

Article

From Anti-Pollution to Climate Change Risk Movement: Reshaping Civic Epistemology

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Abstract: From the perspective of reflexive governance, this study probes into the transformative capacity and roles of government and civil society, and aims to determine how the authoritative developmental neo-liberalism state was challenged by civil society in democratization from the end of the 1980s, when it encountered a crisis of governance legitimacy. By analyzing the anti-petrochemical movement of the recent two decades, this paper recognizes the important historic line, and proposes that without innovative governance, a regime of expert politics with hidden and delayed risk will result in higher degrees of mistrust and confrontational positions by the public. In contrast to the government, local and civil societies are growing through the anti-pollution appeals of simple group protests into systematic and robust civic knowledge and strategic action. By administrative, legislative, judicial, and risk statement paths, such strategic mobilizations break through authoritative expert politics and reshape new civic epistemology. The process of reflexive governance is extremely radical. When two parties cannot commit to dealing with a high degree of mistrust, they will not be able to manage the more dramatic threat of climate change. Fundamentally speaking, a robust civil society will be an important driving power competing with government, in terms of constructing innovative governance.

Keywords: expert politics; neo-liberal developmentalism; transformative capacity; social robustness; innovative governance

1. Introduction

The dialectics of economic growth and environmental protection in the context of developmental states will result in different social results. In East Asia, since the 1980s, chemical and petrochemical industries are the main industrial choices for triggering exports and economies among developmental states, in spite of their high pollution levels, high energy consumption, high water consumption, and high carbon emissions. However, the driving industries of economic growth valued by developmental states, as in other places in the world, are resisted due to other concerns, such as environmental pollution and health risks.

In addition, with the ideology of neo-liberalism, since the mid-1980s, developmental states in East Asia have encountered crises in their attempts to enhance, dominate, and regulate industrial development. Under the expansive lobbying of conglomerates, governments are forced to collaborate; thus, gradually transferring their dominative power of economic development. In other words, industrial decision-making absolutely ruled by technocrats no longer exists, but are transformed to act in concert with industrial interests to formulate future direction, e.g., capitalists entered the consultation committee of government to affect economic policy in Taiwan in 1985. This phenomenon formed what Peter Evans called “embedded autonomy” [1]. In his analysis, East Asian governments, under such political economic conditions, could only maintain relative autonomy in economic matters and hardly consider social fairness. Furthermore, this embedded autonomy represents that policy decision-making was compressed by industrial groups, through which governments lose their power to maintain economic and social equality, as well as labor and environment sustainability. As analyzed by Castells [1,2], these phenomenon result in the destruction of developmental states.

Meaning that, in East Asia, economic penetration gradually led the government into a market-driven state. In South Korea and Taiwan, in the wake of political democratization in late 1980s, the political powers of Chabos and industrial groups considerably influenced technocrats’ decision-making, and placed economics as the first ideology principle for promoting national development. On the other hand, due to neo-liberal globalization guided by deregulation, governments have more difficulty in maintaining policy direction for distributional equality and sustainability [3–7], and this situation has been criticized as developmental neo-liberalism [8].

Regarding such trends, society not only resists environmental pollution, but also faces the demands of market-orientation. In addition, with global warming and rising public risk consciousness, social resistance makes progress towards the next level: a climate change risk movement.

This paper attempts to analyze the market-oriented developmental state in Taiwan after the mid-1980s, as well as the economic and political process of arrangements with, and withdrawal of, the petrochemical industry. It includes the continuous loss of environmental protection, neglect of carbon reduction, and the threat of sanctions on the total national industry by global green conventions. Although the government has proposed a series of sustainable development policies, it allows the continuation of highly controversial petrochemical industry operations. In addition, this paper explores how society resists the construction of chemical and petrochemical plants at different stages, which resistance has evolved from a simple anti-pollution movement to a climate change risk movement. In part three, under the context of historic formation, this paper analyzes the meaning of the social robustness of different

protests, as well as how local and national civil groups develop their resistance strategies at different stages, and obtains participatory knowledge of against-expert alliances for contextual reflexive governance.

Noticeably, different types of constructed civic epistemology have transcended the authoritative boundaries of expert politics, resulting in new national and social decision-making and dialectic relationships. Therefore, by confronting historic images and lessons, this paper discusses the transformative capacity of the developmental state of Taiwan.

2. Theoretical Framework: Civic Epistemology in Context of Developmental States

2.1. Participatory Knowledge

In the late 20th century, increased industrial global pollution negatively impacted public health, and the model of environmental movements changed. Ecological discourse has become the master framework by which to fight industrial pollution [9]. In addition, in the public field, risk communication and discourse constructed by discussions of pollution became the new focus [10]. This change shows that people have moved from passive perception of polluted situations to subjective risk perception in advance. In other words, the public has turned from passive resistance to subjective alarm and monitoring in order to change elite decision-making.

Nowotny, Scott, and Gibbons suggested that [11], regarding the various kinds of risk caused by modern science, to ensure sustainable survival, society must have continuous and robust responses, and ponder the challenges of technology regarding environmental, ethical, health, and political aspects. Most importantly, society must change from passive knowledge production to active construction of socially-robust knowledge in order to monitor and challenge the inappropriate behaviors of both government and industry [11–14]. In the process, civil participatory knowledge might overcome the monopoly of expert politics, and carry out technology-related democracy.

