

# **A Welfare Approach to Mitigating Environmental Injustice: Exploring Needs of Pollution Victims**

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## **SUMMARY**

This article defines the social welfare needs of residents living in a severely polluted community by examining a set of communities around the An-shun plant in southern Taiwan that were polluted by dioxin. The study examines the inhabitants' economic status, the communities' manpower utilization, and the prevention of social contingencies and the provision of aftercare. A survey conducted between March-April 2008 revealed the need to reduce poverty in these highly polluted communities, to identify and maximize each community's human resources, to address illness, aging, pollution, and lack of professional skills, and to better inform residents about pollution so that they can understand how to protect themselves. The article concludes with suggested programs to meet the social welfare needs of residents in a highly polluted community.

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## INTRODUCTION

Although environmental pollution and protection have been key issues in environmental governance and sustainable development for decades, only recently have the social aspects of environmental issues begun to attract global attention. It is argued that environmental issues involve both the ecosystem and the social system (Wapner, 1997), and therefore technical solutions such as pollution clean-ups are by themselves simply insufficient to solve all the problems resulting from environmental pollution. People who are victims of environmental pollution, especially those lacking resources, deserve the same attention as the physical setting because they are more vulnerable to the effects of environmental deterioration than people who are better off. In the past two decades, the United Nations has started to address the importance of helping the poor in this regard. One landmark, the Millennium Development Goals, was developed out of the United Nations Millennium Declaration and signed in September 2000. “Eradicate

extreme poverty and hunger” and “ensure environmental sustainability” were listed as two of the eight international development goals (United Nations General Assembly, 2000; United Nations Millennium Goals website). Following that, the 2002–2004 World Resources Report asserted that better environmental governance should include a specific promise to look to the needs of the poor because they are most vulnerable to environmental degradation, and their opinions and ideas are rarely heard in environmental decision-making (United Nations Development Program etc., 2003: 16). In addition, Environment and Poverty Times, published by a collaborating center of United Nations Development Program called GRID-Arendal, asserts that eradicating poverty is an indispensable requirement for sustainable development (Johnson, 2005: 1).

Why do underprivileged people in particular deserve our attention with regard to environmental pollution? First, underprivileged communities are frequently selected as the sites for industries known to pollute the environment or for hazardous waste treatment/storage/disposal facilities because the land in those communities is cheap and the property taxes are low. Moreover, the opinions of residents in such communities can be easily suppressed because of their inferior social status (Bullard, 1990; Lake & Disch, 1992; Lake, 1993). Poor people are usually excluded from the environmental

decision-making process, and once a policy is made, they are usually powerless to change it. One well-known example of this occurred when the North Carolina state government insisted on creating a polychlorinated biphenyl (PCB) landfill at Warren County in 1982 despite a negative environmental evaluation and the concerns of the local inhabitants (Labalme, 1987: 2; Labalme, 1988: 23; Stocking, 1993). Empirical studies have shown that minority or low-income people bear more environmental risks than others (Freeman, 1972; Asch and Seneca, 1978; Gianessi et al., 1979; United Church of Christ Commission for Racial Justice, 1987; Bullard, 1990; 1992; Bryant and Mohai, 1992; Gelobter, 1992; U.S. Environmental Protection Agency, 1992; Sexton et al., 1993; Sexton and Anderson, 1993; Kuehn, 1996; Sexton, 1997; Perlin et al. 1999). The environmental justice movements have, as a consequence, begun advocating for the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (Office of Environmental Justice website).

Second, when pollution occurs, poor people are more vulnerable to environment damage than others because they often depend greatly on natural resources (such as well water, water products, collectible forest products, etc.) for subsistence (United Nations

Development Program etc., 2003: 16). If the environment deteriorates, their very survival is immediately threatened. In addition, pollution can bring about not only ecological deterioration but also economic decline. The shutting-down of an industry or the lowering of its production rate because it generates pollution will drive the unemployment rate of the polluted area higher. In addition, agricultural and fishery products from polluted areas will lose their market value, thus reducing the incomes of local farmers and fishermen. Residents who can afford to leave the polluted area will do so, leaving behind only those who cannot afford to leave. Consequently, the entire polluted area becomes even poorer. The methyl mercury pollution caused by Chisso Company in Minamata City, Japan, is a famous example of a city declining due to industrial pollution (George, 2001).

