluf 2008). It is north to note that although Yunlin County has made a

SOP (Standard Operation Process) for dealing with serious traffic accidents like air crash and shipwreck, however, there has not had any SOP which dealing with technological disasters so far. Since the county government has realized the importance of having a well-organized emergency management system in dealing with such disasters, it is necessary to enhance their preparedness and response ability by making SOPs as their guidelines of actions. Thus Yunlin County Government should make more SOPs which can be used in different kinds of disasters.

4. Recovery

Recovery is the activity that returns infrastructural systems to minimum operating standards and guides long-term efforts designed to return life to normal or improved levels after a disaster. This is a very daunting phase of emergency management because it requires personnel and community motivation. It is achieved through the following ways: damage assessment, debris removal, and disaster assistance centers (Shaluf 2008). The central government usually bears the responsibility in recovering actions after the disaster. But if the disaster is caused by human actions or errors, the central government will help the local officials to oversee and make sure that the troublemaker has to take the most of responsibilities in recovering. In this case, the Environment Bureau and Ministry of Economic not only oversee the recovery actions from Formosa Group but also help Yunlin County to create monitoring mechanisms that assure the environment will not be harmed by the plant in the future.

Risk perceptions of local people

There are several factors which are viewed as having influence upon local people's risk perceptions. Tierney (1999) mentions the role of mass media in framing perceptions about why disasters and accidents occur. Wildavsky and Dake (1990) offered several theories to explain different extent of risk perceptions among different people. The

economic theory argues that the rich are more willing to take risks stemming from technology because they benefit more and are somehow shielded from adverse consequences. On the other hand, the poor presumably feel just the opposite. The knowledge theory tells us that people perceive technologies to be dangerous because they know them to be dangerous.

Among these arguments, the concept of trust may have a more important affection than other factors. Clarke and Short Jr. (1993) focus on the importance of trust and reliability. They find that organizations, elites and professions are also the main institutional actors who make choices among technologies. Hence the elites act as the main role to make technology policy, people tend to trust them because they have higher professional knowledge to cope with such issues. However, when elites make mistakes which lead to disasters, they will not only lose people's trust but also affect people's attitudes toward risks. In the Mailiao case, the Formosa Group, as the organization with high profession, may easily win people's trust toward their technology and production activities. But when the Formosa Group makes mistakes which cause disasters, it becomes a non-reliable organization. When a professional organization becomes non-reliable, it may refute the assumption of elitism that people rely on elites because elites have higher knowledge and profession to cope with problems well. Furthermore, when an organization, which is the most professional one to deal with a certain issue, loses people's trust, how would people make decisions to deal with that issue? If the Formosa Group becomes a non-reliable organization, would people trust its safety guarantee? In this case, the local dwellers relied on county and central government officials to oversee the production of the plant.

Smith and Marquez's (2000) article analyzes how distrust characterizes both sides in NIMBY syndrome. They find that supporters and opponents of a certain project are quite similar, they both distrust each other. Once a person has decided that a project is

dangerous, he or she will distrust any so-called expert who says otherwise. Hunter and Leyden (1995) argue that both lack of trust in government and fear of health consequences are critical factors which affect risk perceptions among local people in cases relate to NIMBY syndrome. When the No. 6 Naphtha Cracking Project was rejected for the first time in 1986, people in Lizi trusted Commissioner Chen's decision. Although the central government stood in the opposite side, local people choose to trust county government rather than the central not because they thought of county government officials as having more professional knowledge than the central. Especially after the disaster occurred again in July, Mailiao residents obviously choose to trust the county government and DPP politicians instead of Formosa Group. These arguments show the importance of trust in affecting people's risk perceptions.

Conclusion

Failures can motivate engineers and managers to search for new methods and to try to create systems that are less likely to fail, and successes may induce engineers and managers to attempt to fine-tune a sociotechnical system – to render it less redundant, more efficient, more profitable, cheaper, or more versatile (Starbuck and Milliken 1988). For Formosa Group, however, having experiences in suffering from explosions and fire accidents do not help them avoid being harmed from similar accidents. On the other hand, the accident in July 2010 exposed the potential hazards and flaws within the existing emergency management system in local level. Lacking enough financial and human resources is the major obstacle to improve the effectiveness of disaster prevention and rescue activities. Since party politics may have impacts upon people's risk perceptions, it offers the incentive to urge for having a well-organized and effective emergency management network. Learning from the past experience is a good way to improve our living standard and having a better life. To what extent could we eliminate the possible

loss and damage caused by technological accidents rely on to what extent could we learn from our experiences. The fire and explosion accidents in No.6 Naphtha Cracking Plant Complex could be a good case to tell us how we can improve the efficiency of Taiwanese emergency management system by finding out the potential problems and threats within. It also shows us that the contradiction between economic development and environment policies has become the major issue in Taiwanese public policy debates. How to make a balance between different preferences among elites, citizens, community groups, and other factors has become a critical question both in politics area and public administration research field.

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