

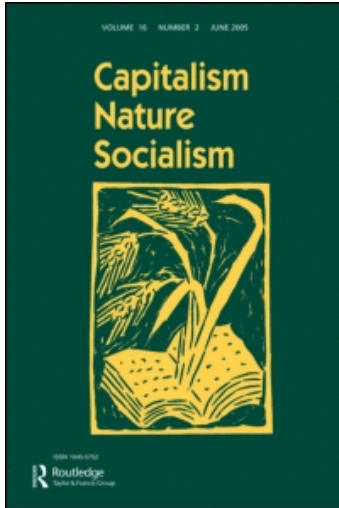
This article was downloaded by: [Hua-Mei, Chiu]

On: 14 February 2011

Access details: Access Details: [subscription number 933354448]

Publisher Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Capitalism Nature Socialism

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713395259>

The Dark Side of Silicon Island: High-Tech Pollution and the Environmental Movement in Taiwan

Hua-Mei Chiu

Online publication date: 10 February 2011

To cite this Article Chiu, Hua-Mei(2011) 'The Dark Side of Silicon Island: High-Tech Pollution and the Environmental Movement in Taiwan', *Capitalism Nature Socialism*, 22: 1, 40 – 57

To link to this Article: DOI: 10.1080/10455752.2010.546647

URL: <http://dx.doi.org/10.1080/10455752.2010.546647>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

The Dark Side of Silicon Island: High-Tech Pollution and the Environmental Movement in Taiwan*

Hua-Mei Chiu

Introduction

Since the 1980s, the global electronics industry has undergone massive reconstruction, and there has been intense competition between different countries seeking to develop their “high-tech industries.”¹ The model emulated by most governments is Silicon Valley, the pioneer not only in information technology (IT) based on micro-electronics but also in establishing the industry’s clean reputation. Although Taiwan was among the latecomers in the development of the high-tech industry, it is now considered the most successful. Its first science park, the Hsinchu Science Park (HSP) is known as the “Silicon Valley of the East” and has been highly praised for its achievements (Mathews 1997). Moreover, the Taiwanese case is widely seen as exemplifying the capacity of the developmental state to launch a strategic national industry through “a process of upgrading and modernization of industry” (Castells 1992, 44).

Ironically, the HSP was established in 1980 as a substitute for heavily polluting industries and a model of environmental protection just at the time when, across the Pacific Ocean, the dark side of the original Silicon Valley was becoming apparent—most notably when toxic solvents in the underground storage tanks of Fairchild Semiconductor Corporation’s plant leaked into groundwater supplies, contaminating the water of 16,500 local homes. The fact is that behind the clean image, the industry is sustained by using vast amounts of chemicals, including toxic and carcinogenic substances. The assembly of computer equipment, for example, uses more than a thousand materials, many of which are highly toxic: solvents, heavy metals, acids, toxic gases, corrosive chlorinated and brominated substances, photoactive chemicals, plastics, and plastic additives. The industry also depletes natural resources to fuel its

*This article draws on research carried out for my PhD thesis: 2010. Ecological modernization or enduring environmental conflict? Environmental change in the development of Taiwan’s high-tech industry. Department of Sociology, University of Essex. It is also informed by my experience as an activist in the movement against high-tech pollution and expansion in Taiwan. I thank the anonymous reader, Jane Hindley, and Ming-sho Ho for their helpful comments.

¹The term, “high-tech” was created by business media writers in 1970s and usually refers to electronics and information technology (IT) based on microelectronics. The industry’s core production system is characterized by highly specialized expertise in the manufacturing processes and high investment costs (Lüthje 2006).

global expansion (SVTC n.d.; Byster and Smith 1999, 2006; Pellow and Park 2002; Leighton et al. 2002; Smith et al. 2006). Indeed, the high-tech industry is characterized as much by its intensive use of chemicals as its well-known short product cycle.²

However, the increasing evidence of negative environmental impacts and violations of labor rights associated with the expansion of the industry (see Smith et al. 2006) was not convenient to governments determined to duplicate the “high-tech recipe.”³ In Taiwan both the state and high-tech capital have claimed that the industry upholds environmental protection standards, and they have used a range of measures to promote its positive environmental reputation. Such joint efforts—which are a prominent feature of ecological modernization in Newly Industrializing Countries—have recently been challenged by grassroots movements and environmental activists. Since the late 1990s, the harmful environmental impacts of the high-tech industry have gradually become more visible in Taiwan, and there has been increasing public concern about the hazards associated with the expansion of the science parks where the high-tech electronics industry factories are located.

The Development of the High-Tech Industry in Taiwan

Since the establishment of the HSP in 1980, Taiwan has gradually become an important player in the manufacture of electronic components for the global market. In 2001 Taiwanese companies produced 70 percent of global personal computer motherboards, 55 percent of laptops, 56 percent of liquid crystal monitors, and 51 percent of all color display tube monitors in the global market (Berger and Lester 2005, 4, 47). This dramatic increase in production has also been accompanied by a continuous expansion of state-operated science parks. The Hsinchu, South Taiwan, and Central Taiwan Science Parks were established in 1980, 1996, and 2003 respectively. By 2007 these three parks housed a total of 719 companies with 200,000 employees and had a combined sales revenue of 1.9 trillion New Taiwan Dollars, or NTD (US\$600 billion). They were located in eleven out of 25 cities and counties and occupied 4,462 hectares of land (NSC 2008; HSPA 2009).

Contrary to the claims of neoliberal theorists, the remarkable expansion and economic success of Taiwan’s high-tech industry and science parks owe a great deal to state intervention, both in terms of subsidies and policy support. This dates back to the late 1970s when the Taiwanese government undertook a strategic review of its

²The industry is notorious for the speed of innovation in new products and technology. To carve a market niche, high-tech corporations compete by providing smaller, faster, and cheaper products to consumers (Mazurek 1999).