Jasanoff [15] pointed out that, in the past, due to its complexity, contemporary technological matters were directed by technocrats, which had formed invisible or monopolized domination in major industrial countries; on the contrary, if civil society could actively participate in the processes of supervision and decision-making, and systemically produce risk knowledge, it would break the monopoly of technological decision-making and form civic epistemology in its society. In other words, this process organized by citizens and challenging expertise would challenge the existing decision-making mode and broaden the legitimacy of technological democratic decision-making. On the other hand, if the intensity of participatory knowledge could be more condensed, it shows that society is more capable of reflecting and fighting against the complicated national, technological, and industrial complexities. Delvenne [14] indicated that it is an important tool against the “ignorance” manipulated by expert politics in a risk society.

In fact, Beck [16] called this process reflexive governance: stakeholders should follow the reflections of the technological, environmental, health, and ethical issues derived from its social development to examine and reconstruct decision-making, the transparency of science, and public participation, and intend to reorganize social and developmental agendas. Particularly, when some kind of governance violated the legitimacy of decision-making, such as authoritative, opaque information, or undemocratic decision-making, then it should find another way to promote or reform its transformation of governance [17].

The process requires time and social learning. When a society encounters significant transformation, it can demonstrate social robustness and construct sustainability through dynamic participation, criticism, and reflection [14,18,19]. Regarding more complicated environmental pollution, climate change risks of different fields, different social contexts, political tradition, and cultural control, will present different degrees of challenge.

2.2. Transformative Capacity in Developmental States

How do we view the risk decision-making and governance of East Asian countries from the reflexive governance perspective? Since the 1970s, countries around the world faced complicated technological matters, and established various expert committees in succession to set up neutral and objective science as evidence to be its basis for decision-making [20]. At the same time, quantitative and cost-benefit analysis became the method that policy science technocrats claimed as precise, effective, and beneficial, which caused the decision-making of government to be dominated by elite and knowledge-monopolized expert politics [21–23].

When it comes to East Asia, it becomes worse. In the theoretical core of developmental states, governmental autonomy is based on the authoritative control of technology, industry and economic policy, suppression of civil society, and acquisition of social resources to obtain legitimacy of governance by economic achievement. Nation-guided capitalism in developmental states, as suggested by Amsden [24], or the success of East Asia, as analyzed by Wade [25], is associated with elite expert politics. Based on powerful economic development, it has become the model of new industrial social development [26]. The author calls it authoritative expert politics, and a complex mingling of technocrats and science elites, which implements dominated and excluded expertise monopoly and decision-making under the authoritative political culture.

Developmental states in East Asia are encountering significant changes. With the political democratization of Taiwan and South Korea in the late 1980s and the maturity of industrial departments supported in the early 1990s, national roles have changed drastically. Hence, national economic development should partially connect with the private sector in order to become embedded in social departments to continuously promote the development of strategic industry [1]. By relative autonomy, with options, governments can guide industrial development to have close public and private cooperation with economic departments, and further create industrial economic growth. However, embedded autonomy will be the cause of domination by business sectors [2,27].

Developmental states encounter the challenge of being eliminated from the global marketplace or being transformed. Thus, Weiss proposed the concept of “transformative capacity” to observe the changing roles of developmental states [28]. Weiss suggested that, while developmental states will not disappear; they may adapt from a strong state, in the coercive sense, to a catalytic role [10]. Moreover, they will continue having economic and industrial planning and guidance.

However, “transformative capacities”, as proposed by Weiss, is limited to the economic field. With this concept, this paper analyzes the transformative capacity of global trans-boundary risks in different fields of countries in East Asia. How are the roles of government and civil society being reset?

This paper observes two important historic timelines in Taiwan. First, in the early 1990s, the developmental state’s embedded autonomy gradually declined. Technological bureaucracy was controlled

by political economic networks; while governance turned to loose environmental regulation. Secondly, the confrontational tension between countries and rising civil society are more significant. These two timelines are negative factors for the transformative capacity of governance regarding the global risk threats of different fields.

2.3. Civic Epistemology in Delayed Risk Societies

With the global risk threat, developmental states in East Asia have encountered the pressure of technology democracy and civil participation regarding risk decision-making in the recent two decades. There is a high degree of tension between country and society. In early times, these countries tried to catch up, and in accelerated and compressed industrialization, the weakened civil society encountered the rough monopoly of a technological economy.

In addition, in the historic context of the geopolitics of the international Cold War, authoritative politics and regulatory science were based on frequent selective affinity. Hence, in Taiwan, technological bureaucracy relies on authoritative expert politics, and emphasizes the superiority of science decision-making. Moreover, it follows the prior logic of the economic growth of developmental states, while neglecting scientific uncertainty and social and ethical risks. The combination forms a high-tech risk society of delays and hidden risk [29–31] or various problems of compressed modernization [32]. This demonstrates the uniqueness of risk governance of a newly industrialized country: authoritative regimes of regulatory science are used to hide risk and produce ignorance; thus, the public becomes extremely anxious and mistrusts governance.

However, in pace with the explosive democratization in Taiwan or South Korea in late 1980s and early 1990s, the strong civic awakening, as triggered by various environmental, labor, political, and social movements, attempts to break through the authoritative expert politics and regulative regime from very early on. Among these movements, diverse participatory knowledge entered this historical stage, especially the against-expert knowledge, as composed of different professional groups, such as professors or vocational profession groups. Although the depths of involvement and influence of various movements are different, they do play important risk discourse roles and form networks. The difference of against-expert knowledge between East and West societies is the latter, which was gradually included as part of the technological democratic decision-making procedures, while the former was excluded outside the decision-making regime, and was viewed as counterwork to government. Therefore, the against-expert becomes important in our analysis (Since 2000, the EU reflected its technological risk decision-making as losing public trust and support. Under the call for democratization of expertise, the EU accepted that risk decision-making should include the principle of extended peer communities. Among this, the inclusion of multiple levels, diverse expertise, and against-experts, which are contrary to official experts, are important to technological democratic governance. [33]).