Indemnities for victims of environmental pollution alleviate their economic emergency only temporarily. In Taiwan, it has become a popular and convenient government strategy for suppressing complaints from polluted communities to offer cash reparations because a clean-up project usually costs much more. For people who are economically deprived, cash reparations are a quick way to relieve their poverty, even if the relief is only temporary. However, if cash reparations seem to be an “effective” means of solving the problem, the government has less incentive to conceive

and implement a long-term plan for sustainable community development. This article strongly argues that it is necessary to understand the social welfare needs of the affected population before proposing strategies to deal with environmental injustice and to develop sustainable community programs in polluted areas.

This article seeks to define the social welfare needs of those who reside in areas of severe environmental pollution by examining the case of the dioxin-polluted communities surrounding the An-shun PCP manufacturing plant (An-shun plant) in Tainan city, which is located in southern Taiwan. The An-shun plant dioxin pollution is quite typical of cases of severe, sizable environmental pollution, and the communities that have been polluted have been deteriorating socially and economically. Residents who consumed products grown in nearby ponds have been suffering for four decades from high blood levels of dioxin and bad health. At present, the polluted area has the highest poverty rate in the entire city (Tainan City Government, 2005). The income of some residents may not even reach subsistence level. In order to provide policy suggestions that will meet the social welfare needs of these residents, we need to identify the multiple facets of those needs.

The first part of this study examines the pollution history of the An-shun plant, and this is followed by a review of prior research and a framework for analysis. Data

analysis and discussion follow, based on the results of a personal interview survey conducted in the polluted areas. The research results have extensive applicability in particular to other polluted areas in Taiwan, but to other polluted areas in the world as well.

## BACKGROUND TO THE DIOXIN POLLUTION OF AN-SHUN PLANT

The now-defunct An-shun plant, located northwest of Tainan City in southern Taiwan, was identified as a pollution remediation site by Environmental Protection Administration (EPA), Taiwan in May 2004. The plant had been established by the Japanese company Kanegafuchi Soda in 1942 to produce a variety of chemical products including hydrochloric acid, caustic soda, liquid chlorine, as well as poison gas for the Japanese navy. When Taiwan's government took over the plant at the end of World War II in 1945, it turned the plant over to a state-owned company named Taiwan Alkali Industrial Corp (TAIC). Placed under the supervision of the Ministry of Economic Affairs in the 1960s, the An-shun plant started to produce pentachlorophenol (PCP)-related products—pesticides, herbicides, antifungal agents, bactericides, and wood preservatives. These products were exported mainly to Japan. By the early 1970s the plant had become Asia's biggest producer of the pesticide

dichlorodiphenyltrichloroethane (DDT). In 1982 the government shut An-shun down both for economic and environmental reasons, but these were kept confidential at the time; the government also stockpiled 5,000 kilogram PCP at the plant site (Huang, 2002). Declassified government documents show that one of the main reasons the government shut down An-shun was that some officials were aware of mercury pollution around the plant site. However, despite this knowledge, the government took no action either to prevent the further spread of pollution or to forbid the consumption of water products grown in these contaminated areas (Wang, 2005).

The Chinese Petroleum Corporation (CPC Corp), another state-owned enterprise, bought out TAIC in 1967. In 1983, right after the An-shun plant ceased to operate, the government ordered the plant property made part of a CPC Corp subsidiary, the China Petrochemical Development Corp (CPDC). CPDC was privatized in 1994 (China Petrochemical Development Corp, 2007: 107–108). Although the An-shun plant did not generate any environmental pollution after the merger with CPDC, it was still surrounded by the very serious environmental pollution generated during its four-decade-long operation. The major pollutants are pentachlorophenol, dioxin, and mercury (Huang, 2002; Research, Development, and Evaluation Commission, 2006). The mud at the bottom of nearby Luermen River has the highest dioxin level of all the

rivers in Taiwan. In January 2006 the dioxin concentration in one ditch on the site was found to be 64 million toxic equivalents, or TEQ ng/m<sup>3</sup>, which is 64,000 times the accepted standard (MacFarquhar, 2006). The dioxin level in fish caught from the reservoir (which was used by TAIC as a toxic waste dump) was as high as 28.3 pg-TEQ/g, as compared with the 4pg WHO-TEQ/g that the World Health Organization (WHO) has set as a safe level for human consumption. A record-high dioxin level—247pg-TEQ/g, or more than 60 times the WHO standard—was found in fish from the reservoir in 1995 (Huang, 2005). For decades, residents have been economically and nutritionally dependent on catching and selling fish, oysters, shellfish, and crabs grown in nearby reservoirs, fish farms, and ponds. They were never informed of the danger of eating these water products.