³Saxenian (1991, 38) suggests that the Silicon Valley recipe combines a research university, science park, and venture capital in an environment free of government regulation and trade unions.

industrial policy in response to pressure for “industrial up-grading.”⁴ As part of this review, senior technocrats visited Silicon Valley and on returning recommended that the government prioritize high-tech electronics as a strategic national industry and adopt the science-park model. These proposals were accepted by central government which then authorized the National Science Council (not the Economics Ministry) to oversee this task. Under its auspices, the HSP was established in 1980, specifically designed as a self-sustaining community within a park-like area, and given strategic support and investment. Companies were given incentives for research and development, cheap land, a one-stop application system, centralized wastewater treatment facilities, and a wide range of taxation benefits and allowances.

In 1981, these policies were reinforced by the national strategic industrial policy, which set legally binding criteria for further government benefits, including subsidies, low-interest loans, and low customs duties. To be eligible, companies had to fulfil six criteria, which became known as the two “highs” (high-tech and good value-added); the “two bigs” (strong industrial linkage and big market potential); and the “two lows,” which served to flag the state’s commitment to environmental protection (low energy consumption and low pollution) (CEPD 1982). The following figures reveal the extent of the tax breaks. Between 1997–2004, the total tax paid by the two leading chip-making corporations, Taiwan Semiconductor Manufacturing Corp. and United Microelectronics Corp., was actually minus 3 billion NTD (US\$100 million), which the companies were able to offset against future profits. Put differently, it seems that the “golden goose” of the nation’s economy has made a rather poor contribution to the treasury (Chen 2005).⁵

Over the past three decades, while implementing policies favoring high-tech capital, the state has also made a concerted effort to promote a clean image for the industry. In the late 1970s, the government declared that the HSP was designed to develop technology-intensive, precision, and non-polluting industry with a prosperous future. At its opening ceremony President Chiang Ching-kuo told the nation, “. . . the advanced technology generates less pollution, which is helpful to achieve the goal of environmental protection” (Staff report 1980). Throughout the 1980s news reports emphasized the green landscape of the science parks, the chimney-free high-tech factories, and the centralized wastewater treatment—reports that served to reinforce the clean reputation of the industry in public opinion. Moreover, during the 1980s, the political momentum to embrace clean industry was invigorated by the emergence of anti-pollution movements in Taiwan. Activists stressed that they

⁴Industrial upgrading became a vital legitimization strategy for the KMT after Taiwan’s expulsion from the United Nations in 1971, when Mao Ze-dong’s People’s Republic of China took over the seat that the KMT’s Republic of China had held since 1945, and in the context of subsequent diplomatic setbacks, the emergence of political opposition, the oil crises, and global recession. It continued to be seen as vital from the mid-1980s when some labor-intensive, heavily polluting industries left the island due to rising environmental and labor costs.

⁵The stunningly unjust tax policy was slightly revised in 2007, when the Legislative Yuan passed the “minimum tax system,” requiring companies to pay at least 10 percent tax.

“would rather develop service and non-polluting high-tech industries than the heavy-polluting petro-chemical industry” (Lin 1987).⁶ Later, in the 1990s, the government used “sustainable development” to justify further expansion of the industry and science parks. There was little change in government discourse when the Democratic Progressive Party (DPP) took power in 2000, ending 50 years of Kuomintang (KMT, the Chinese Nationalist Party) rule. The slogan “Green Silicon Island” adopted by former President Chen Shui-bian during his election campaign was emblematic of the claim that the industry combines economic growth and environmental protection. By this time, however, the negative impacts of the allegedly clean national industrial model had become increasingly apparent.

From Awareness to Action: the Evolution of the Movement against High-Tech Pollution

Although anti-pollution movements proliferated in Taiwan from the early 1980s, they targeted heavy industries such as petrochemicals and manufacturers of plastics. It was only in the late 1990s that public concern about the environmental impacts of the high-tech industry erupted, and later still that the movement extended its protests to the expansion of both science parks and the high-tech industry itself. The widening of the movement’s target was largely due to the dramatic growth of the semiconductor and opto-electronics manufacturers, the two most important branches of the industry. By 2007 together they accounted for 50.1 percent and 40.9 percent of the total turnover of the science parks and employed 8.5 percent of science park employees (NSC 2008); in 2008 they comprised 34 percent of Taiwan’s total exports (Editorial 2009). Moreover, the semiconductor and opto-electronics industries are not only the most capital- and chemical-intensive among the science park industries, they are also the biggest users of water, power, and land, as well as the main producers of toxic hazards.

There’s no doubt that the industry’s continued expansion has given the anti-high-tech campaign greater scope and urgency. But to understand the evolution of the movement, we also need to examine the changing strategies, composition, and ideology, as well as the process of political learning that has occurred over the three main periods of its trajectory: 1997–1999, 2000–2005, and 2005–present.

The emergence of public awareness of high-tech pollution (1997–1999)

In 1996 and 1997—as semiconductor companies rushed to construct new factories, celebrate their lead in the global market, and expand their record-breaking production capabilities—two different incidents fractured the two-decade-old illusion that “high-tech equals low pollution.” A rash of serious fires in the HSP sent several firefighters to the hospital for chemical poisoning, causing huge concern

⁶This was the view of anti-pollution activists campaigning against the Lee Chang-rong Chemical Plant in Hsinchu.

among local residents. In the second incident, considerable quantities of wastewater flowed into irrigation channels, rain drains, and rivers in the area surrounding the HSP. It was this story that became national news. On October 29, 1997 the first major national newspaper report on high-tech pollution was published in the *China Times* with the headline, "HSP disorderly discharged wastewater; a thousand hectares of farmland polluted?"

