Glocalized Dioxin – Regulatory Science and Public Trust in a Double Risk Society

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Abstract: This article probes into risk events that occurred in Taiwanese society between 2004 and 2005, including dioxin contamination in baby formula, ducks and duck eggs. It critically discusses the special risk governance structure, public risk perception and trust in newly industrializing countries. In particular, through discourse analysis, the author points out that historically, technocrats have shown authoritative attitudes when regulating different risk events. The author also analyzes how the delayed and hidden risk governance structure alters public perception and systematically destroys public trust in regulators' risk governance.

1. Problem identification

From the 1990s, occurrences of dioxin contamination in food have appeared in an apparently endless stream. For instance, in 1997, animal feed in Belgium, France, German and Austria was found to be contaminated with dioxin. Serious political dispute surrounded the issue. In June 1999, an instance of dioxin contamination in meat and milk occurred in Belgium. In March 2005, French baby formula was suspected of being contaminated by dioxin, and in March 2006, Dutch pork was found to be contaminated by dioxin. As Taiwan is an importer of these products, the above have all had a degree of impact on Taiwanese society.

Taiwan, as a newly industrializing country in East Asia, has experienced an authoritative socio-political history in the Cold War era, and thus has its own special risk governance problems in terms of regulatory science, which deserves in-depth discussion. By focusing on the issue of dioxin contamination in milk, and duck meat and eggs in Taiwan in 2004 and 2005, this article aims to discuss the phenomenon of technocrats' risk assessment in terms of positivistic regulatory science, which hides and delays risk and ignores risk communication. Also, through the results of national telephone surveys, the author analyzes problems of public trust and risk perception in response to the special risk governance.

2. Theoretical and analytical framework

2.1 Regulatory science and culture

Since ecological, health, social and ethical risk threats have become trans-boundary, technocrat-monopolized policy decision-making mechanisms are facing governance dilemmas. In the past, technocrats traditionally emphasized that positive scientific evidence for risk assessment and governance of health, ecology, and food contamination issues was the fundamental basis for policy decision-making. Technocrats also believed that technological assessments should be done based on objective and neutral scientific rationality to ensure the existence of risk and its effects. Thus, social values and political inventions of nonscientific rationality were excluded (Wynne 1980; Rutgers / Mentzel 1999). From another perspective, this is the character of contemporary „regulatory science" – through the scientific consultation mechanism, technocrats apply mainstream and sound science as the foundation of policy-making to conduct risk regulation (Jasanoff 1990). However, these positivistic risk assessment viewpoints of regulatory science have had adverse impacts and suffered mismanagement. For example, the British government's handling of BSE risk and the Seveso incident in Italy are all being challenged on grounds of legitimacy.

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Another problem of regulatory science is that while supporting risk policy decision with positivistic scientific assessment, it is often necessary to set risk tolerance standards. This is the dilemma of narrow, positivistic scientific rationality, as proposed by Beck (1986, 1993). We live with much pollution, considering national regulation of toxic materials; yet the government ironically assures us that everyday exposure to „low" levels of toxic materials does no harm to human health. Additionally, experts in different sectors (including governmental agencies and scientific consultation commissioners) have disputes on single risk events. Disputes between experts also reveal scientific uncertainty (Schwarz / Thompson 1990). However, for ease of regulation and management, technocrats often ignore the uncertainties and directly deem positivistic knowledge as the foundation of regulation. They are fully confident that scientific inspection, tracking and management are the sole instrument in dealing with contemporary uncertainties. Such an attitude makes risk regulation a matter that gives priority to science and shows severe and objective positivism. Under these circumstances, analysis of the following cases showed that regulatory culture is rather inclined to „hard science" (Jasanoff 1990).

From another perspective, such limited regulatory culture, which also ignores scientific uncertainty, in fact usually underestimates the complexity of risk, delaying and hiding risk threats, which results in public distrust and dissatisfaction in state's risk governance capability. Yet, „ignorance" (Nicht-Wissen) is the core of contemporary risk problems (Beck 1986). In a society with highly-developed, complex technologies, more transparent and open social leaning and reflection are required. Ignorance makes public panic and discontent. However, technocrats and their narrow scientific rationality have a monopoly on risk knowledge, and this broadens the gap between science and society and shapes public trust and risk perception.

2.2 Risk governance and regulatory culture in newly industrializing countries

Newly industrializing countries have their own particularities in terms of risk governance and regulation, especially in the face of fierce global technological competition. Like all countries of the world, they shoulder the threats and pressures of technological risks. Further, the metaempirical goal of learning and tracing development trends in Western industrialized countries results in a mentality that puts economic and technological competition ahead of risk governance. On the other hand, in recent decades, emerging industries have rapidly forced high technology onto societies. However, unstifled criticism and a watch-dog attitude have not developed within society.[1] Such a contradictory phenomenon partially reveals the theory of the development state, one which argues that government authority directs and manipulates the outlook of national technological and economic development (Evans 1995; Weiss 1998).