Looking into demographic statistics of An-nan district, in which the An-shun plant is located, we find that the residents' average educational attainment is lower than that of other districts in Tainan City. In addition, the district's poverty rate is the highest in the entire city (Tainan City Government, 2005). Although the existence of dioxin pollution in nearby areas seems to have been widely accepted, and although warning signs have been placed in the critically polluted areas, some residents refuse to take this warning seriously. This is understandable, as these people, who have depended upon the

nearby waters for their food all their lives, find it difficult to believe that the fish in the water are poisoned; it is therefore not surprising that even recently people have still been catching and selling water products from the polluted areas (Tsai, 2005; Liu, 2005).

A study conducted by National Cheng Kung University at the request of the Tainan City government tested blood samples of 570 residents living in Hsien-gong, Lu-er, and Si-tsau townships, which surround the An-shun plant. The results show that 72 percent have higher levels of dioxin in their blood than the tolerance limit set by the United Nations, with the average level being 71.1pg as compared with the accepted level of 32pg. One local resident has a blood dioxin level of 951pg, the highest recorded in Taiwan. The average dioxin level of blood samples from Hsieng-gong township, located right next to the An-shun plant, is the highest of the three townships (Chang and Chen, 2007). Dioxins are carcinogens that can cause birth defects, diabetes, immune system abnormalities, and many other health problems when exposure is excessive. The cancer rate in polluted areas is higher than it is at clean sites. For example, the death rate from cancer between 1999 and 2003 in Hsien-gong township is 39.3 percent as compared with the national average of 25.5 percent (Wang, 2005)

In July 2005 the Ministry of Economic Affairs agreed to set aside NT\$ 1.3 billion

(US\$ 40 million) for a period of five years to compensate victims of dioxin pollution from the An-shun plant. However, the government stated that the compensation would be distributed only out of humane consideration. It held that the government should not bear responsibility on behalf of CPDC, a privatized company. Those registered as resident in Hsien-gong, Lu-er, and Si-tsau townships before June 30<sup>th</sup>, 2005, are entitled to get a monthly cash payment of NT\$ 1,814 (US\$ 55) per person. People whose blood level of dioxin is higher than 64pg-TEQ/g lipid will get NT\$ 3,000 (US\$ 91) a month, and those who have become physically or mentally handicapped or seriously ill because of the pollution will receive NT\$ 15,840 (US\$ 480). The relatives of people who died as a result of the pollution will be entitled to a one-time payment of as much as NT\$ 200,000 (US\$ 6,061) in compensation. These monthly payments are intended to pay for the continuing medical treatment of various illnesses, including cancer, as well as for social welfare and living expenses (Tainan City Government, Bureau of Social Affair website). However, residents have complained that the monthly payment of NT\$ 1,814 per person is insufficient to cover their medical bills and other expenses. Many seriously ill residents are seeking state compensation on grounds that the plant was owned by the government at the time it produced the dioxin pollution. The changed ownership of An-shun plant, however, has made the issue a lot more complicated. In November 2007,

although the pollution occurred when the plant belonged to the state-owned TAIC, the Highest Administrative Court held that CPDC was responsible and ordered the company to pay both the compensation and clean-up costs (Tainan City Government, 2007). Since it was held responsible for cleaning up the dioxin pollution, CPDC started to propose a clean-up plan to the government in 2008 (Cheng, 2008).