Further news reports continued to shock the public, but within two months a corporate backlash brought the media campaign to an abrupt end. In reaction to the news reports, the Association of Industries in HSP announced a boycott of the *China Times* and withdrew all advertising. In official letters the association attacked the series of "negative" news reports, implying their content was "against the truth," "denied the contribution of the companies in the HSP to national economy," and "damaged the goodwill and reputation of the member companies of the Association of Industries in HSP."⁷ The boycott ended after the newspaper's chief editor, deputy director, and local branch editor visited the association to apologize.

Although the media disclosures were quickly suppressed, they did expose the previously unpublicized issue of high-tech pollution and gave birth to the movement. The news reports grabbed the attention of environmental veterans from the Hsinchu Pollution Prevention Association (HPPA), which had formed after a chemical dispute in the 1980s.⁸ HPPA then mobilized other organizations to keep a watchful eye on the environmental problems associated with science parks, especially Hsinchu. In response to their lobbying, in 1998, the National Science Council published the first-ever environmental protection report on the HSP, and then in 1999 established the first institutional mechanism for monitoring high-tech hazards: the Environmental Monitoring Group (EMG). These developments ushered in the next phase of the movement, during which environmental activists addressed high-tech hazards through institutional participation. Finally, it is notable that the international exchange has largely contributed to the local awareness of high-tech pollution. As a result of the efforts of the Taiwan Environmental Action Network (TEAN),⁹ in the late 1990s the local groups in Hsinchu first developed their international linkage with the Silicon Valley Toxics Coalition in the U.S. In 2001, delegates from the Silicon Valley Toxics Coalition visited Taiwan, bringing stories of the dark side of Silicon Valley. The international linkage between Taiwanese and international societies has lasted to date.

⁷Official Letter of the Association of Industries in HSP, December 18, 1997.

⁸The HPPA was founded in the late 1980s after the successful campaign against the Lee Chang-rong Chemical Factory. Residents near the factory, who had suffered from severe pollution since the early 1980s, turned to collective action after failing to get a response from the company or the government. They blockaded the factory gates three times from 1986 to 1988. The final blockade, lasting 425 days, got the factory closed.

⁹The organization was founded by several Taiwanese graduate students who studied in the U.S. in the late 1990s. Their collective action began with the international campaign to save the habitat of the Black-faced Spoonbill in Tainan County. In 2006, TEAN registered in Taiwan and began to pay more attention to the movement against high-tech pollution.

Dilemmas of institutional participation (2000–2005)

Between the late 1990s and early 2000s, residents and environmentalists in Hsinchu were concerned about various environmental problems, including wastewater pollution, odors, groundwater contamination, waste solvents, and a suspicious cancer cluster found in Ta-chi village, where villagers had no access to tap water and relied on groundwater for drinking and irrigation. There were other notable cases of environmental pollution and disputes at this stage:

(1) *The Shengli Accident*. In 2000 the Shengli Firm, which processed 80 percent of the toxic waste-solvent generated by semiconductor companies in the HSP, dumped unprocessed toxic solvents in the Chishan River. As a result, water supplies for more than 2 million people in the Kaohsiung metropolitan area were shut off for two days. Defining a suitable location for treating the waste solvents generated from high-tech companies then became a major movement issue.

(2) *Disputes over the Environmental Impact Assessment (EIA) of the United Microelectronics Corporation (UMC) factory*. In 2000 the Hsinchu Environmental Protection Bureau ordered the UMC to halt the trial operation of their new factory, which was located in a protected water resource area, until the EIA was complete. The CEO responded with a media campaign attacking local government, claiming that the companies inside the HSP were models of “high profit with zero pollution” production.¹⁰ The central government intervened to get the EIA approved, ending the dispute ten days later.

(3) *“Green Oysters” in Hsinchu*. In 2001 the *China Times* reported that scholars had found oysters that had turned green due to heavy metal contamination on the Hsinchu coast (Tsou 2001). The government denied the pollution and accused the scholars of contravening academic ethics on neutrality. To reassure consumers and combat protests by local oyster farmers, the Premier ate raw oysters on national television.

Initially the main strategy of local environmentalists engaged in the mounting disputes over high-tech hazards was participation in the Environmental Monitoring Group. But they soon found this was ineffective. The EMG was designed to apply scientific methods to investigate and monitor pollutants and by doing so eventually prevent pollution. It was also set up as a model of democratic participation in environmental affairs, because it brought together scientific experts, environmentalists, residents, and representatives from the industry and state environmental protection agencies. In practice, however, environmentalists found that while they participated in institutionalized EMG activities, high-tech contamination remained unidentified and unresolved. A key obstacle was that environmental regulations had not been updated to reflect the rapid changes in high-tech production, so the

¹⁰Quoted from an advertisement by UMC in the *China Times* on May 15, 2000.

hazardous effects did not actually violate the law. Moreover, monitoring pollution through scientific studies proved inadequate, because the methods used were defined by outdated regulations and excluded findings based on residents' experiences of pollution. The efficacy of the EMG was also undermined by inadequate independent funding, resources, and its statutory position. Furthermore, administrative manipulation by the Hsinchu Science Park Administration (HSPA) hindered attempts to identify pollution and left no room for solid, critical studies. For example, the HSPA vetoed epidemiological studies designed to establish health impacts proposed by environmentalists within the EMG.