We need to deliberate on the relationship between the long-term authoritative historical and political backgrounds and mainstream regulatory science. That is the „selective affinity" between them and how it manifests in terms of technocrats' risk policy-making. Taiwan experienced an authoritarian rule during the Cold War era. From the 1970s, technological expertise dominated policy-making and formulation, and became institutionalized. On the

1) For in-depth analysis, please refer to Chou's (2002, 2004) articles. Moreover, in newly industrializing countries, the tension and systemic gap between technology and society has caused greater problems regarding public trust and risk governance. For example, the South Korean researcher Dr. Huang Woo-suk faked scientific numbers and breached scientific ethics. What caused ethical disputes was the issue of female personnel in his research team donating their eggs to his research. However, because of the strong nationalist feeling in South Korean society, most Koreans viewed Dr. Huang as a national hero (The Guardian Newspaper, 2006). Please refer to analysis of Chou (2005).

other hand, although Taiwan democratized at the end of the 1980s, the Taiwanese government still relied on the expertise-oriented scientific consultation model inherited from the West. Thus, authoritarian expert politics maintained its position controlling policy-making and governance. This history shows how authoritative political tradition and positivistic regulatory science have been embedded in society, allowing technocrats to hold relative autonomy to execute authoritative policy-making and control discourses of risk regulation.

Chou's (2005, 2007) research in risk governance and communication of GMOs, SARS and the Taiwan Biomedtech Island Project discovered that due to the „selective affinity" between authoritative ruling and regulatory science, Taiwan's risk regulators emphasize the spirit and model of scientific positivism to a certain degree. Also, technocrats get used to manipulating evidence-based scientific risk assessment as the foundation of judgement. They also assert that resolution and prevention of scientific problem should be dealt with by scientific logic. Thus, they ignore other dimensions such as the social, ethical and legal. Such a regulatory culture not only results in risk uncertainty, it also causes hidden and delayed risk governance, inadvertently causing „public unawareness" to risks. This is why the government's slow and ineffective risk governance has encountered strong public criticism. This illustrates the particularity of risk governance in newly industrializing countries – an authoritative regime of regulatory science perpetually hides risks and breeds ignorance, causing public anxiety.

2.3 Ignorance shapes risk perception

We need to examine how ignorance shapes public risk perception, and how it causes public distrust. Slovic (2000a, 2000b) points out the „asymmetry principle"; that is, the public trust is rather vulnerable and easily destroyed in response to technological risks. In many cases, we see that public distrust is developed faster than trust.

When dealing with risk events, if technocrats, trapped in the viewpoint of positivism and „sound science", totally ignore the impact scientific uncertainty and risk communication has on the public, public antipathy develops. The public considers official aggrandizing of serious objective scientific evidence as the basis of risk policy-making "trash science" (Edmond / Mercer 1998). That is, how technocrats ignoring risk uncertainty and showing inclination to positivistic and empirical scientific judgment results in a lack of interaction and multilateral risk communication.

To reflect the problems of the authoritative regulatory regime of newly industrializing societies, risk communication is critical. Not only is scientific uncertainty ignored (this is rationalized as being more effective and emphasizing economic development); risk governance delays knowledge of and conceals risks. This distorts the process of risk communication, causing „system gaps" and weakening public trust (Chou 2002). This cyclical process can cause serious public anxiety and distrust.

2.4 Analytical framework

Using the above theoretical frameworks, this research focuses on risk regulation and governance in newly industrializing country and public perception and trust under these structures. For the risk regulation and governance, the author analyzes regulators' (technocrats') viewpoints on risk assessment and communication at the occurrence of an event through discourse analysis. Mainly, „symbolic viewpoints" and „narrative materials" were collected to identify the problems in the risk regulation model. As the major actors of risk regulation, technocrats hold the power to control mainstream discourses on risk events. Whether for follow-up, investigation or statistics, technocrats possess more risk knowledge and systemati-

cally carry out systematic governance measures (Lipton 1999; Ericson / Haggerty 1997). The discourses of technocrats reveal the particularity of regulatory science and the authoritative culture. At the same time, by studying the development of instances of dioxin contamination, the author analyzes how technocrats respond to criticisms from social movement groups and the public. Under these contexts, we clearly see how technocrats' attitudes shape a governance culture of uncertainties (Wynne / Dressel 2001) and symbolically become the over-riding characteristic of risk regulation in newly industrializing country.

In facing the culture of governing regulatory science, the author observes what kinds of risk perception and trust are formed. Attention is particularly given to pubic risk perception and trust formed by the arousal of political and social movement groups in a structure of hidden and delayed risk governance. The author undertook national telephone surveys to study public opinions on state's risk governance capability, to systematically understand public risk perception, and to discuss the problem of public trust and risk governance in newly industrializing country.

3. Storyline of risk events and governance

Below are several dioxin contamination risk events for analyzing risk governance problems in newly industrializing country. Viewpoints of risk assessment and risk communication from technocrats in different sectors are studied to know how regulatory science is operated, so as to further reveal how it is governed in the authoritative historical background, and how technocrats become strongly inclined to positivism in conducting risk regulation.