These observations have been applied to the long-term anti-pollution movement since the late 1980s and the climate change risk movement from the mid-1990s. It first shows that Taiwan is experiencing an historic change of science, power, and decision-making legitimacy. In the serious disputes of development projects of the petrochemical industry, there is conflict between government and civil society regarding scientific knowledge production.

The environment in which to form civic epistemology depends on the state's regulatory institution, expert politics, robustness of civil participation knowledge, and trust in government [15]. Our observations seek to understand how a technology society, progressing from hidden and delayed states to awareness, develops more robust civil participation and resists authoritative expert politics with developmental consciousness via against-expert production civil knowledge. Therefore, a number of relevant questions arise. What are the transformative capacities of government and civil society in governance generally? Is the confronting position of governance more significant and do they not trust each other? After various kinds of conflict, can they be transformed and have the reflexive governance of a transformative society with self-criticism? Moreover, in such a context, what is the significance of establishing local civic epistemology?

2.4. Analysis Framework and Method

Based on reflexive governance and socially-robust knowledge, this study mainly examined the transformation of environmental movements in Taiwan in the recent two decades. Reflexive governance stresses that researchers have to closely review the change of social context, and analyze its technology, economy, environment, ethics, and politics. The concept of social robustness then advocates that researchers should investigate whether citizens or social groups are capable of constructing systematic risk knowledge to supervise and participate in decision-making.

Starting from these two analysis concepts, this author used literature review to systematically sort the environmental movement data of Taiwan in recent decades, and categorize the anti-petrochemical movements in Taiwan by recent observations of participating anti-petrochemical protests. The author argues that the entire transformation of the environmental movements from the anti-pollution movements in 1986 gradually stepped toward a climate change risk movement in the mid-1990s; and the key to this transformation came from the mobilization strategy and development of environmental movements, gradually moved toward local and limited political mobilization, knowledge, and discourse, and was then raised to local-national wide political mobilization, diverse knowledge, and robust systemic risk discourse. This transformation also becomes the milestone of the paradigm shift of environmental governance in Taiwan.

From this analysis framework, the author further discussed decision-making, mono or diverse protest, protest strategy, degree of systemic knowledge, major issues of risk discourse, and social trust of different stages of environmental protests and events in detail. Through such analysis categories, it constructs the confrontation between the decision-making of authoritative expert politics and public risk knowledge. The former is a dominative decision-making science composed of elite technocrats and official experts, while the latter is a joint-construction of risk knowledge composed of civil groups and diverse knowledge groups (including undergraduates, professors, and medical professional groups). The possibility of robust capacity and extent of civil knowledge to challenge authoritative expert politics becomes the focal point of this study regarding civic epistemology formation and environmental democracy in Taiwanese society.

The observations of this study focus mainly on the eight most important events in environmental movements in Taiwan in the last two decades. The author has taken part in these movements in different periods, and offers personal long-term observation and gained-knowledge. The key participatory

observation here is his involvement as a professor in the Anti-Kuokuang Petrochemical movement in 2010. The main concerns to join this movement are that the newly-planned petrochemical plant would exacerbate Taiwan's proportion of CO₂ emission worldwide, damage the wetlands and the environment, and violate the sustainable route to economic and social development. In the entire process of the movement, the author, as an against-expert, and several university colleagues organized "Academics Alliance against Kuokuang Petrochemical" to conduct a series of campaigns of scrutiny and protest, which focused on the possibly serious environmental, ecological, and social impacts on sustainability by the eighth Naphtha Cracker (No. 8 NCP). Through cross-disciplinary knowledge, the professors accomplished a risk knowledge pamphlet, which implicated climate change impacts to challenge the official discourse raised by the Ministry of Economic Affairs. Due to limitations of movement mobilization, including press conferences and academic conferences, we finally formed an alliance with environmental groups and professional groups to extend the battlefronts and enlarge our capacity. On the one hand, we wished the academics' neutral position could be played as against-experts; on the other hand, risk knowledge had been evolved into systemic and professional risk discourse as a mainstay in the later period of the environmental movement. Only after the successful prevention of No. 8 NCP in April, 2011, and through one year of contemplation and reflection, the author started to sort out the participated observation analysis for this study. This case has also opened the author's thinking to investigate the roles of against-experts in environmental movements in Taiwan. In addition, the author argues systemic risk knowledge production has already transformed the paradigm of the environmental movement, especially for those of us who have been forced to face the threat of compound climate change risk.

3. From Anti-Pollution to the Climate Change Risk Movement

3.1. From Developmental State to Neo-Liberalism

In the late 1960s, the petrochemical industry provided key materials for thousands of chemical goods, and was treated as a base to construct primary manufacturing and industries in Taiwan after World War II. Moreover, it became the condition for the country to provide low-cost living necessities to maintain low labor costs. Therefore, the petrochemical industry in Taiwan, as in other developmental states, such as South Korea and Singapore, became the engine for important economic development and industrial expansion.

In the 1980s, the petrochemical industry triggered economic development further. Its employment percentage accounted for one third of the entire manufacturing industry, while the export value accounted for one third of the total value in Taiwan. It was once the largest manufacturing industry system [34], thus, petrochemicals became an important fundamental industry. Although it requires a high amount of initial capital investment, the technical threshold is not high. At this time period, the technocrats dominated, and the government-operated petrochemical manufacturing system was challenged by the need for private capital. Opposite to the governmental domination from 1973–1980, Wang suggested that, from 1980 to 1985 [27], the influential lobbying of the private sector and the rise of petrochemical capital resulted in strong pressure, which challenged the national petrochemical industrial route.