Such inadequacies triggered the emergence of more confrontational movements, including a community-based environmental monitoring group and a campaign against the HSP Sludge Incinerator. In June 2001, assisted by environmentalists and scholars, residents in a neighborhood near the HSP suffering from unbearable odors set up the Ker-yuan Neighborhood Community Sniff Group. Residents were encouraged to volunteer for a course that trained them as "sniff masters," able to detect and record dangerous odors. Records were then sent to scholars for analysis, which in turn were posted on the Hsinchu Foundation website¹¹ and released to the media. With coherent data on chemicals and release times, residents and environmental organizations were better equipped to identify sources of pollution and pressure the science park and companies. This monitoring network not only offered a new approach to community mobilization, it succeeded in getting the HSPA and the companies to divert the wastewater that was the source of the smell. The emphasis on residents' daily experience challenged official notions and methods of defining and detecting pollution, while highlighting the need to consider human suffering.

The campaign against the HSP incinerator also revealed the limitations of the EMG and showed the effectiveness of grassroots mobilizations. This incinerator was designed to use waste solvents as fuel and resolve the disposal problems faced by high-tech companies after the Shengli accident in 2000. Although the Executive Yuan (the Taiwanese Cabinet) granted planning approval in 2001, the EMG committee did not learn about the project until the HSPA started construction in 2003. Since the legality and legitimacy of the incinerator were in question,¹² the EMG formed a special working group of scholars, experts, environmentalists, residents, and businessmen to monitor the incinerator once it started operating in 2004. Although the group identified numerous shortcomings in safety, when their reports failed to get operations suspended, they took the matter to the neighborhoods. Residents and environmentalists subsequently demonstrated on the streets,

¹¹The Hsinchu Foundation is an independent environmental organization founded by a veteran environmentalist in 2000. Its membership has overlapped with the HPPA's, and the two organizations have cooperated extensively.

¹²The HSPA used a loophole in the EIA Act: it designed the incinerator's capacity just 5 tons below the legal threshold for an EIA review.

protested outside HSPA buildings, lobbied to freeze the incinerator's budget, and sought support from the International Campaign for Responsible Technology (ICRT), a global citizen-based network and support group, which the Taiwanese movement has been part of since its establishment in 2002.¹³ The residents' and environmentalists' year-long campaign succeeded in 2006 when the Legislative Yuan ordered the HSPA to close the incinerator. The conflict over the HSP Incinerator drove environmentalists towards a more confrontational strategy that achieved their goal. But their success also had an immediate backlash: it resulted in the re-shuffling of the EMG committee and removal of environmentalists from key positions.

During this period, movements against high-tech pollution were mainly confined to the local Hsinchu area and lacked the capacity to challenge the high-tech industry's unsustainable production and expansion. With only limited resources and manpower, institutional participation in the EMG drained environmentalists' energies. And the EMG monitoring model—which relied on official, elitist science to identify pollutants and advocated a technological-fix approach to remedy the problem—continually limited their actions. The identities of local residents involved in the community campaigns also inhibited widening demands. Although the Keryuan Neighborhood Community Sniff Group and the Alliance Against the Hsinchu Science Park Incinerator fought successful campaigns, both dissolved after their specific demands were met. Neither showed interest in the industry's impact on other communities or in challenging its expansion. Many residents active in these protests were employees of high-tech companies, and while they were prepared to defend their living environment, they were unwilling to raise broader issues that might put their jobs in jeopardy. Building broader alliances between environmental movements and high-tech employees who potentially suffer double hazards remains a big challenge.

Towards an environmental and social justice movement (2005-present)

Since the mid-2000s, a much broader-based movement against high-tech hazards in Taiwan has emerged, and campaigns have been waged in different parts of the country in response to revelations about high-tech pollution. The most notable are:

- (1) *Official confirmation of “green oysters” on Hsinchu seashore.* In 2006, five years after the problem was exposed, the government finally acknowledged the existence of contaminated oysters (Pan 2006). It used taxpayers' money to shut the oyster farms and compensate the farmers for their losses but refused to sponsor research to identify the sources of the pollution.

¹³This international exchange and support network was established to connect organizations, workers, academics, and activists who confront high-tech negative impacts globally to hold the industry and governments accountable to its host communities. For further details see: http://www.svtc.org/site/PageServer?pagename=svtc_int_campaign_responsible_tech.

- (2) *Farms salinated by wastewater from Central Taiwan Science Park (CTSP)-Phase One and Two.* In 2006 tests by the local environmental authority showed that electrical conductivity in the wastewater was four times higher than the maximum allowed by regulations. The saltwater contamination damaged about a thousand hectares of farmland and resulted in the loss of rice crops (Lu 2006).
- (3) *Arsenic air pollution associated with science parks.* In 2007 researchers revealed that the arsenic used in the semiconductor and opto-electronics industries was polluting the ambient atmosphere in areas surrounding science parks. In the vicinity of CTSP-Phase One and Two, where there are 400,000 residents and six universities, arsenic levels were over twelve times higher than before operations began (Chung et al. 2007).
- (4) *Pollution of the Shiaoli River by two leading opto-electronics manufacturers, the AU Optronics Corporation (AUO) and Chuanghwa Picture Tubes, Ltd. (CPT).* Pollution of the Shiaoli River, (officially registered as a first grade, or top quality, water resource) affected the drinking water of 36,000 residents and the irrigation of 1,500 hectares of farmland downstream. As a result, the Environmental Protection Administration was obliged to deliver drinking water to residents in the Hsinpu District of Hsinchu County for more than a year.¹⁴

At the same time, the expansion of science parks since the mid-2000s has provoked a much more coordinated resistance movement and new strategic alliances. The EIA reviews for the new science parks have revealed the industry's thirst for land and water sources, as well as its intention to exploit the powerless to fuel its expansion. Some of the movement's major political breakthroughs have come through its participation in the EIA review of the Central Taiwan Science Park-Phase Three. In 2005 the DPP government appointed environmental scholar and veteran campaigner, Chang Kuo-long, as head of the Environmental Protection Administration (EPA). He then nominated several environmentalists as EIA committee members, opening new political opportunities for enhancing the capacity of the movement. During their period in office, these committee members reviewed the EIA reports and found that the environmental and health impacts of the proposed expansion were very serious and that the EIA report contained numerous flaws.