3.1 Story one: dioxin contamination in milk

Risk disputes spread along with the deeds and delayed communication of regulators. On April 13th 2004, the Department of Health (hereafter DOH) announced that dioxin levels in all food in Taiwan for the past year conformed to WHO standards. However, stories ran in the China Times Express on May 17th and in the Apple Daily on May 18th about the surprising news that the DOH had concealed the fact that three samples of milk (produced by two different brands) contained excessive levels of dioxin. These news caused public panic and a slowdown in sales of all milk products in supermarkets. On May 24th 2004, Legislator JaoYung-ching and the Environmental Quality Protection Foundation (hereafter EQPF) held a press conference. They requested the DOH to identify the brands of milk that were tested with excessive dioxin levels. However, their request was rejected. Further, politicalization of risk dispute becomes even serious. Facing the pressure of social movement groups and the public, DOH was still unwilling to publicize examination details. Even, Director Chen Luhon of the Bureau of Food Sanitation argues that from the viewpoint of scientific assessment, there is no food safety problem. On TV Media, he also stressed:

> Although the examination value is higher than regulated, they are all within the range of WHO regulation (Hong / Liao 2005).

However, surveys done by environmental protection groups showed that not only did some of milk products have excessive dioxin levels, but one goose sample and two chicken samples all had excessive dioxin levels based on EU standards. This caused strong criticism from environmental protection groups. Environmental protection groups such as the Green Formosa Front, the Green Citizens' Action Alliance, the Taiwan Watch Institute, and the EQPF strongly criticized DOH reports, which only argued that the general average of the inspection was lower than the highest tolerable level of EU standards rather than notifying which milk samples contained abnormally excessive dioxin levels. The DOH tried to „pretend that everything was going well" (Lin 2004). At 6 p.m. on May 25th 2004, under great pressure from environmental protection groups, the DOH announced that milk products of

two brands were over 3 pg I-TEQ / kg-bw / day as regulated by the EU. This event stimulated environmental movement groups to request the government to establish strict dioxin standards for food. They also declaimed against the government intentionally concealing the truth and breaching the consumers' right to know. In fact, the reasons that the DOH refused to notify the public included protecting the suppliers and their stance of adopting narrow risk assessment. When interviewed by TV media, Director Chen of the Bureau of Food Sanitation said:

> Dioxins are everywhere in our living environment. They are in all kinds of food we eat, but in different levels. This is a normal situation (TVBS News 2004).

Obviously, from these statements, it can be seen that DOH officials viewed risk communication from the obstinate perspective of positive risk assessment. And, ironically, it was deemed that there is no harm for the public with exposure to „normal" or „low" dioxin contamination in daily life.

3.2 Story two: salmonella contamination in baby formula

On March 24th 2005, Celia baby formula (imported from France) was suspected of being contaminated with salmonella. After La France à Taiwan had urgently informed the DOH, they had immediately requested the suppliers to remove some milk products from supermarket shelves. However, this information was not released until the evening of April 18th 2005. This caused fierce protests from consumers and great public fear. In addition to the media's wide reporting and critical comments regarding this issue, the Consumers' Foundation also strongly attacked the DOH for deceiving the public and delaying the release of risk information. Obviously, such deeds meant that officials ignored the public's right to know in safeguarding their health. As Central News Agency reported, Director Chen of the Bureau of Food Sanitation explained:

> The reason of why we delayed in informing the public was that we were actively investigating contaminated brands and products. We did not want to cause unnecessary fears. We are certain that our measures in dealing with this issue were beyond question (Lin 2005).

However, under great pressure from a consensus of consumer groups, the Executive Yuan, DOH, and BFS apologized to the public on April 19th 2005. They said reflections should be made about better risk communication (Chen et al. 2005a). Up to this point, the gap between the above fragments of issue development occurred because technocrats still deeply believed that scientific risk assessment and professionalism was superior to risk communication. As China Evening reported, Director of Bureau of Food Sanitation apologized to the public and announced:

> DOH will take administrative responsibilities. If the public grades us 80 points then there is 20 left for us to work on (Chen et al. 2005b).

His attitudes showed DOH's deficiencies in risk communication. Also, it seemed he implied that DOH had done enough as a regulator. However, DOH ignored what consumers' required – information transparency and communication. More, during the disputes of this case, the vice minister of the DOH continued to emphasize the spirit of scientific risk assessment and tried to legitimize their actions. Instead, he put little concentration on risk communication. With such attitudes of hard science, he indicated:

> From existing information and risk assessment, the DOH's actions were not improper (Lin 2005).
>
> Balanced information access and scientific risk assessment were elements of professional considerations (Chen et al. 2005b).

Overall, the issue of salmonella contamination in French baby formula also involved a risk governance culture with hidden risk information and delayed risk communication. The logic

embedded in such contexts was that technocrats were still accustomed to applying traditional risk assessment models as the foundation for professional judgment. They ignored the fact that risk communication is equally important.

From governance disputes on these two food risk issues, we can see that, compared to the public, technocrats held different thoughts on the importance of risk assessment and risk communication. Technocrats tended to apply risk assessment and positive scientific evidence to form reaction strategies. What is paradoxical is that positive evidence and investigation are usually only used as reference. Accordingly public risk perception and possible reactions are ignored. The public values the transparency of risk information and considers risk perception and risk identification priorities. That is, there are essential risk communication gaps between the public and technocrats.

3.3 Story Three: dioxin polluted duck eggs

On June 11th 2005, following the previously mentioned food risk disputes, the media unmasked another case where the DOH delayed and concealed risk information. As news of dioxin contamination in ducks and duck eggs made national headlines in the following days, fear and criticism arose from the public and consumer groups. In addition, since the origin and evidence of pollution were not certain, it was believed that the problem had been there for a long time.