## PRIOR RESEARCH AND ANALYTICAL FRAMEWORK

### *Prior Research*

One major concern when discussing environmental pollution issues is how to compensate those physically and mentally harmed by pollution. This study shifts away from the more familiar issues of simple monetary compensation to discuss the broader social welfare needs of residents in polluted areas. In addition to much analysis regarding compensation, prior research on the victims of environmental pollution can be divided into two groups: the first addresses environmental injustice, such as the works of Freeman (1972), Asch and Seneca (1978), Gianessi et al. (1979), United Church of Christ Commission for Racial Justice (1987), Bullard (1990, 1992), Bryant and Mohai (1992), Gelobter (1992), U.S. Environmental Protection Agency (1992), Sexton et al. (1993), Sexton and Anderson (1993), Kuehn (1996), Sexton (1997), Perlin et al. (1999).

These studies show that disadvantaged people are, by and large, the victims of pollution because it is they who usually live in unclean, polluted areas. The situation is created primarily by discrimination. The second group includes studies aimed at promoting “just sustainability”; these analysts focus on blending environmental justice with sustainable development (Agyeman and Warner, 2002; Agyeman et al., 2002; Agyeman et al., 2003; Agyeman and Evans, 2004; Agyeman, 2005). These studies assert that a sustainable society must also be a just society, and a just society is one in which peoples’ rights to a clean and safe environment cannot be denied on the basis of race, class, or economic status.

To date, little or no empirical research has been carried out to explore what the residents in polluted areas actually need for their future lives. This article argues that in order to make any compensation policy meaningful for the affected communities, it is first necessary to comprehend the specific needs of the community’s residents.

#### *A Framework for Analysis*

Although the concept and boundaries of social welfare are ambiguous, changing, and blurred (Dolgoft and Feldstein, 2000:13), setting a clear definition is necessary before we can use the concept to examine the needs of residents of polluted areas. Social

welfare can be so narrowly defined as to include only residual welfare services for needy people or so broadly defined as to cover education, housing, and employment for all. The narrow definition, based on individualism, assumes that poverty results from personal dysfunction. The government's responsibility is to provide the least possible safety net, and only for the poor. The broad definition, grounded in a collective perspective, assumes that poverty arises out of fundamental socioeconomic circumstances and the lack of access and opportunity. The government's responsibility is to provide broad program coverage to ensure full opportunity, economic security, and basic social goods (Gilbert and Terrell, 1998: 17–19).

It is very difficult to find a social welfare system that is either purely individualistic or purely collectivist in orientation because the government is always held responsible not only for the disadvantaged but also for all its citizens. As Marshall (1965: 258–259) states, the foundation of social welfare policies should not be limited to the individualist perspective because the total welfare of a society is more than the sum of each individual's welfare. The concept of a welfare state goes beyond both individualism and collectivism. It asserts that the mission of the government is to enact various policies that increase the citizens' welfare in situations where the market can not operate effectively. Briggs (1961: 228) states that the government should modify ineffective

market forces by: (1) guaranteeing individuals and families a minimum income; (2) narrowing the extent of insecurity when individuals and families encounter certain social contingencies; and (3) ensuring that all citizens are offered the best available social services without distinction of status or class.

This article examines three aspects of the social welfare needs of residents in polluted areas, namely, the economic status of each household, manpower utilization in the area, and social contingency prevention and aftercare. First, what are the residents' income sources and what constitutes a subsistence level of income? With regard to manpower utilization, are unemployed residents able to and willing to participate in job training? What do the children and young people need at this point in their lives, for they are the community's human resources of the future (Gough, 1979)? The last analytical dimension, social contingency prevention and aftercare, focuses on the residents' health. To what extent are the residents satisfied with the existing health care services provided specifically for the polluted communities, and what level of understanding do the residents have about the pollution in their communities?

## METHODS

To identify these social welfare needs, a personal interview questionnaire that included

both structured and open-ended questions was employed. The questionnaire was developed from a conceptual framework that included the economic status of the household, area manpower utilization, and social contingency prevention and aftercare. A pre-test was carried out one week before conducting the official survey, and this pre-test permitted fine-tuning of the final questionnaire. In the questionnaire, most of the structured questions asked the respondents to describe their relative agreement with each statement on a four-point Likert scale ranging in value from 1 (the lowest) to 4 (the highest). The higher the value an item received, the more the respondent regarded that item as being important, had experienced it to a great extent, or was satisfied with it. A few of the structured questions asked the respondents to select from among multiple-choice answers. The open-ended questions asked the respondents to elaborate on their thoughts if the structured questions did not fit their situations. To reduce bias in the interview outcome, all interviewers were trained well before the survey was conducted.