¹⁴Farmers found that spiral shells (notoriously resistant to many pesticides) and shrimps had disappeared from the river, and rice plants were maturing without ears. Tests by the Taiwan Irrigation Association, for example, showed the river contained high levels of electrical conductivity, total nitrogen, chloride, and sodium carbonate residues that exceeded standards for irrigation water. Other tests showed that the river and nearby wells contained organic compounds, heavy metals, and some rare toxic substances. In 2008, the EPA warned the residents not to drink water from the Shiaoli River and began delivering drinking water. However, it later claimed it was safe and complied with regulations.

CTSP-Phase Three comprises the Houli site and the Chihsin site situated in the north and the south of the Houli District in Taichung County. Each site had separate EIA reviews. Both the Houli and Chihsin sites had been selected because the land was easy to acquire, and the companies involved preferred these sites. However, both sites were inappropriate for high-tech industry for a number of reasons. These included the health risks posed to residents who already have abnormally high cancer rates associated with a local steel plant, paper mill, and incinerator. The sites are located in an area renowned for producing highly valued flowers and fruit, and which, according to the government's own regional plan, is suited to agriculture and ecological tourism. Air pollution from volatile organic compounds (VOCs) threatens to affect a water treatment plant adjacent to planned sites in Houli District, which provides drinking water for half the population of Taichung City and County, more than 1.3 million people. The toxic wastewater could easily pollute rivers, soil, groundwater, harming agriculture, fisheries, and coastal ecosystems. As proposed, CTSP-Phase Three requires 137,000 tonnes of water per day, making the total demand of the CTSP equal to one-third of the total household water consumption in Taichung City and County. Moreover, to solve potential shortages, the government plans various projects to divert water from river and irrigation systems to the science park. These water diversions will jeopardize replenishment of the two main rivers in central Taiwan, leading to the drying up of more than 4,700 wells and damaging the livelihoods of farmers and fishermen. In Houli District, which will bear the greatest impact, over 50,000 people work in agriculture. Since no compensation is planned, the project will destroy their livelihoods.

Despite these serious flaws, the EIA reviews were approved in 2006 following state intervention in line with the investment schedule of AUO, the main user.¹⁵ Although the environmental camp failed to stop the development plan for the construction of CTSP-Phase Three or to force a second phase EIA review, they used the opportunity to enhance their influence by creating new institutional channels and non-institutional fronts outside the EIA process. The most crucial thrust came from the six environmentalists on the EIA committee who worked collaboratively on the Central Taiwan Science Park cases. As a result of their efforts, a broad informal alliance was formed between local farmers and several prominent environmental organizations: the Wild at Heart Legal Defense Association, the Taiwan Environmental Action Network, the Taiwan Academy of Ecology, the Ecological Education Center of Kaohsiung Teachers' Association, and the Taiwan Watch Institute.

Strategically, the environmentalist EIA committee members have used their power to publicize the key environmental, health, and social impacts of the new development plan. By attaching conditions where possible to cases that were approved and following up the EIA reviews, new battlefields were created for the

¹⁵The uneven power structure of the EIA committee, which consists of fourteen experts nominated by the Head of the EPA and seven representatives from governmental departments, left room for government intervention.

resistance movement. The alliance has taken its systematic critique of the EIA review to the Committee of Regional Planning in the Construction and Planning Agency as well as public hearings in the Legislative Yuan. By collaborating with one pro-environmental legislator, they forced the National Science Council to hold two legally binding public hearings, which benefited the farmers and environmentalists who later brought the cases to the administrative court to prove that the EIA review was passed without proper evaluation. The outcomes favored local farmers. In January 2008, the Taipei High Administrative Court repealed the conclusion of EIA review of the CTSP-Phase Three Chihsin Site; and in 2010, the Supreme Administrative Court, an appellate court in Taiwan's lower court system, dismissed the EPA's appeal and formally nullified the conclusions of the EIA review of this case.

The EPA, however, instead of suspending construction at the Chihsin Site, defended the legitimacy of the EIA review. Backed by the National Science Council, it alleged that responsibility for protecting the interests of corporations lay with the government and was consistent with the public interest. It also attacked commentaries published by scholars and environmentalists in the national media and placed advertisements in national newspapers reproaching the Supreme Administrative Court and denouncing its verdict as "invalid, meaningless and sabotaging the EIA system."¹⁶ Such arrogance on the part of the authorities only served to stimulate wider social support for the farmers and the environmental organizations.

Based on the experiences and the multiple fronts constructed during the campaigns against the CTSP-Phase Three and the Shiaoли River pollution, the environmental movement was able to launch serious campaigns during and after the EIA review meetings over the CTSP-Phase Four in 2009, including taking the case to the Taipei High Administrative Court after the EIA review. In July 2010, ruling in favor of farmers, the Taipei High Administrative Court ordered the Executive Yuan to suspend the development and operation of both the Chihsin Site of CTSP-Phase Three and CTSP-Phase Four. The EPA and NSC have appealed this ruling to the Supreme Administration Court. In an effort to resolve the dispute over the Chihsin Site, the Premier has announced the principle of "suspending the construction [of the site] without interrupting the operation of existing companies" and instructed the EPA to work to remedy the existing EIA review instead of conducting a new one as the law requires. The newly altered EIA review of the Chihsin Site was accepted by the EPA on August 31, 2010, just two days before the Supreme Administrative Court dismissed the appeals by the EPA and the NSC. Regarding CTSP-Phase Four, the Supreme Administrative Court sent the case back to the Taipei High Administrative Court for retrial.