However, since the petrochemical industry is a manufacturing industry with high energy consumption, high pollution, and high carbon emissions, in the late 1970s, Taiwan's government faced a policy dispute between "expansion of the petrochemical industry" and "internal demand orientation" [35]. The latter suggested that Taiwan should follow Japan's model of the late 1960s to give up its petrochemical industry with low added value, and adopt high quality measures based on internal demand [7,35,36]. However, after Yu Kuo-hwa, the committee chairperson of the Council for Economic Planning and Development, who supported the "expansion of the petrochemical industry", took over the office of the premier in March 1985, and the Industrial Development Advisory Council, in cooperation with industry, government, and academia, launched the intervention of industrial groups in national economy decision-making.

The political economic changes led the central government to seek private capital, thus, technocrats' capacity to dominate policy was directly weakened. In May 1986, the Executive Yuan expanded the Fifth Naphtha Cracker of the CPC Corporation, a government-operated enterprise. In September, it permitted investment of private capital in the Formosa Plastics Corporation's sixth Naphtha Cracker, thus, expanding the scale of the petrochemical industry. In addition, a large amount of private capital investment was introduced in petrochemicals. During the mid-1980s, meaning the period of enforced martial law, environmental protests rose rapidly in Taiwan and became fiercer. Wang suggested that, during that period [27], national technocrats encountered industrial lobbying of private capital and a series of environmental protests, and became "perplexed".

In fact, the confusion of the government means that technocrats' decision-making is deeply influenced by political economic factors. In addition, when Taiwan turned from authoritative to democratic politics, the autonomy of governmental decision-making was weakened. In other words, the ideology of neo-liberalism in a "watchman" country developed on a unique historic stage. In July 1987, as martial law was lifted, many environmental protests were launched and labor movements arose, which was highly challenging to democratization in Taiwan. Regarding environmental and labor movements, the main subjects intended to resist and destroy authoritative politics. For instance, in the movement of anti-nuclear plant No. 4, "anti-nuclear is anti-dictatorship". In the labor movement, people resisted an authoritative government that supports capitalists. In other words, one of the objectives of early democratization in Taiwan was that the opposition party, which represents the Taiwanese people, combined different environments and the power of a labor-based society, and attempted to overcome the ruling party Kuomintang-state capitalism dominated by mainlanders and capitalists' alliance [7,37]. Numerous economists, who studied in the U.S., regardless of whether or not they supported the KMT, emphasized the ideology of market determination and deregulation [38,39]. Under such paradoxical historic conditions, neo-liberal deregulation became considerably popular as the guiding principle of mainstream discourse regarding economy and democracy.

However, neo-liberalism mainstream discourse, as constructed by different parties, continued using historic paradox to construct deep political economic relationships. In the early 1990s, "New-Mercantilism" groups significantly dominated economic policies and governance [40]. Castells suggested that "embedded autonomy" led to the failure of developmental states in East Asia. In other words [2], decision-making by technocrats is highly suppressed by private capital. The ideology of deregulation totally eviscerates the justice and sustainability of governmental operations. An authoritative developmental country, which treats economic growth as a priority, has completely become a regime of neo-liberalism

upon de-regulation and efficiency. Although the measures might be different in each country, one of their purposes is to support capital expansion and conglomerates. In South Korea, Chabos exclusively formed market-oriented post-developmental states [4] or “neo-liberal developmentalism” [8], and the degrees were similar.

In other words, the neo-liberalism regime that arose after democratization in Taiwan in the 1990s had a high degree of privatization of the capital-intensive petrochemical industry. The government thoroughly liberated chemical and petrochemical industries with high-energy consumption, high pollution, and high carbon emission. However, they neglected the sustainable development declaration signed by representatives of different countries at the Earth Summit of Rio de Janeiro in 1992. Moreover, it triggered strong protests from people in different places, and the type of protest changed from anti-pollution to climate change risk.

3.2. Anti-Pollution Movement

Developmental states treat economic development as their priority and neglect pollution control. Thus, in the late 1970s, environmental problems and food safety became serious issues, and resulted in the rise of the environmental consciousness of people across Taiwan. In the early 1980s, environmental protests in different places focused on anti-pollution. At the time, as it was the period of martial law, the protesters started with regional “self-preservation”: since community residents’ health was harmed and they could not endure it, they resisted polluting plants by road-blocking the factories.

In 1986, DuPont USA planned to construct a plant in Lukang, a traditional literary town in central Taiwan; however, the plan was resisted by local residents (Table A1 in Appendix) from 1986 to 1989. From 1990 to 1992, the Formosa Plastics Corporation, the largest chemical manufacturer in Taiwan, attempted to construct the sixth Naphtha Cracker, and the plan was strongly resisted by residents in Lize, Yilan County, and Guanyin, Taoyuan County. Finally, Mailiao, Yunlin County (central Taiwan) was selected as the site location. Since 1987, residents in Hou Jing, the petrochemical base in Southern Taiwan, have strongly protested the risk of pollution and resisted the construction of the Fifth Naphtha Cracker of CPC. In 1988, the pollution leakage of the chemical plant in the Linyuan Industrial Park, Kaohsiung in Southern Taiwan was serious. The residents blocked the plant, and forced it to stop. In 1995, Bayer of Germany planned to construct a chemical plant in central Taiwan, and local residents were extremely worried. Finally, the plan was cancelled due to the opposition party’s successful and strategic mobilization in a local election.