In February 2005, when the DOH carried out selective inspections in supermarkets, they found that duck eggs from Siansi Township (Chunghua County, Taiwan) contained excessive dioxin levels. They immediately destroyed these toxic duck eggs and closed duck farms, but did not release this information. However, in June 2005, the DOH found contaminated duck eggs had entered the market and the secret thus became public. After exposure of this news, in addition to receiving wide coverage highlighting the adverse health effects dioxin may pose to humans, the media and social movement groups also successively criticized government practices as very improper.

However, as people suspected that the government concealed the truth, on United Daily, the Council of Agriculture (hereafter COA) insisted:

> Since pollution origin is not ascertained, hastily announcing the information will cause public fear (He et al. 2005).

Meanwhile, the director of the Bureau of Food Sanitation denied that the DOH had concealed the truth. He said that based on professionalism, the priority was to stop dioxin contaminated duck eggs from entering the market and to destroy them the very first time. On Epochtimes, he also emphasized:

> Discovering problems is for solving problems, not for raising meaningless public panic. DOH did not want to conceal the information. According to a past experience, even one milk company closed for higher dioxin tolerance standard. Thus, DOH decided to destroy all duck and duck eggs before informing the public (Chen 2005).

However, the media still suspected that the DOH, COA, and Environmental Protection Administration (hereafter EPA) had known the inspection results as early as four months ago and that they had concealed the news and secretly bought back then destroyed and slaughtered contaminated ducks and duck eggs. The Consumers' Foundation condemned the DOH, COA, and EPA for „making a joke of the health of the public" (ibid.). Moreover, evidence showed that the pollutants came from dense smog with greatly excessive dioxin levels emitted by the Taiwan Steel Union Company (hereafter TSU). However, since the EPA and COA lacked clear scientific evidence, confirmation of the pollutant still cannot be made public (Lin 2005a).

3.4 Story four: regulatory science and high pollution industries

The issue of dioxin contamination in duck eggs raises another wave of concerns in information concealment and risk assessment instrumentalization. Subsequently, another secret of instrumentalized scientific risk assessment and hidden information broke out when it emerged that Taiwan Steel Union Company, which emitted dense smog with greatly excessive dioxin levels, had been operating since 2001. July 2003 was the first time that the EPA found dioxin emissions from TSU to be 150 ng-TEQ / Nm^3, which was hundreds of times in excess of the EU standard (0.4 ng-TEQ / Nm^3). In February 2005, a reading of 282 ng-TEQ / Nm^3 was found. However, since there was no regulated national dioxin emission standard, TSU only received a ticket from the EPA. It was not until the issue outbreak of dioxin contaminated duck eggs that the TSU was forced to officially shut down in June 2005 (ibid.).

It was because the TSU is one of the resource industries of the „Challenging 2008 – National Development Projects", which are promoted by Taiwan government. China Times reported that the Director of Industrial Development Bureau said:

> If TSU closed, slag from all factories will be no place to go. Thus, TSU shutdown will cause serious problems (Lin 2006).

It was feared that serious consequences would result from the shutdown due to TSU being categorized as a state-promoted resource industry, and it was also part of a subproject titled Challenging 2008 National Development Project (Lin 2006).

Greenpeace Taiwan trumpeted criticism that the environmental evaluation of TSU was faked. They questioned „how can this kind of industry survive?" and proposed the following:

> Early in 2003, EPA found that TSU emitted over 150 ng-TEQ / Nm^3 and twice required them to improve. TSU was fined third times for excessive emission and improper outdoor storage. This means that Siansi Township has been polluted for over two years. EPA did not regulate TSU when it was established. After TSU operated, EPA made no warning after pollution caused" (Lee / Lin 2005).

As the EPA urgently enforced dioxin emission regulations, in October 2005, TSU finished a self-inspection on dioxin emission standards in January 2006. At that time, the dioxin emission quantity had been reduced from 251 ng-TEQ / Nm^3 to 1.73 ng-TEQ / Nm^3. On August 12th 2006, the EPA announced that dioxin emissions from TSU had achieved the strictest regulatory standard of 0.4 ng-TEQ / Nm^3. That is to say, the great drop of dioxin emission quantity during this period was due to the laissez-faire attitude towards risk governance and long-term concealment of risk information. Inspection and assessment of pollution had no practical function for risk governance. It was until risk outbreak that legal regulation was enforced. Coincidentally, such a hidden and delayed risk governance process conformed to the severe criticism by Environmental Quality Protection Foundation:

> The average dioxin emission quantity of 150 ng-TEQ / Nm^3 was 375 times higher than the newly enforced standard 0.4 ng-TEQ / Nm^3 (Lin 2005b).

The whole issue reveals that technocrats maintain the authoritative logic of developmental state and they hold the attitude of „valuing economic development and ignoring risks". Under the contexts of strong statism and valuing industrial development, they concealed risk information and delay risk governance. For now, they faced strong criticism and challenge by the society.

