

## **CHAPTER FOUR**

### **Conclusion and further studies**

#### **4.1 Conclusion**

America has a more advance semiconductor industry; especially the Silicon Valley in California was the starting point of the sector. American economy benefited from the technology superiority of the semiconductor industry. But it is not without cost, due to the toxic chemicals used in the production process, and insufficient environmental awareness, pollution was rampant in California and it has highest concentration of superfund sites, total of 29 superfund sites and 20 of those sites were result of the high tech electronic industries production (Mazurek, 54). During much of the 50s, firms accumulated capital, by 60s American corporation begun to shift it to overseas, and establish production facility in the newly industrialized countries. In the eagerness for the economic expansion, they over look American example; Taiwan pursuit economic prosperity without regards for the ecology, and is now suffering from the externality of development.

The natural environment is scarce and limited, and the state of natural system is

decline at an increasing rate. The corporations had become very efficiency at exploiting the environment for profit, and scarcity means that firms could not keep producing the way they had infinitely. A wide variety of the toxic industrial wastes are releasing into the ecology, and there are no natural processes to absorb and digest them. In the competitive market without make added investment, the easier way to decrease costs is to retrench employment or incurred less operation costs such as treatment of toxic waste. Paul Hawken the author of *The Ecology of Commerce*<sup>1</sup> believe that the price system of economy does not reflect the true cost of the products produce, for example the final products of semiconductor consist of very little of the input used during the production process, since most of those input are water, energy and chemicals. The waste generated during this production without proper treatment cause environmental pollution, and this cost to society was not included in the price consumers paid for their high tech products, therefore the price is greatly under what should be paid. As the production increase, wealth of semiconductor producers increase, but it would also cause more pollution, thus raise the social cost, it was as Marx state in his theory of the accumulation of capital. Instead of the raising in price of the high tech product to reflect the increase in terms of environmental costs, the price had fall in order to retain the competitiveness of Taiwanese semiconductor firms

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<sup>1</sup> Hawken, Paul. *The Ecology of Commerce*. New York: The HarperCollins Publishers, 1994.

in the global market.

In order to accumulated capital, entrepreneurs manipulated ecology and workers to gain unstable competitiveness, as the environmental conscious is raising fast and the production method are still behind time, Capitalist have no way of improving pollution prevention method used in the current production without incurring large expensive thus increase cost. Therefore most Capitalist put up a good show of been environmental conscious, but they had behave in the way that is harmful to ecology and workers. Although in the way part of the problem is that there is not enough proper waste treatment facility in Taiwan, as the supply of such facility has fallen behind the demand made by production. At same time the monitor system of government lack the authority and resources to make it effective, and that add to the incentive for firms to behave in the way that is irresponsible.

As income raise, people started to be more environmentally aware, and they realized that the economic developments over past twenty years were built on the environmental sacrifices. On the other hand the firms still produce goods as they had before, and people has began to question the production method of the firms. As more and more pollution incidents are expose to the public, firms realize that the economic growth is no longer excuses for pollution and they have to be responsible for the

pollution damage they had cause in the past, and even more important is that pollution preventive measure had to be taken. In the discussion of the environmental pollution cases above, it can be seen that government had favor industry, as firms could amass more resources to engage in lobby for their own interests, because of the resource they commend they were power to be reckon with. As government blind by the short term advantage offer by the Capitalist, people who suffered from the contamination have no channel in which to ask for help and support. The worst situation is that often the culprit who were cause the environmental contamination could not be identify because source of pollution is from Industrial Park, and the substance that actually cause the contamination is not list as control substance by the EPA, as can be seen from the pollution in the rivers near Hsinchu Science Industrial Park.

As can be seen from Chapter Two and Three we can see that support of the central government, there is lack of compromising on the part of corporations, and the local government was worst off from the bargaining. With concentration of power, the local government lack authority in dealing with environmental pollution cause by corporation, since it could be control by many other departments in the bureaucratic system. And because of this reason oversight by the authority is often, since there is complicated definition of jurisdiction. With this loophole the corporation was able to manipulated situation to its advantages, for example the land use control. By changing

the land use on the polluted site, corporation was able to make profit out of contaminated land. But the contaminated land poses as direct threat to the local residences, it could expose they to the harmful substances, up to today there is very few study done on the contaminated sites by government or private institutions.

Taiwan's natural environment is very vulnerable, and bureaucrats cannot effectively control and monitor the whereabouts of the chemical waste. With inadequate environmental laws, the growth in production volume could only cause worst pollution. The inadequate regulation also means that corporation got off lightly when they pollute, since the punishment imposed by government far out weight by the gain from pollution. And by allowing the change of land use control government is under suspicion of collusion with the corporation for profiteering purposes, local government, workers and local residence were left to pay the price and coped with the consequence, local authority can do little to regulate the behavior of corporation, since they do not have the necessary power.

In the past decade, Taiwan industry had accumulated capital and also begun to export capital to developing countries such as Mainland China, because of the cheap labor and production costs as well as the large local market. In 2002, Taiwan Semiconductor Manufacturing Company announced the plan to invest in the

production plant of eight inches wafer in China, although there was many political obstacles this move was inevitable<sup>2</sup>. As companies had shift the production facility to area with more advantage, they are also reallocated resource and revenues as well, social and environmental problem were left behind, society, as a whole were worst off only Capitalist benefited.