The anti-pollution movements were launched under the lift of martial law in July 1987, which responded to various environmental, labor, and political movements [41], and the media coverage stirred the issue into a national debate. At the beginning of political democratization, with the criticism of the KMT, local issues rapidly obtained the advantage of national risk discourse, and resulted in anti-chemical and anti-petrochemical characteristics. However, the core risk discourse was based on anti-pollution.

3.3. Shifting to a Climate Change Risk Movement

The self-preservation anti-pollution movement was the focus of national risk discourse; however, civil resistance was regional and based on anti-pollution, which harms health. Due to the climate governance issue at the Earth Summit in 1992, the environmental movement was changed.

In the early 1990s, neo-liberalism in political democratization, with significant political economic pressure, permitted the construction of the sixth Naphtha Cracker of the Formosa Plastics Corp. in 1992. Upon the requirement of global climate governance in 1992, particularly the development of the global green convention after signing the Kyoto Protocol in 1997, the government convened National Energy Conferences in 1998, 2005, 2009, and 2010, as well as National Sustainable Development Conferences. In those conferences, a national sustainable energy policy outline was formulated, and the project of energy saving and carbon reduction was planned. However, in fact, the government continuously permitted or expanded plant constructions and operations of the petrochemical industry.

With the construction of the sixth Naphtha Cracker in 1992, the largest national enterprise in Taiwan, CPC, tried to expand the productivity of the Third Naphtha Cracker and launched the Fifth Naphtha Cracker (No. 5 NCP) in 1994. Carbon dioxide emissions increased with the completion of the first period of the sixth Naphtha Cracker in 1998. In 2000, the second period of the sixth Naphtha Cracker (No. 6 NCP) was completed and began operation. In 2003, the third period of the sixth Naphtha Cracker was completed and began operation. In 2007, the fourth period of the sixth Naphtha Cracker was completed, began operation, and reached its peak. Although the government has held national conferences in different periods to respond to international climatic change conventions, it continues to allow the construction of petrochemical plants. According to previous research [42], from 1992 to the end of 2000, the expansion and operation of petrochemical plants resulted in a significant peak of CO₂ emissions, and this was the main cause of the increase of CO₂ emissions, by 1.3 times, in Taiwan in the past decade.

In addition, with the requirements of other private sectors, in 1993, Taiwan's government planned to develop a petrochemical and steel Binnan Industrial Park (Southern Taiwan) on the wetlands in Qigu, Tainan; however, it was resisted by local residents and resulted in a national environmental resistance movement for more than ten years, and the project was finally halted. In 2006, the government planned to expand the eighth Naphtha Cracker (No. 8 NCP, Guoguang petrochemical industry) on wetlands in central Taiwan. The national anti-No. 8 NCP was the most well-known project in 2011. On Earth Day (22 April), the administrative department announced the cessation of this investment plan, which reached NTD 600 billion, and the eighth Naphtha Cracker was successfully stopped. In 2011, the Formosa Plastics Corp. proposed the expansion of period 4.7 of the sixth Naphtha Cracker (No. 6 NCP expansion), which led to national environmental group resistance until the present.

With the systematic and large-scale expansion of petrochemical plants upon government instruction, the environmental resistance model changed. From the anti-Binnan movement of 1993, civil environmental resistance changed from regional, anti-industrial pollution movements to a national and composite climate change risk movement regarding high energy consumption, high carbon emissions, and high pollution. The resistance strategy changed significantly due to concerns regarding environmental pollution and health risks to concern about wetlands, carbon reduction on wetlands, habitats of wild animals, conflict over water resources, and the safety of agricultural foods, land subsidence, and sustainability of villages, meaning it systematically developed risk discourse and mobilized people at different levels.

4. Social Robustness

4.1. Anti-Pollution Movement: Emergence of Socially-Robust Knowledge

From the anti-DuPont movement in 1986 to the anti-pollution movement (for instance anti-Bayer) in the mid-1990s, in the political democratization of Taiwan, decision-making was dominated by authoritative expert politics. In addition, civil society rose, where the subjects of resistance were mostly local residents whose health was harmed or whose risk consciousness was enhanced. As it was rarely expanded to a national alliance or supported by knowledge against experts, anti-pollution movements were mostly based on the self-preservation of anti-public hazard, and social robustness was initially formed in the process of political mobilization.

The author saw this period as an anti-pollution period, which included actions against DuPont, the Linyuan incident, anti-Fifth Naphtha Cracker, anti-sixth Naphtha Cracker, and the anti-Bayer movement. In this period, social robust knowledge was burgeoning. The upper part of Table A2 in the Appendix shows that, most resistance subjects were local residents or local political figures, and resistance strategies were mainly political mobilization, plant blockage, and even local referendums. Expert groups rarely intervened, and while some students and university professors participated, their discourses were not systematic. Therefore, in the movements, risk discourse was based on anti-public hazard and anti-pollution. The exception is that, in the anti-DuPont movement, the appeal referred to the protection of historical sites in Lukang, which is the third most important harbor in the developmental history of Taiwan.

Knowledgeable young people and university professors are important supporters of socially-robust knowledge in the environmental movements of Taiwan. In movements regarding the anti-sixth Naphtha Cracker in Yilan, university students returned to their hometown to support the protest, and 12 university professors organized an environmental assessment monitoring team for the sixth Naphtha Cracker. Moreover, the larger-scale movement of anti-Fifth Naphtha Cracker was founded in Hou Jing in 1990 (Table A2). In this anti-pollution movement, university students established a work team, while the scholars intervened to examine the objectivity and disadvantages of the environmental report. Regarding air pollution and water pollution, which are harmful to the human body, the first investigation of community epidemiology was conducted. The petrochemical industry policy was reviewed to resist the construction of the Fifth Naphtha Cracker. Mobilization was conducted by the Taiwan Environmental Protection Union cross-regional before and after the lifting of martial law. A socially-robust knowledge system rose during political mobilization.