3.5 Story five: the second dioxin contamination issue

Scientific uncertainty was involved as well in the issue outbreak of dioxin contaminated duck eggs in June 2005. Duck farmers not only denounced the EPA for maintaining silence for two years, they also requested the government to release the truth (Jiang 2005). The EPA and COA passed the buck regarding the responsibility of solving the problem of dioxin con-

tamination in duck eggs (Wang 2005). On August 16th 2005, the COA, EPA, and DOH held a joint press conference. However when the EPA indicated that the pollutant of dioxin contamination might be animal feeds, the COA immediately contradicted this statement. The COA believed there to be no problem with animal feeds, and that the pollutant might be toxic combined ash emitted by TSU.

After issue outbreak, the COA, EPA, and DOH decided to strengthen communication mechanisms. They planned to hold regular meetings on food safety issues and to establish a cross-department Crisis Management Team. Yet, while the risk outbreak in June was still under investigation, Legislator Ting Shou-chung announced that on September 27th 2005 dioxin contamination in ducks and duck eggs was found again in the neighboring Sengkang Township (Chunghua County). His interrogation showed that governmental agencies had already known the results of the inspection on August 18th 2005, but they continued concealing the information. They did not notify and warn the public immediately. Thus, another wave of consumer fear and criticism from social movement groups occurred (Chen / Cao 2005).

Since this was the second issue outbreak of dioxin contamination in ducks and duck eggs, it made headlines and full page news reports appeared in all major newspapers and other paper media in Taiwan. The main emphasis of this criticism included the following. When EPA tests found dioxin contamination in food, they did not send official communication forms to the COA for immediately carrying out collective measures. Thus, during this period, contaminated ducks had entered the markets with nearly 3,000 ducks being sold. Also, nearly ten thousand contaminated duck eggs were preparing to be manufactured (Chen et al. 2005b). In reality, dioxin contamination in food was found or tested for by technocrats in August. However, the EPA did not immediately release the explanation of the uncertainty of risk assessment. The director of the Department of Air Quality Protection and Noise Control (of the EPA) indicated:

> DOH is serious in handling this issue. The problem is that it is complicated to figure out pollution origins, thus we need to collect scientific evidences. This is why we didn't announce the information immediately (ibid.).

That is, technocrats deemed cautious scientific risk assessment and evidence to be the fundamental basis of policy decision-making. However, such a concept may delay initial risk communication to the public from concerns of causing serious social fear. Eventually, similar consequences occurred with the minister of the EPA admitting his fault and to apologize.

In respond to pubic fear and criticisms, from the viewpoint of scientific safety standard, as Epochtimes reported, Director of Bureau of Food Sanitation said:

> According to WHO standard, tolerance intake for a person per month is 70pg / kg. That is, for a 60kg adult, the tolerance intake for him / her is 4,200pg / month, which means there will be no problem for an adult to eat 12 ducks in a month. To converse into the number of duck eggs, if one eats 70 duck eggs with 10pg dioxin, then he / her exceeds the level regulated by WHO (Epochtimes 2005).

But, the next day, after criticisms, Director Chen changed his statements and said:

> Dioxin is in not only duck and duck eggs, but other food. Therefore, better not to eat more than 7 ducks / 40 duck eggs per month (ibid.).

What contradictory was that, from the view of scientific safety, even regulators have different interpretation – one COA commissioner said that if he were the director of DOH, he would call upon the public not to eat ducks and duck eggs for these two days (ibid.).

3.6 Reflective discussion

In observing the risk events above (see Table 1), we can see that along with wide reporting and follow-up by the media, the emphasis of social sectors has been changed from a hidden and delayed risk culture to continuous scrutiny and criticism of social movement groups. Accordingly, the public displayed high risk perception and awareness, and started to get rid of the structural gaps of delayed development in the social system. However, conversely, as social sectors became aware of risks, technocrats who dominated national risk governance were still being limited within old ideologies of regulatory science, so as to produce institutional gaps between risk assessment and risk communication. No matter whether it was technocrats of the EPA, DOH, or COA, they all dealt with these successive risk events by applying the model of delayed regulation and risk communication. In addition, basic discourses after issues outbreak mainly emphasized that for protecting consumers to be free from fear, uncertain pollutants and pollution origins will be investigated thoroughly in order to propose precise evidence and results of risk assessment. In other words, consumers can be free from fear through severe risk assessment and scientific evidence – this is still the favorite risk governance model by technocrats. However, comparing reactions of social sectors to those of technocrats, the latter seemed to play the role which continuously produced systemic gaps in terms of hidden and delayed governance model, regulatory institution, and risk communication. From the 1990s on, in EU societies, BSE and GMO disputes have aroused social concern amongst consumer groups. However, in comparison with Taiwanese society, related risk perception on food risks just started to develop around 2005. That is, only recently globalization of food safety and risk, and risk perception in newly industrializing countries has been increased. Maybe this is another developmental stage characterized by a later-comer and technological learning society. Most important of all, how newly industrializing countries gradually get rid of hidden, delayed, and ignorant risk culture / structures. This new development, which pushes forward the need of paradigm shift in terms of risk governance for emerging technologies, goes hand in hand with the creation of high tension between national technocrats and the public.

On the one hand, such structural tension results in requests by the public for transparent and open information and public participation. On the other hand, professional authority and black-box operation is insisted by technocrats, which usually result in another wave of risk debates. What is worthy of further analysis is how such a structurally hidden and delayed risk culture would challenge public trust. Moreover, concerning previous analysis, as the public becomes rather sensitive and suspicious in response to risk information, the so-called asymmetry principle highlights the reason for public trust loss in a disadvantageous structural environment. Based on this hypothesis, we further analyze the problem of public trust in risk disputes and risk governance.