¹⁶The EPA spent nearly 1 million NTD (US\$33,000) on advertisements in the *Liberty Times*, the *China Times*, the *United Daily News*, the *United Evening Express*, and the *Apple Daily* on February 10, 2010.

The dispute, which continues at the time of writing, is no longer just between the state and civil society. It is also being played out at a higher constitutional level: between the government and the judiciary. As a result, part of the price the government is prepared to pay to solve the crisis over the Chihsin Site is the erosion of the authority of the legal system. More importantly, the farmers and the environmental organizations have not given up seeking justice. They are extending their lawsuits to target both the government officers and the high-tech companies, which continue to illegally operate although the dispute is not yet settled.

During this most recent period, the environmental movement has clearly developed in some fundamental respects. First, unlike the previous stage, it has established a clear position against the overall trend of high-tech expansion. It has widened its focus to include issues of social and environmental injustice resulting from high-tech expansion, such as natural resource depletion and ecological degradation, unjust subsidies to high-tech capital, and loss of livelihood suffered by farmers and fishermen. It has also advocated tighter environmental regulation under the precautionary principle and challenged the dysfunctions of official environmental institutions and the absence of environmental democracy.

Second, the movement's strategy has shifted from a cooperative to a confrontational mode pursued inside and outside institutional channels. The cooperative approach was abandoned when the limitations of institutional participation were revealed. Nonetheless, the movement has retained a flexible attitude to institutional participation.

Third, it has relied on grassroots mobilization. Achievements relating to the EIA reviews were the result of effective networking between environmental organizations and local residents. The environmental organizations did not confine their work to the meeting rooms and internal politics of the EIA review. Instead, they took the issues to the communities and mobilized effective, emotive, grassroots protest. In various campaigns, farmers brought flowers, fruit, vegetables, and ears of rice, and fishermen brought oyster shells to highlight the threats of high-tech industry to agriculture and fisheries. Moreover, these colorful protests by the powerless have caught public attention and undermined the legitimacy of zealous state support for high-tech industry. The farmers against CTSP-Phase Three have also become activists in the wider struggle and have gone as envoys to support and inform farmers and residents in other areas affected by science park expansion.

Fourth, the movement has deployed lay knowledge effectively to challenge decision-making based on official and elite science. Farmers can easily point out the flaws in EIA statements based on their own working knowledge of hydrology, meteorology, farming, and land use. Their statements have strengthened cases put forward by environmentalists on the EIA committee against EIA statements produced by specialist consultancy companies on behalf of developers.

Fifth, the movement now embodies a broad alliance of different social groups and interests. Previous campaigns were usually led by a few environmentalists and academics dealing either with an old community with many newcomers or new communities established after Hsinchu Science Park was created. The fact that most residents depended on HSP employment limited their interests to immediate, concrete problems. In contrast, farmers, who are autonomous from the science parks, now constitute the backbone of the movement. They have organized themselves into citizens' associations against high-tech industrial development and have a totally different orientation from their counterparts in earlier disputes.

Sixth, the movement has also benefitted from the involvement of the most active environmental organizations in the country, which usually have at least one full-time officer and voluntary inputs from professionals—including lawyers and scholars with social science, environmental science, or public health backgrounds. These organizations have also publicized the struggles on university campuses, encouraging students to form various types of support groups, including the Shiaoли River Youth Taskforce and the Anti-CTSP Youth.

Seventh, another significant change is that the high-tech corporations, who for so long have been sheltered by state-owned science parks, have finally become a direct target. One characteristic of the development of Taiwan's high-tech industry is that the state has absorbed social challenges on behalf of capital: it has been the state, not companies, that has dealt with disputes over land, financial support, infrastructure, labor and environmental damage. The campaigns against the Shiaoли River Pollution and CTSP-Phase Three and Four, which involved the same company, AU Optronics, changed this. In both cases, protests were not just directed at the state or science park authorities, but also against AUO.

Subsequently AUO and its main purchaser and shareholder, Acer, which ranks among the world's top five branded personal computer vendors, have become targets of the wider environmental movement. The first major protest against Acer was launched during its Corporate Social Responsibility (CSR) Forum in late 2008. Environmentalists accused it of "greenwashing" by holding the CSR forum while its main suppliers, AUO and Chuanghwa Picture Tubes, pollute local environments. They also denounced the way international NGOs had been invited to assuage Western consumers, while local voices were ignored. Since then, protests against high-tech companies have been held at corporate headquarters, shareholder assemblies, high-tech trade fairs, and graduate recruitment drives on university campuses. Additionally, the anti-high-tech movement has joined the campaigns against the exploitation of workers in some Taiwanese electronic manufacturers, such as Young Fast Optoelectronics in Taiwan and Foxconn in China.

Finally, the international network has continually played an important role in the Taiwanese movement. For example, the protest against Acer's CSR forum in 2008 was helped by intensive information exchange between Taiwanese

environmental organizations, the Center for Research on Multinational Corporations (SOMO), and Greenpeace International.¹⁷ Visits by ICRT coordinator Ted Smith in 2007 and 2009 have contributed to empowerment of the local residents and attracted media attention in the campaigns against Shiao-li River pollution and CTSP-Phase Three and Four.

In sum, the shifts that have occurred since 2005 have enabled the environmental movement to engage with other social movements that challenge the high-tech industry from the perspective of tax justice, farmers' and workers' rights, and corporate social responsibility. Such alliances and joint campaigns have increased the possibility of shattering the industry's false image as flawlessly clean.