Based on a total of 1,383 households in the three polluted townships, Hsien-gong, Lu-er, and Si-tsau, an acceptable sample size for the questionnaire survey was determined to be 301, at a 95 percent confidence level and 5 percent confidence interval. In order to match the population proportion among these three townships, the 301

samples were distributed among them proportionally. A systematic sampling technique was used to select the households to be interviewed. Every respondent had to be at least 18 years old. The interview survey was conducted during March-April 2008. The collected data were entered in the SPSS version 10.1 statistical software program, and the data analysis was based on the various statistical reports generated.

## RESULTS AND DISCUSSIONS

The unit of analysis of this study is the household. The overall internal consistency reliability of the questionnaire as assessed by Cronbach's Alpha is 0.87.

### *Demographic Profile of the Survey Samples*

The respondent demographics reflected several common features: old age, low education level, and low income level. The mean age of respondents was near 50 years old, and 42 percent were over 60. A low education level is reflected by the mean value of 3.39 (standard deviation = 1.62), which places the average education level of the respondents between elementary and junior high school. Most of the respondents (69 percent) did not have high school diplomas, and nearly one-fourth (23 percent) declared that they were illiterate. Poverty in the polluted communities is reflected by low

household income. More than one-third of the respondents (36 percent) claimed their monthly household income was under NT\$ 20,000 (US\$ 606), as compared with the 2007 national average in Taiwan of NT\$ 92,390 (US\$ 2,800) (Directorate-General of Budget, Accounting and Statistics, 2008). Nine percent of the respondents indicated that their major income source was the government's welfare cash benefit.

#### *Findings on Economic Status of Household*

The economic status of a household was examined through household consumption and expenditures and through gifts and remittances sent to or received from others. The purpose here was to investigate the residents' financial shortfall in attempting to maintain a minimum quality of life. To evaluate household consumption and expenditures, the survey asked the respondents to evaluate their households' financial sufficiency on food consumption, non-durable goods (toilet paper, shampoo, laundry detergent, etc.), services (hair cuts, phone service, insurance, education, etc.), and durable goods (furniture, electronic appliance, motor vehicles, etc.). The findings, as displayed in Table 1, show various levels of insufficiency. Half of the respondents, 51 percent and 50 percent respectively, indicated that they felt their consumption of food and non-durable goods was either slightly insufficient or very insufficient. When it

came to the items regarding services and durable goods, most of the respondents, 71 percent and 84 percent, respectively, felt their consumption was either slightly insufficient or very insufficient.

[Insert Table 1 here]

The inflow and outflow of gifts and remittances partially reflect the economic status of a household. The survey asked the respondents to evaluate the dollar value of the gifts and remittances they sent to or received from others, namely, friends or non-profit organizations, if it had occurred in the previous year. It is worth emphasizing that the survey did not include gifts or cash donations to temples because of the prevailing local culture. In Taiwan, most of the rural population believe in Taoism or Buddhism, and in both the act of donating cash, gifts, or time to a temple implies a wish for good luck in return. Because of this, such donations often become a habit even when the household is under a tight budget. According to the survey results, although 28 percent of respondents did send gifts or remittances to others, their yearly donation was very small. Among those who were willing to identify a dollar value for their yearly donation, most of them were below NT\$ 5,000 (US\$ 150). Regarding gifts and

remittances received, only 8 percent of the respondents have gotten help from others in the previous year. Most refused to elaborate on how much they received from others.

The survey results provide a more detailed picture of the economic status of the residents of An-nan district. The 50 percent of the respondents who consider their consumption of food and non-durable goods insufficient deserve more attention. Obviously, these residents barely met subsistence level. The Chi-Square Test at each consumption level showed statistically significant ( $p < 0.01$ ) associations between consumption levels and gifts or remittances sent to others (see Table 2). However, the same test did not show any association between consumption levels and gifts or remittances received from others. This result reveals that the residents who were incapable of achieving subsistence level by themselves did not necessarily obtain help from others.