Table 1: Comparisons of Risk Issue Developments

Time	**Issue**	**Governmental Agency**	**Civil Society**	**Media**	**Public Reaction**
June 1999	**Dioxin contamination in Belgian milk and dairy products**	DOH official admitted that they had limited knowledge about dioxin levels in food.	Consumers' Foundation appealed to government to check products thoroughly and the suppliers should ensure products are not contaminated.	Wide coverage & strong criticism	General public fear

Time	Issue	Governmental Agency	Civil Society	Media	Public Reaction
July 2004	**Disputes resulted from DOH's inspection of milk**	DOH did not notify the public that Tunghai and Uni-President milk had excessive dioxin levels. Public fear and criticism arose.	Environmental protection groups criticized the snails pace of the government's progress in establishing dioxin standards in food and raw materials. Consumer groups criticized DOH for trying to conceal risk information.	Wide coverage & strong criticism	General public fear
March 2005	**Salmonella contamination in French baby formula**	On March 24th 2005 DOH knew imported French baby formula was suspected of being contaminated with salmonella. However, DOH delayed informing consumers until a press release on April 18th 2005.	Consumers' Foundation strongly criticized the government of concealing risk information. CF also appealed DOH to actively release information to consumers instead of concealing. And, an emergent risk communication mechanism should be established as well.	Wide coverage & strong criticism (from CF and legislators)	Frightened consumers denounced DOH for concealing the truth and delaying to inform the public.
June 2005	**Dioxin contamination in duck eggs (Siansi Township)**	In February 2005, duck eggs in supermarkets were tested, and found to be contaminated with dioxin. DOH forced to remove toxic duck eggs from shelves. From March 2005 on, toxic duck eggs were destroyed and duck farms were closed in turn. After four months, the public was notified the public of the issue on June 10th 2005. Outsiders suspected that the government concealed the truth.	Consumer groups criticized the government for delaying risk communication. Environmental protection groups fiercely criticized the DOH for being irresponsible, intentionally concealing risk information, ignoring public health, and trying to pretend that everything was going well.	Wide coverage and strong criticism	General public fear

Time	Issue	Governmental Agency	Civil Society	Media	Public Reaction
June 2005	**Excessive dioxin emission of TSU**	In 2003, the Environmental Protection Administration (hereafter EPA) found that the dioxin emission quantity of TSU exceeded 150 ng-TEQ / Nm3. However, due to delayed regulations, it was not until 2005 that dioxin emission standards were set and put into effect.	Environmental protection groups widely criticized the government for being lax about the existence of highly-polluted industry and delayed risk regulation. EQPF indicated that the average emission quantity of TSU was as high as 150 ng-TEQ / Nm3. This meant that Siansi Township has been suffering the dioxin emission standard which is 375 times higher than that of the EU (0.4 ng-TEQ / Nm3).	Wide coverage and strong criticism	General public fear
September 2005	**Dioxin contamination in duck eggs (Shenkang Township)**	EPA had tested excessive levels of dioxin emissions in August 2005 but no preventive measures were adopted. On September 27th 2005, Legislator Ting unmasked this secret. EPA thus urgently sent an official communication form to COA for carrying out joint measures.	Social movement groups fiercely criticized the government for delaying and hiding risk information again.	Wide coverage and strong criticism	General public fear

4. System destroys public trust

Based on above issue contexts, the author conducted a national-wide telephone survey in November 2005.[2] The main purpose was to analyze public opinion on risk regulation and governance measures of technocrats, with a special focus on risk communication and public trust. Hence, the questionnaire design was based on the development contexts of related issues. Major emphasis was placed on public trust and public recognition on risk communication and risk assessment models of technocrats. Meanwhile, based on this foundation, the questionnaire also tested public trust in the risk governance capacity of the state and public perception towards food safety issues in Taiwan.

2) The national telephone survey was done during the period from November 2nd 2005 to November 16th 2005 by the Center for Survey Research, Academia Sinica. Subjects included citizens aged over 18. The survey fields including the island of Taiwan, Kinmen, Matsu, and the Pescadores. Computer-Assisted Telephone Interviewing (ACTI) was utilized for data collection. The sampling method was stratified systematic sampling. A total of 924 valid samples were collected with a confidence level of 95 %. The standard error was ±3.29 %, with 14.80 % completion rate and 35.59 rejections. Average time for finishing a complete questionnaire was 16 minutes and eleven seconds.

4.1 Toxic baby formula (salmonella contamination in French baby formula)

In March 2005, France and the WHO urgently informed the DOH (of Taiwan) that imported baby formula was suspected of contamination. However, in order to carefully investigate and evaluate the whole issue, the DOH notified the public nearly three weeks after risk outbreak. This action raised strong public opinion and criticism from consumer groups. Although the DOH apologized afterwards, the key is that technocrats insisted that only after cautious scientific investigation and assessment was done could risk information be released to the public.