Generally speaking, at this stage, the movements were based on the initial socially-robust knowledge of anti-pollution resistance, and developed in the severe transformation of democratization at the end of the 1980s. Academic circles must carefully associate with monitoring of the authoritative regime, which still has strong political power. Civic epistemology is shaped by the dissatisfaction with the KMT authoritative and mistrust of expert politics. During this period, although academic circles had individual intervention and supervision, the against-expert knowledge was not systematic, and could not thoroughly challenge the discourse on national industrial policy; thus, it could hardly expand the risk discourse as the knowledge base for the mobilization of the environmental movement.

4.2. Stage of Climate Change Risk Movement: Reshaping Civic Epistemology

The middle and end of the 1990s was the start of the “democratic consolidation” of Taiwan [43]. From the anti-Binnan movement to the anti-No. 8 NCP, and anti-No. 6 NCP expansions after 2010, the composition and scale of environmental movements have completely changed. The author refers to this period as being transformed from the anti-pollution movement, and considers it a more systemic climate change risk movement with robust risk knowledge to challenge decision-makers.

The lower half of Table A2 shows that the appeal first expanded from anti-climate change risk of high energy consumption, high pollution, and high carbon emission to wetland protection, wild animal protection, land subsidence, seawater encroachment, air pollution, health risks, and sustainability of villages. The strategy of the movement expanded from the simple protest path to administrative, legal, justice, and reinforcement of risk discourse paths.

Against-experts, including university professors and lawyers, established an alliance with environmental movement groups and developed systematic participatory knowledge, by which more systematic social robustness constructed participatory knowledge and resisted the low value-added national petrochemical industry policy.

4.2.1. Administrative Path

Against-experts and environmental groups actively participated in environmental assessment procedures. In an environmental assessment (EA) conference at the early stage, they systematically proposed the definition of the risk assessment scope. The purpose was to examine and reject the developers’ EA reports by multiple specialties of “against-expertise”. From the anti-Binnan case, in addition to the health risks of pollution, carbon emissions, and wetland protection, the protection of globally-precious black-faced spoonbills were first included in the scope of the EA. Furthermore, regarding the anti-No. 8 NCP case of 2011, newly established expert meetings of EA procedures covered more of the topics with high impact on the coast, including Chinese white dolphins, health risks, water resource usage, and greenhouse gases. Finally, social and economic assessments were included. Regarding the EA of the No. 6 NCP expansion of 2011, civil groups focused on the pollution calculation of volatile organic compounds (VOCs). At the second stage of the EA meeting, in a final push for the rejection of the development case, total political and social mobilizations were launched to block approval of that case.

Regarding the strategy of the administrative path, once a development case passes the EA, they must also be approved by the Regional Planning Committee of the Ministry of the Interior. Therefore, it became another important battleground for the environmental group’s strategic use of participatory knowledge. The Binnan development case was approved, with conditions, by the EA disputes of 1999. However, in October 2006, it was rejected by the Regional Planning Committee. In 2010, when the No. 8 NCP project was discussed in relation to the EA, the environmental group had already strategically presented an action plan to the Regional Planning Committee.

4.2.2. Lawmaking Path

Wetland protection is an important climate change issue in the development cases. Against-experts suggest that wetlands can absorb carbon dioxide, lower the risk of global warming, and globally protect

precious wild animals. Upon this framework, the anti-Binnan civil group actively promoted lawmaking for the Wetland Act, and successfully constructed the Southern Taiwan Taijiang wetland National Park as an important international habitat of black-faced spoonbills. The anti-No. 8 NCP civil groups launched 40,000 subscriptions for a national trust of wetlands in Changhua. The initiation was promoted by the Wetland Act and National Trust Act, and successfully protects the habitat of the *Sousa chinensis* (Chinese white dolphin). After the success of the anti-No. 8 NCP movement in April 2011, the Wetland Act was passed into law in the middle of 2013.

4.2.3. Justice Path

Although Taiwan introduced the civil suit system in 1999, with the incinerator case in Linnei, Yunlin in 2006, the environmental group won their first administrative suit. Lawyers and environmental groups must break through various conservative legal regulations and court cultures, such as suit qualification of the person concerned, as well as the target and scope of the suit. In 2013 and 2014, they, respectively, won the development cases of the third and fourth periods of the Central Taiwan Science Park regarding semi-conductor pollution, which encouraged a path to justice examination. In 2014, environmental lawyers and scholars proposed an administrative suit for the annulment of the Executive Yuan resolution of the EA meeting regarding the pollution control of the No. 6 NCP expansion. They suggested that the expansion of the sixth Naphtha Cracker must consider the total control of the VOCs in order to lower the harm of particulates on the human body.

4.2.4. Risk Discourse Path

In addition to the previous action strategies, the most important fact is that, against-experts and environmental groups in the movements tried to fight for risk discourse rights through sub-political alliance in order to resist national expert politics [44]. The anti-Binnan movement invited university students and scholars, who advocated the risk threats regarding high energy consumption, high pollution, high water consumption, high carbon emissions, and the destruction of wetlands. They cooperated with local residents, local historic workers, and political figures in discourse regarding homeland sustainability, wetland economy, and alternative development.