[Insert Table 2 here]

#### *Findings on Manpower Utilization*

The survey explored manpower utilization in terms of current human resources and future manpower. The first dimension examined the willingness of unemployed

residents to return to the labor market. The second looked into the current needs of children and young people. Unemployment is a serious problem in the polluted communities. The survey findings show a total of 50 (17 percent) currently unemployed breadwinners, and among them, 35 have been unemployed for more than two years. Most of these unemployed breadwinners used to work either as laborers or fish farmers. In addition, unemployment is related to poverty in the polluted communities; the Chi-Square Test shows statistically significant associations ( $P \leq 0.05$ ) between unemployment and economic status at four consumption levels (see Table 3).

[Insert Table 3 here]

When asked about the primary reasons for their being unemployed, the laborers most frequently answered because of sickness, old age, or lack of professional skills. The fish farmers most frequently cited pollution and old age. Accordingly, there are three issues that deserve more attention in addition to the high unemployment rate in the polluted communities. First, aging seems a serious factor causing unemployment, and there appears to be a gap in the generations in the polluted communities, with the very young and the old, but not many working-age individuals. Once a breadwinner grows

too old to work, the entire household's subsistence is automatically threatened. Second, the lack of professional skills makes it difficult for able-bodied laborers to find jobs. Third, because of water pollution, the professional fish farmers have lost the entire world on which they depended for survival.

Regarding the willingness of the unemployed to return to the labor market, fewer than half were still searching for job opportunities in the past month. The most popular methods of searching for jobs were through recruitment advertisements or networks of family and friends. Most of the unemployed residents did not seek help from government-established "job placement centers." Although these unemployed residents were willing to participate in job training programs, most did not know what professional skills they wanted to develop. Some elaborated in the open-ended question that they would take any kind of job offered as long as they could make a living. Obviously, the survey results show that a significant number of human resources in the communities are idle, and this is significantly associated with poverty.

In examining future manpower by looking into the current needs of children and young people, the survey found that dioxin pollution had stigmatized the polluted communities and caused mental damage to the children and young people, who felt inferior to their counterparts living in clean areas. In addition, many children and young

people had also lost family members to dioxin-related illnesses. Because they are the community's future human resources, on which its sustainability depends, the welfare of children and young people deserves significant attention. The survey looked into this issue by investigating the respondents' perceptions regarding the futures of the children and young people in their households and their perceptions as to the current needs of the children and young people in their households.

The results reflected the residents' ambivalence toward their own communities. Among 174 out of 301 sample households with at least one child or young person, as high as 91 percent (158) of them indicated they wished their children would learn more about their own communities. However, as high as 55 percent (95) hoped that their children would be able to leave the polluted areas in the future. Obviously, the adult residents showed ambivalence about their communities. On the one hand, they hoped that their children would understand more about their local culture and how the communities have suffered from pollution, but they also wanted their children to escape from the stigmatized communities and find a better life. In traditional and rural areas like Hsien-gong, Lu-er, and Si-Tsao townships, the guidance of parents or family elders can be a very important factor for young people choosing their future life. If the adults keep encouraging these young people to leave the community, the community may

encounter difficulties in the future. When a significant number of young adults leave a community, aging and poverty problems grow.

With regard to the current needs of the children and young people in their households, 69 percent of the respondents who had child or young persons in their households revealed the need for routine assistance in reviewing homework and preparing for course examinations after school. When asked if their offspring were emotionally influenced by all the unfortunate events and disadvantageous situations caused by pollution, only 29 percent answered “yes.” However, when it came to an item regarding the need for psychological counseling in order to rebuild the confidence of their children, only 18 percent answered that there was a need. This finding appears to reflect a traditional attitude of Chinese parents or family elders toward their children. In rural areas like the three polluted townships, the academic performance of children is always at the top of the parents’ priority list. Parents usually believe that a good academic performance indicates their children will have a better chance to earn a better living. In addition, parental misunderstanding of the function of psychological counseling deters many people from utilizing it. If parents perceive that psychological counseling is for people who are mentally dysfunctional, they will not use such services because they do not want their children to be doubly “stigmatized.” This may explain

the greater need felt for school work assistance and the much lower desire for psychological counseling.