Under Coase theorem, without transaction cost, government regulations would not lead to the Pareto optimum result; the parties would reach mutually beneficial agreement between themselves. The utilities should be compared, the damaging party and damaged party could negotiate to reach a mutually beneficial agreement, and compensation from one party is pay to the other. In the case of the river pollution, the value of the clean river is compare to the value of the semiconductor products produced<sup>3</sup> (which mostly is made for consumption outside this country, not for consumption of domestic consumers, and the gain from the sale of the products belong to the few individual in the industry). However the reality is not that simple, it's difficult to put the value of clean river into the monetary terms, the river pollution affected all living beings and it has spin-off affects, and it is obvious that the total cost to the environment have to be weight against the total gain of the production. One of

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<sup>2</sup> Young, L. W. " Interviewing Morris Chang/Morris Chang: TSM would start production in China next year " Dong Shan News. 26 Apr. 2002.

<sup>3</sup> Coase, Ronald C. "The Problem of Social Cost." *Journal of Law and Economics* 3 (1960):1-44.

the most important assumption of Coase theorem was that the damaging and damaged party can bargain on the equal footing, in reality it is not always true, in the industrial pollution case most often the Capitalist has more resources than the victim, at same time with asymmetric information, it is difficult for victims to specified the cause of pollution, much less proof guilt of the firm, also the asymmetric information make risk avoidance impossible. Therefore the under Coase the fairness was over looked, since it was only concern with social Pareto outcome measure in monetary terms.

It is very important for the public and NGOs to participate in the decision making process, as decision will have great impact on the living standard of the local residence and it is only fair to allow them some say, as they are the one who will be most affected by any change. People were not the only one who opinion were overlooked, the local government who lack the authority and resources to control activities in the park, since the central government receiving bulk of the revenue from the park, and the rent seeking acting by the entrepreneurs take place within the high rank bureaucracy, large firms within the park is a power to be reckon with, in the fight between UMC and Hsinchu City government<sup>4</sup> had demonstrated this very clearly.

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<sup>4</sup> Chung LC., High-Tech Fantasies: Hsinchu Science Based Industrial Park and Local Development. 2001.

UMC's fifth production plant had not conducted environmental assessments prior to the operation, and EPA had not demand it of them until the operation is ready to start, and production plant was shut down by EPA, and numerous fines given. UMC claim that they had been unjustly wrong, and the city

Right now, it is critical to establish communication channels between government, firms, Non governmental Organizations, and residence. And improve public awareness of the environmental situation, so there would be participation from people.

The lack of co-operation and co-ordination between the NGOs means that they have weak influence on the society, therefore government and firms tend not to take them seriously, and their opinion was ignored. The NGOs and residence should be part of decision making process, because they live and interact with local environment, their input is valuable.

The transparency of information is very important, right now the measure of the pollution in the area of Hsinchu had done by the Environmental Monitoring Team of Hsinchu Science Industrial Park and Hsinchu Foundation. The control substances in the water pollution were not relevant in the semiconductor pollution since it does not test for the extent of contamination by toxic industrial waste. Also the result of the test for contamination should be disclosed to the public, without such information it is difficult to prevent the future incidents. Semiconductor firms tend to view the inputs used in the production process as top trade secrete, therefore prevention before hand

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government is conspired against the firm, and that city government mayor and officials obtain illegal gain. In the end central government mediate between the two parties, both side agree to settle the dispute, however Hsinchu City Mayor, secretary, and department head of Hsinchu EPA was charge with misconduct and sentence to one year to two year and six month, UMC won the fight on all round.

had almost become impossible, and it is a situation with little likelihood of changing, as trade secrets are jealously guarded by the all corporation.

Proper environmental regulations for the semiconductor firms had to be developed and install, although it is not easy as can be see by the struggles of American environmental programs, but it had to start somewhere. As the natural ecology hangs on fine balance, and the mass consumerism of the capitalism economy had upset that balance, and natural resource had be exploited at alarming rate, the protection had to be place on the environment and restriction place on production.

As mention before US government implemented certain environmental programs such as the Common Sense Initiative, project XL. Those programs were to enhance the understanding and improve regulation on the semiconductor industry, also to make information more transparent between parties. At same time it was hoped that the government, firms and NGOs could work together to decrease pollution. Also the US EPA have regulations such as right to know act, Toxic Gas and Hazardous Materials Storage Ordinance, Hazardous Material Storage Ordinance, and Toxic Release Inventory. The above regulations is to provide public information regarding the toxic substances used in the production, this way the people were more aware of the danger of pollution in the area. Information transparency would decrease the cost of the

pollution.

## 1.2 Future Studies

The effect of the semiconductor production on workers and environment had remain unknown, and had just started in United States. As Taiwan's semiconductor industry had been developed for more than twenty years, it is about time an epidemiology being done on the workers of semiconductor industry. This is a daunting task, but as there are number of workers in largest export sector, whose health expose to hazardous chemical in the workplace, yet remain ignorant about it. Although it's quit difficult, but hopefully with the information and data we are able to collect, it is hope that we will be able to know the effect of the toxic substance on human and it's prevention

Right now the most urgent matter is to allow public access to the information regarding the substance used in the semiconductor production. In Taiwan lack of the information had provide obstacles to the establishment of effective laws, and more information would help in the establishing waste treatment facility to treatment hazardous industrial waste. At the rate of the production, more infrastructures

concerning the waste treatment should also be a priority in the government policy.

If we look at the US environmental programs, it was not successful, but it was a step towards better environmental programs in the future, and at this point simply giving up is not an option since the pollution create great burden on society.

Also a new set of control substance and their measurement tailor made to monitor semiconductor production had to be establishes. With out it, laws cannot be implement, and standard cannot be set.