In the anti-No. 8 NCP movement in mid-2010, different fields of scholars organized a diverse discourse group, and systematically accomplished professional analysis of climate change risks. Moreover, they spread this analysis through the internet, which later became the risk knowledge basis of the movement. In addition, sub-political mobilization included not only academic circles, local historic workers, farmers, fishers, and national art circles, but also included physicians. They practiced artistic singing (publication and creation) for enhancing sustainable identification, published the data of air pollution causing cancer, and constructed a more robust risk discourse alliance.

The scale of the expanded alliance is systematic. In the anti-No. 6 NCP expansion of 2011, against-experts continuously proposed the risk knowledge of reduction, monitoring, and examination of air pollution according to difference analyses of environmental assessments. A medical alliance in Changhua actively promoted a control policy for particulate matter PM_{2.5} in Taiwan, and reviewed the development and national sustainability of the petrochemical industry in Taiwan.

4.2.5. Confrontation between Expert Politics and Civic Knowledge

From the above analysis, although Taiwan has transformed from an authoritarian regime to democratization, its decision-making remains quite strong with respect to authoritarian expert politics. This decision-making mode linked elite technocrats and official experts, and from the anti-pollution movements in mid-1980s to the climate change risk movements in mid-1990s, has been challenged more and more rigorously. In the early days, although this decision-making gradually lost public trust, it maintained superficial legitimacy by dominating expertise and political oppression. However, as the national alliance between civic groups and diverse knowledge groups became more and more robust, systemic civil risk knowledge shook or disintegrated the basis of official decision-making knowledge.

Using local environment knowledge, the creation of art circles, academic knowledge, and medical knowledge, and through sentimental singing and rational analysis, multiple and independent professional groups formed a risk discourse alliance of different perspectives and systems, which had a snowball effect and resulted in new mobilization. It demonstrated that the environmental movement in Taiwan was experiencing a significant paradigm shift. University professors and medical circles practiced rational risk knowledge, which built a socially-robust knowledge basis. In addition, local historic workers, art circles, and groups of farmers and fishers created sentimental poetic arrangements, and made accusations regarding the lack of sustainable development. They developed powerful and different mobilization paths, and acquired a moral position through risk discourse to reflect on social development.

These diverse, voluntary, and new social participative path mobilizations directly challenged the existing expert politics, which comprised technocrats, industry, and government patronized scholars. It changed decision-making regarding industrial policy and re-established a new civic epistemology. Expert politics lost its legitimacy, and civil risk knowledge and discourse resulted in more robust supervision governance and decision-making. This paradigm shift of environmental governance in Taiwan continuously influences other new social movements, and produces a cry for governance innovation [45].

5. Discussion and Conclusions

From the perspective of the country and its civil society, this study analyzes their roles, transition, and interaction in the anti-chemical and anti-petrochemical movements from the mid-1980s to the present. The paper presents several important historic timelines and issues: first, after radical democratization in the mid-1980s and democratic consolidation of the mid-1990s, the inter-transformative capacity of government and society has expected to build. Second, an authoritarian developmental state, which lost its embedded autonomy and combined with neo-liberalism, is challenged at different stages regarding the regime of expert politics of hidden and delayed risk. Third, local and civil society progressed from anti-pollution to a climate change risk movement and from simple protests to systematic resistance and risk discourse. Fourth, while robust social participatory knowledge overcame expert politics and formed a new civic epistemology, it has caused a high degree of mistrust between government and society. Fifth, government and society failed to learn from each other, to communicate with each other, or to advance innovative reflexive governance, which resulted in crisis.

The findings suggest that the neoliberal developmental state developed high carbon emissions and high energy consumption, but neglected the pressure of international green mobilization. They continued promoting the non-sustainable brown industry by administrative guidance and the decision-making model of expert planning. Moreover, they treated social resistance as an obstacle to national economic development. The conservative developmental regime was challenged by civil society robustness at different stages. However, according to observations of previous cases [31,46], they rarely transcended the governance models of expert politics, which have endured for decades, thus, resulting in a high degree of social mistrust, as shown in Table A2.

From another perspective, there were conflicts between government and civil society in social communication. In previous cases, developmental state's expert politics caused distrust between technocrats and the people. Civil society robustly monitored and challenged the government by enlarging the administrative, lawmaking, justice, and risk discourse paths, which made the existing governance paradigm highly suspect. Hence, civil society attempted to transform civic epistemology through these processes, and the expert politics model government of the past was forced to change.

The evolution of the developmental state turned into a deadlock, causing significant crisis in the transformative capacity of government and society. A neo-liberalism regime could not provide sustainable discourse superior to that of a civil society. Moreover, a rough industrial policy would encounter stricter international, national, and social monitoring and resistance. "Bringing society back in" had become the international key for government and society to develop the severe governance transformation of climate change. Therefore, further observations should be conducted on the force of public trust, as well as the robust and systematic capacity of civil society, regarding innovative and transformative governance. In other words, the turning point of reflexive governance will be in competition with learning and participation governance innovation. This dynamic process will reconstruct new policy decision-making for industry, environment, and society.

Conflicts of Interest

The author declares no conflict of interest.

Appendix

Table A1. Taiwanese anti-petrochemical project movements from 1980–2011.