In the survey, only 15.1 % of the respondents agreed with the following statement: „After knowing imported baby formula was suspected of being contaminated by salmonella in March 2005, the DOH immediately requested suppliers to remove contaminated baby formula from shelves. However, the DOH only notified the public after three weeks of issue outbreak." As many as 70 % of the respondents disagreed with the statement. Moreover, 42 % of the respondents strongly disagreed.

Based on scientific risk assessment dominated by technocrats, respondents were given the following statement: „The reason why the DOH delayed informing the public was because they had to clearly verify the name of the company and product variety." Only 32.4 % of the respondents agreed with this statement and 29.4 % disagreed, with 34.1 % strongly disagreeing. In total, 63.5 % of the respondents disagreed with this statement.

Further, for the statement: „DOH's actions of dealing with the issue of toxic baby formula were not in accordance with the principle of openness and transparency." 55.4 % of the respondents agreed with this statement, while 35.2 % held the opposite opinion.

That is to say, the reactions of the majority of the public are that transparent and speedy communication and notification mechanisms are essential for governing serious food risk events. The superiority of risk assessment was rejected. Meanwhile, the public is worried about technocrats concealing related risk information and delaying to inform the public.

4.2 Dioxin contamination in duck eggs and ducks (Siansi and Shenkang Townships)

In 2005, risk events of dioxin contamination in duck eggs and ducks broke out in Chang-hua County (Siansi Township – June 11th; Shenkang Township – September 27th). The DOH and EPA successively delayed and concealed related risk information. Although these two homogeneous risk events happened one after another, technocrats adopted traditional scientific and closed risk assessment models. Risk communication was done based on this foundation. The whole process started after media exposure of risk issues and was passive and dispirited.

Following is an analysis of risk communication models on the above risk issues. Technocrats usually adopt the model of risk communication after risk assessment. Based on this model, survey participants were asked to respond to the following statement: „The DOH said the reason why they destroyed toxic duck eggs first and informed the public later was because they wanted to reduce public fear." Only 28.3 % of the respondents agreed with this statement, 30 % disagreed, while 38.2 % strongly disagreed. In total, 70 % of the respondents disagreed with this statement.

For the statement: „People said that the reason the government delayed notifying the public risk information was because they required complete professional assessments." 38.2 % of the respondents agreed with this statement, while 57.1% disagreed.

In terms of the degree of risk communication, we asked: „People said that the DOH had done their duty and fulfilled their responsibilities to explain the situation to the public." 29.9 % of the respondents agreed with this statement, while 36.6 % and 28.5 % disagreed

and strongly disagreed respectively. That is, in total, 65.1 % of the respondents disagreed with this statement.

The above three questions show that the public was in considerable disagreement with the traditional risk governance model of technocrats in dealing with risk issues of dioxin contamination in ducks and duck eggs (which deemed risk information notification and risk communication as trivial and narrow scientific risk assessment to be the priority). Thus, public trust in professional risk assessments done by technocrats was reduced.

In light of these two risk issues of dioxin contamination in ducks and duck eggs, the director of the Bureau of Food Sanitation openly announced safety standards of eating ducks.

Concerning statements on food safety standards, we asked: „The DOH indicated that one person will be safe if he / she eats no more than 12 ducks in a month or 27 duck eggs in one day." Only 26.9 % of the respondents trusted this statement. The number of respondents who distrusted and strongly distrusted this statement was as high as 36.7 % and 31.2 % respectively. In total, nearly 70 % of the respondents distrusted this statement. Thus, it is concluded that past models of delayed and hidden risk communication provided a weaker and more sensitive asymmetrical basis of trust. Within this structure, safety discourses on technocrat-dominated scientific risk assessment have found it even more difficult to regain public trust. In particular, since previous delayed and hidden risk communication was based on professional scientific risk assessment, this resulted in severe social criticism.

Overall, from survey analysis on public risk communication, it is showed that risk assessment and risk communication models dominated by technocrats had lost their legitimacy. In detailed analysis, the scientific authority of technocrats had been under fierce criticism of the public. On the contrary, the public requested transparency of policy decision-making and information communication processes. That leads to problems in the relationship of trust. That is, such a risk governance model results in the system destroying trust (Slovic 2001).

5. Discussion

From the above analyses of technocrat regulation and the public perception survey, it is observed that whether for dioxin contamination in milk, French baby formula, duck meat, duck eggs or excessive dioxin emission by TSU, technocrats' risk handling and governance actions caused great disputes. These events have in common consistent inaction, delay of knowledge and concealment of risk. However, in this process, risk assessment and policy decision-making are obviously instrumentalized. Moreover, scientific uncertainty of risk assessment was highlighted to delay risk regulation and public risk communication of serious pollution events. In fact, instrumentalization of risk assessment by technocrats is not new (O'Brien 2000). Further, EU countries saw the following areas as needing more work: transparent information and diversified and participative policy decision-making. In particular, from the 1980s on, occurrences of BSE and dioxin contamination in food, and GMOs stimulated the world's governments to reflect on risk governance. The historical role of risk governance has undergone paradigm shift in Europe also, in 1990. A most concrete example is the UK government's measures in dealing with the BSE crisis. Values and mechanisms of scientific risk assessment were widely changed, but, at the same time were also fiercely challenged (Millstone / Zwanenberg 2000).