The Future of the Movement Against High-tech Industry

Taiwan's environmental movement against high-tech pollution has made important advances in the last five years. But it faces significant challenges. First, although the negative impacts of the industry have been made more visible, the state and global capital have collaborated to strengthen their narrative about their efforts to "green" operations, ameliorate hazardous effects, and comply with international standards. Since the late 1990s, companies have invested proactively in public relations. They have also improved factory operations by introducing environmental technology and management systems designed to reduce fire risks, enhance water re-use efficiency,¹⁸ and comply with international environmental and occupational health and safety standards, such as ISO 14000 and OHSAS 18001.¹⁹ Since the mid-2000s, leading companies have also publicized their commitment to CSR. The case of AUO—polluter of the Shiao-li River and main user of CTSP-Phase Three and Four—illustrates this well. Its first CSR report came out in 2007, and it initiated "AUO Green Solutions" at the beginning of 2008. The company was also among the few Taiwanese companies recognized for disclosing the carbon footprint of several products. For actively responding to the global environmental agenda, AUO has received several environmental awards from the EPA and Taiwan's leading economic magazines.

¹⁷Both international organizations were invited by Acer to be the representatives of social stakeholders in the forum.

¹⁸In 2000, the integrated circuit (CT) manufacturers together with the Energy and Environment Research Laboratories at the Industrial Technology Research Institute (ITRI) formed a "Semiconductor Alliance for Water and Energy Saving." A few semiconductor factories that began production after 1999 have reached an 85 percent water recycling rate.

¹⁹These are the two most important international quality control standards related to environmental management systems and occupational health and safety relevant to high-tech production. By 2000, one-third of the 400 or so Taiwanese companies that had obtained ISO14000 certificates were in the high-tech industry (Ku 2000). Yang (2005) views the changes, such as the adaption of ISO 14000, lifecycle analyses and other environmental techniques, as well as the diminishing use of CFCs among high-tech companies as part of the evidence showing that Taiwan is moving towards the path of ecological modernization.

Countering this official discourse and companies' efforts to protect their environmental credentials will not be easy, especially as companies adopt advanced technology and environmental management systems. But these measures are often little more than "greenwashing." They do not address the core problems associated with the industry's expansion, such as natural resource depletion and social injustice. Moreover, companies continue to adopt aggressive strategies towards environmental impact reports, reject further tightening of command-and-control forms of regulation, and deny the existence of pollution.

The second challenge results from the limited political opportunities created by the democratic transition. The Taiwanese state has moved to institutionalize environmental issues in response to the emergence of the environmental movement against high-tech hazards. The state (1) insists on the high-tech industry's capacity to comply with environmental regulations; (2) places high-tech companies under the supervision of the Science Park Administration; (3) employs allegedly value-free methods to investigate concerns about pollution; and (4) claims that current decision-making processes are consistent with principles of environmental democracy. In reality, legal regulations are outdated and have not kept up with changes in the industry,²⁰ companies conceal their comprehensive lists of raw materials as "business secrets," scientific studies of hazards are limited and selectively deployed, and institutional channels do not respect the exercise of democracy, as the EMG and EIA reviews demonstrate.

As a zealous host country, the developmental state in Taiwan has vowed to provide the best possible service to high-tech industry. In endeavoring to extend the science parks, the environmental and social consequences of the high-tech expansion have been sidelined; the electoral competition, which emerged after the political transition, has exacerbated this tendency. Both the KMT and the DPP have persuaded high-tech capital to increase investments in order to capture more votes. The 2005 appointment of Chang Kuo-long by the DPP government as head of the EPA did open up political opportunities for the environmental movement. But, the DPP has been keen to discard its "anti-business" label and has not been tough on high-tech capital. As a result, the movement still fights on an uneven playing field.

Third, while the global movement has bridged labor and environmental concerns (see Smith et al. 2006), in Taiwan the movement still has to develop a robust red-green alliance (see Chiu, this volume). Employees of high-tech companies in Taiwan are reluctant to take collective action against workplace exposure to hazardous substances. My interviews with semiconductor employees show that frontline engineers and operators are aware of their routine exposure to hazards and feel they are treated like "experimental laboratory mice." But, in the absence of trade

²⁰In September 2009, for example, a source in the EPA's Department of Environmental Sanitation and Toxic Substance Management revealed that the Shiao-li River polluters, AUO and Chuanghwa Picture Tubes, had respectively declared just thirteen and three of the 259 toxic substances regulated by his department.

unions, they only deploy individualist strategies. Numerous voices in the environmental movement are advocating stronger linkages between environmental issues and occupational diseases, workplace safety, and workers' rights. But the potential conflict between environmental protection and secure employment remains a central movement challenge. Collaboration with the labor movement is crucial for developing viable employment alternatives and challenging the formula of "high-tech development equals job creation." While some high-tech employees have joined local campaigns against high-tech pollution, it will be vital to encourage them and others to build connections with the wider environmental and labor movements.

The fourth key challenge comes from the limitations of relying on the consumers' movement in the West. How far the consumers' movement can go is still unclear, but given that it leaves untouched fundamental issues like democratizing decision-making in production processes, it cannot be relied on to curb the industry's expansion. The reality is that Taiwanese high-tech corporations can produce goods deemed "environmentally sound" while expanding production, squeezing the livelihoods of vulnerable people, and depleting natural resources. Hence, it is crucial for the global consumers' movement to connect with local environmentalists, grassroots organizations, and the labor force. Only in this way can fundamental contradictions at the heart of the capitalist mode of production and consumption be challenged.

Fifth, democratizing science is another important battlefield. Contests over definitions of high-tech hazards have been central to environmental disputes with the industry, which are shaped by the highly specialist, technological expertise characterizing the industry and the power structures surrounding the politics of knowledge. Because hazardous impacts remain unclear, pollution becomes an issue of risk, subject to evaluation and calculation. In Taiwan as elsewhere, scientific studies and rhetoric are employed by the state and capital to legitimize hazardous production. The causalities between production hazards and impacts on the environment and health are developed as expert knowledge. Lay people's physical experience of pollution and their knowledge of ecological changes as well as workers' understanding of workplace hazards have been excluded from decision-making. Subjection to the authority of professionalized knowledge partly explains why workers are so often silent about high-tech hazards. The movement against high-tech expansion and pollution in Taiwan has used alternative forms of science based on ordinary people's experiences to challenge the authority of official and elite science and technology. But it will need to elaborate more coherent ways of organizing popular knowledge systems and present a more vigorous alternative science.