Year	1988	1987–1990	1986–1989 1990–1992	1993–2006	2006–2011	2011–2012
Protest movement	Linyuan Petro-Event	Anti-No. 5 NCP	Anti-No. 6 NCP	Anti-Binnan Industrial Zone	Anti-No. 8 NCP	Anti-No. 6 NCP Expansion (phase 4.7)
Location	Linyuan Dist. of Kaohsiung City	Nanzi Dist. of Kaohsiung City	Lize Dist. of Yilan County Guanyin Township of Taoyuan County	Qigu Dist. of Tainan City	Dacheng Township of Changhua County	Mailiao Township of Yunlin County
Type	anti-pollution	anti-pollution	anti-pollution	anti-high energy consumption, high water consumption and high pollution industries	anti-high energy consumption, high water consumption and high pollution industries	anti-high energy consumption, high water consumption and high pollution industries

Source: compiled by this study.

Table A2. Reshaping civic epistemology.

Environmental Movement Paradigm	Event	Decision-Making Mode	(Subject) Protest Mode (Mono or Multiple Subjects)	Protest (Procedure) Strategy	Scholars or Students (Protest) Alliance	Systemic Protesting Risk Discourse	Risk Discourse (Major Event)	Social Trust Social Trust
Anti-pollution Movement	Anti-DuPont Movement 1986–1987	Authoritative regimes Expert politics	Local residents Local politicians (forming national alliance) Joint petition by many factions	From relief afterwards to prevention in advance	Some students and scholars	Not systemic	Opposition to public hazard Anti-pollution Residents in Lukang wanted to keep cultural sites instead	Distrust to government governance Distrust to firms
	Lin Yuan event 1988	Authoritative regimes Expert politics	Local residents Self-preservation	Surrounding the plant to force a shutdown	None	None Emerging health risk discourse	Opposition to public hazard Anti-pollution	Distrust to government regulation Distrust to firms
	Opposition Movement to NCP No. 5 1987–1988	Authoritative regimes Expert politics	Local residents Community consciousness NGO alliance Students and scholars Political groups	Massive petitions and protests	In 1990, the Student work team for the Hou-Jing opposition movement to NCP No. 5 NGO formed an alliance with scholars	The first communal epidemiological discourse on harm to human Scholars reviewed the EIA report Q & A for opposing NCP No. 5	Anti-pollution (CPC) Air pollution Water pollution (river pollution) Petrochemical Industry policy	Distrust to government regulation Distrust to firms

Table A2. Cont.

Environmental Movement Paradigm	Event	Decision-Making Mode	(Subject) Protest Mode (Mono or Multiple Subjects)	Protest (Procedure) Strategy	Scholars or Students (Protest) Alliance	Systemic Protesting Risk Discourse	Risk Discourse (Major Event)	Social Trust Social Trust
Anti-pollution Movement	Opposition Movement to NCP No. 6 (Yilan) 1986–1989	Authoritative regimes Expert politics	Alliance between local government and local residents	203 professors jointly petitioned the government undergraduate's coalition	Local political mobilization to protest	12 Professors composed of the assessment group for the EIA review of NCP No. 6	The first time to suggest that it is not suitable to have a petrochemical industry in Taiwan Energy policy Socio-economics Manufactures Ocean Ecology Wastes	Distrust to government regulation Distrust to firms
	Anti-Bayer Movement 1995–2000	Authoritative regimes Expert politics	Local government Local residents	Local referendum	None	No systemic	High pollution/High energy consumption Lung saving action Decision on Anti-pollution industry park or trade park with low pollution	Industrial pollution and disaster caused public distrust

Table A2. Cont.

Environmental Movement Paradigm	Event	Decision-Making Mode	(Subject) Protest Mode (Mono or Multiple Subjects)	Protest (Procedure) Strategy	Scholars or Students (Protest) Alliance	Systemic Protesting Risk Discourse	Risk Discourse (Major Event)	Social Trust Social Trust
Climate Change Movement	Anti-Binnan Movement 1993–2006	Expert politics	Local residents Politicians' alliance with anti-reservoir movement	Engaged in surveillance of EIA procedures Engaged in surveillance of regional commission Criticism on black box decision-making The Committee of experts	Scholars Student alliance combining conservation groups and scholars abroad	Systemic	Discourse of loving motherland Opposed high energy consumption Opposed high pollution Opposed high water consumption Opposed high CO ₂ emission Protecting wetlands and Black-faced spoonbills	Industrial pollution and disaster caused public distrust
	Protest to Kuokuang Petrochemical Project 2010–2011	Expert politics	Local residents Environmental coalition Academic groups Medical alliance	Engaged in surveillance of EIA procedures Engaged in surveillance of regional commission Sub-politics Protests (multiple)	Scholar alliance Student network	Systemic Publication	Protecting wetlands and Chinese white dolphins Climate change Water pollution Food security Subsidence Air pollution and health risk	Industrial pollution and disaster caused public distrust

Table A2. Cont.

Environmental Movement Paradigm	Event	Decision-Making Mode	(Subject) Protest Mode (Mono or Multiple Subjects)	Protest (Procedure) Strategy	Scholars or Students (Protest) Alliance	Systemic Protesting Risk Discourse	Risk Discourse (Major Event)	Social Trust Social Trust
Climate Change Movement	Opposition Movement to NCP No. 6 (Expansion Phase 4.7) 2011–2014	Expert politics	Local residents Environmental groups Scholars Medical alliance	Engaged in surveillance of EIA procedures Citizen suit Initiatives for a referendum prohibiting the burning of petroleum coke and coal-fired electricity	Scholar alliance Plan and prepare for anti-NCP No. 6 work teams	Systemic Issues on PM 2.5 health risk newsletter: FPCC go away	Air pollution Health risk Water pollution VOC controversy Interest	Industrial pollution and disaster caused civil severe distrust

Source: compiled by this study.

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