While shouldering the burden of paradigm shift in the historical role of risk governance, it is doubtful whether world's governments will move ahead and undergo self-modification and reflection. In fact, for newly industrializing country, with globalization of technology, food, and health, social sectors have gradually changed from being characterized by blind, delayed, and hidden risk cultures into those defined by awareness, criticism, and transparent

communication. However, based on past experience, the situation is not so optimistic that it is likely that technocrats in governmental agencies will adopt a new governance paradigm like that of the EU. It seems that there is no sign of a great institutional shift occurring in authoritative and top-to-down risk policy decision-making and governance models. In addition, even after undergoing many challenges, technocrat-monopolized risk governance still holds its dominative stance by combining scientific expertise and conforming to the value of risk assessment, as well as ignoring risk communication. Don't forget that expertise governance is a combination of authoritative political and historical contexts embedded in local society.

Technocrats' perpetuating delayed and hidden risk culture is a major cause of „double-risk society" (Chou 2002, 2004). This results in the process of „system destroying public trust". Instead, such special contexts and structural developments make later-comer and technologically learning newly industrializing countries became weak in disputes about technological risks, and more vulnerable than Western societies[3].

This can be observed from a comparative EU survey investigating risk perception and public trust in risk governance by governments. From research contained in *Eurobarometer 2006 – Risk Issues* published by the European Commission (European Commission 2006), we see that 63 % of respondents stated that they were worried about mercury or dioxin contamination in food (ibid. 2006: 22). Also, there was general trust in risk governance of governments in EU member states. 54 % of respondents considered EU authorities to have placed considerable emphasis on public health and food risk problems (ibid. 2006: 35). 55% of respondents considered EU authorities to have been quick to react to public health and food risk problems (ibid. 2006: 39). Meanwhile, 49 % of respondents considered the EU authorities able to perform good risk communication in cases of food risk events (ibid. 2006: 40). This survey related the state of risk governance in 25 EU states. On average, it showed there was prevailing public trust in governments. Although the risk governance capacities of world's governments vary, for Europe, the survey results were met with stable and positive appreciation.

Conversely, previous research in Taiwan has revealed that the public are highly suspicious of the government's risk communication and risk governance ability. That is, due to distinct problems and social contexts in Taiwan, a double-risk society characterized by weak risk perception and weak public trust has formed. Also, through the accumulation of a hidden and delayed risk culture, the foundations of technological risks and public trust have become even weaker. Thus, the confrontation between technology and society is more serious in Taiwan than in western societies.

6. Conclusion

In Taiwan, with the authoritative historical and political background, as major regulators, technocrats hold their superiority in terms of risk policy-making and risk knowledge. With respect to risk policy-making, because the government had not been challenged by social

3) Bijker (2006) proposed the viewpoint that due to advanced technological development in Western societies, they are subject to more vulnerability. The author considers that for newly industrializing countries, more vulnerable and unstable tensions will be caused due to the special structure and culture of a „double risk society" – characterized by authoritative technological policy decision-making, a hidden and delayed risk governance and risk culture. As the tension between technology and society in Western societies can be managed by scrutiny of social movement groups in a systematical way, risk governance problems and policy decision-making in later-comer countries are dealt with by adhering to traditional historical and cultural thoughts. The state of high confrontation between the state and society is also another dilemma. This is also a problem that urgently needs to be resolved in terms of risk governance on technology, food, and human health.

movement groups in response to technological risk policy-making, the long-term authoritative ruling retains its legitimacy. Regarding risk knowledge, like western industrialized countries, technocrats can trace, investigate, and gather risk statistics and manipulate information to create official discourses. They comprehend much more about risk than the general public. Thus, authoritative expert politics are a special feature of Taiwan's risk governance. Technocrats who are inclined to positivistic regulatory science and institutionally hide and delay risks shape a governance culture in response to uncertain risks. To maintain the authority of regulation, even under strong social pressure seen nowadays, technocrats have continued to promote the effectiveness of scientific risk assessment. They apply a „hard science" view to support their discourses, which, though the public views as controversial are necessary to support their discourses. In other words, they still firmly believe that scientific risk assessment is superior to transparent risk information and risk communication.

In social sectors, whether for social movements or for public opinion surveys, the public is dissatisfied with the narrow official culture of regulatory science. In particular, the pubic is anxious and uncertain of these risk disputes and distrusts the technocrats' governance capability. In other words, even when social sectors strongly force paradigm shift of risk governance, they have to struggle with the expertise-dominated political structure of the authoritative state. In this wave of risk governance ideology confrontation, conflict ensues. Technocrats not only retreated to traditional model of scientific risk assessment and policy-making; from manipulating expertise, they systematically conceal and delay risk handling and risk communication. Compared with western societies, newly industrializing country appears positioned in high confrontation in terms of risk governance paradigm. Also, the authoritative decision-making and structure enjoyed by technocrats in newly industrializing country still perpetuates the legitimacy of continuing such a governance model. Even under fierce social criticism, the existing governance model will not easily collapse.

While dealing with governance disputes of emerging technological and food risks, we have to evaluate the historical and social contexts of later-comer and technological learning industrializing countries. Through analysis of the special structural dilemmas in social and governmental agencies, risk problems in different societies can be understood better. In particular, the phenomena and features of weak public trust and risk perception in a double-risk society can be the theoretical basis for future research on risk governance.

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