Sixth, until now environmental movements have only produced limited visions of alternatives to high-tech economic development. The two main alternatives are: first, sustainable and responsible high-tech industry, which rejects the omnipotent role of the market; and second, sustainable agriculture, which responds to the squeezing of farmland and threats to rivers and coasts. Beyond these, there is ample

room for the movement to elaborate feasible and more sophisticated alternatives that place environmental and social justice at their center.

Finally, the case of Taiwan shows that the connection between local and international organizations is vital for the movement challenging high-tech capital in the era of corporate capitalist globalization. Through these cooperative actions, some Taiwanese multinational corporations for the first time met the protests and pressure that they are familiar with in the West in Taiwan. The environmental movement in Taiwan, which is the home country of many multinational high-tech manufacturers, has a critical strategic role in tackling the pollution in both high-tech production and e-wastes. To achieve this, an obvious obstacle is how local poorly resourced organizations can manage to maintain their international participation while they are engaged in exhausting local campaigns.

References

- Berger, S. and R.K. Lester, eds. 2005. *Global Taiwan: Building competitive strengths in a new international economy*. Armonk, New York: M.E. Sharpe.
- Byster, L. and T. Smith. 1999. High-tech and toxic. *FORUM for Applied Research and Public Policy* 14 (1): 69–75.
- . 2006. From grassroots to global: The Silicon Valley Toxics Coalitions's milestones in building a movement for corporate accountability and sustainability in the high-tech industry. In *Challenging the chip: Labor rights and environmental justice in the global electronics industry*, ed. T. Smith, D.A. Sonnenfeld, and D.N. Pellow. Philadelphia: Temple University Press.
- Castells, M. 1992. Four Asia tigers with a dragon head: A comparative analysis of the state, economy and society in the Asian Pacific rim. In *States and development in the Asian Pacific rim*, ed. R.P. Appelbaum and J. Henderson. Newbury Park, CA: Sage.
- CEPD (Council for Economic Planning and Development). 1982. *Record of economic conferences for ten year* [in Chinese]. Taipei: CEPD.
- Chen, Chia-hung. 2005. Two high-tech giants criticized for negative tax contribution [in Chinese]. *China Times*, February 22.
- Chung, Li-hwa, Yuan Shih-chung, and Su Meng-chuan. 2007. Arsenic pollution in the air in Taichung is more serious than mining area [in Chinese]. *Liberty Times*, February 8.
- Editorial. 2009. Why does the scale of export in Taiwan decrease to 1/2 of export in South Korea? [in Chinese]. *Commercial Times*, July 9.
- Ku, Young. 2000. *Environmental strategy for high-technology industries: Current status and discussions* [in Chinese]. Taipei: Research, Development and Evaluation Commission of Executive Yuan.
- Leighton, M., N. Roht-Arriaza, and L. Zarsky. 2002. *Beyond good deeds: Case studies and a new policy agenda for corporate accountability*. California Global Corporate Accountability Project, Business and Human Rights Resource Center.
- Lin, Song-ching. 1987. Capital reallocates investment as a reaction to protests against pollution [in Chinese]. *United Daily News*, December 15.
- Lu, Jin-tzu. 2006. Farms polluted by the wastewater of Central Taiwan Science Park [in Chinese]. *China Times*, April 7.
- Lüthje, B. 2006. The changing map of global electronics: Networks of mass production in the new economy. In *Challenging the chip: Labor rights and environmental justice in the global electronics industry*, ed. T. Smith, D.A. Sonnenfeld, and D.N. Pellow. Philadelphia: Temple University Press.
- HSPA (Hsinchu Science Park Administration) 2009. *2008 Annual report*. Hsinchu: HSPA.

- Mathews, J.A. 1997. A Silicon Valley of the East: Creating Taiwan's semiconductor industry. *California Management Review* 39 (4): 26–54.
- Mazurek, J. 1999. *Making microchips: Policy, globalization, and economic restructuring in the semiconductor industry*. Cambridge, MA: The MIT Press.
- NSC (National Science Council). 2008. *2007 National Science Council annual report* [in Chinese]. Taipei: NSC.
- Pan, Kuo-cheng. 2006. Fisheries Agency confirms the oyster in Hsiangshan polluted [in Chinese]. *China Times*, May 10.
- Pellow, D.N. and L. Park. 2002. *The Silicon Valley of dreams: Environmental injustice, immigrant workers and the high-tech global economy*. New York: New York University Press.
- Staff report. 1980. President Chiang: We should develop technology and upgrade industries in order to achieve modernization [in Chinese]. *Economic Daily News*, December 16.
- Saxenian, A. 1991. Institutions and the growth of Silicon Valley. *Berkeley Planning Journal* 6: 36–57.
- Smith, T., D.A. Sonnenfeld, and D.N. Pellow, eds. 2006. *Challenging the chip: Labor rights and environmental justice in the global electronics industry*. Philadelphia: Temple University Press.
- SVTC (Silicon Valley Toxics Coalition). <http://www.etoxics.org>.
- Tsou, I-hui. 2001. Oysters in Hsiangshan and Kingma found seriously polluted [in Chinese]. *China Evening Express*, January 9.
- Yang, Li-fang. 2005. Embedded autonomy and ecological modernization in Taiwan. *International Journal of Environment and Sustainable Development* 4 (3): 310–330.