#### *Findings on Social Contingency Prevention and Aftercare*

Social contingency includes problems related to old age, sickness, and unemployment (Briggs, 1961: 228). In the polluted communities, aging and sickness are closely associated with unemployment, and both aging and sickness require health care. In order to prevent the residents' health from being further harmed by pollution, it is important for them to understand about pollutants and how to protect themselves. This part of the survey explored the residents' understanding of the pollution problem in their communities. Regarding contingency aftercare, the survey examined how residents perceived the health care services provided for them.

The survey results show that a number of residents still do not have precise understanding about the pollution around them or the toxicity of dioxin. Half of the respondents were not articulate about the pollution problem even though fighting about the problem has been going on for a decade. Ten percent still do not know about the toxicity of water products grown within the pollution control site or do not believe those products are toxic. In addition, 35 percent stated that they were still not clear about

toxicity of dioxin.

The survey results show that as high as 46 percent of respondents were themselves or had a household member who had a dioxin-related illness. Another 17 percent were not sure if their illness (or that of a family member) was associated with dioxin pollution. Concerning current health care services, 82 percent were satisfied with the accessibility of services provided by the community health center, but 22 percent were unsatisfied with the services themselves. Survey respondents believed that the medical equipment as well as the quality and quantity of medicine should be improved.

## CONCLUSION

Nowadays justice has become a critical issue in solving environmental pollution problems. As a consequence, the needs of residents in polluted areas deserve public attention in addition to clean-up operations. The needs of victims of pollution are multi-dimensional, and so justice in any environmental pollution case can be achieved only if governments develop feasible and suitable programs that address all the problems at hand and that truly benefit pollution victims. Although the An-shun plant pollution case is local to Taiwan, its characteristics and the disadvantaged social status of many of the communities affected by pollution are very typical of severe and sizable

pollution sites globally. By examining the most serious dioxin pollution case in Taiwan, this study has attempted to provide a perspective on defining the social welfare needs of pollution victims, which may then help governments design and formulate policies to promote community sustainability.

The research findings underscore that poverty can be a serious issue for residents in polluted areas. The reasons for unemployment among able-bodied household breadwinners may include pollution-related illness, the loss of markets for local products due to pollution or stigmatization, or the migration of business away from the community. In such a deteriorating community, the strategies for poverty reduction should focus on temporary poverty alleviation for the truly needy households and maximization of current manpower. Welfare cash benefits can be distributed based on a means test in order to ensure that those households which can barely reach subsistence levels of income can survive. For maximizing current human resources, strategies can include promoting work incentives for able-bodied adults, providing job training and placement programs for residents who are willing to return to the labor market, and so forth.

This study also identified aging as a serious issue in the polluted communities. A deteriorating community without a sustainable future and job opportunities can drive

able-bodied residents away, leaving only the elders behind. Therefore, developing future manpower is as important as maintaining current manpower and should be considered an important element in achieving sustainable development for polluted communities. Two kinds of services surfaced from the survey results, the first of which is routine assistance for children in their academic or school work. This is one way to improve their academic performance so that they will have the confidence to pursue advanced education. The second service area, mental counseling to reduce the trauma that has resulted from the pollution, did not receive much approval from most respondents at the An-shun plant pollution site. It is worth noting, however, that the respondents may have misunderstood the function of psychological counseling.

The last part of this study emphasized the importance of health education and of providing the best available health care services for pollution victims. People who have been highly dependent on nearby natural products for their living may have great difficulty believing that these products are toxic. To protect residents from further damage by pollutants, therefore, health education should be promoted. In addition, clinic health care services are important for residents who suffer from pollution-related illness. Providing high-quality health care services to pollution victims can help to build trust in the government. If victims remain skeptical about the health care services that

the government provides, they will be less likely to visit the health center even when they desperately need its services.

These findings and discussions have led us to a general conclusion. The social welfare needs of residents in environmentally polluted communities are a multi-dimensional, long-term issue. The distribution of cash reparations alone will do little to bring about sustainable development, but will simply alleviate poverty temporarily. To help a highly polluted community recover from serious pollution damage and develop toward sustainability, a long-term package that meets residents' multiple needs is necessary. Because different localities inherit different cultural norms and characteristics, local governments, which are more familiar with local features, can play a vital role in helping design such a program package. In the process of program design, residents should be involved to provide information regarding their true needs. The challenge for government is to design customized program packages that build a "safety net" for the poor and ill while at the same time maximizing local human resources that will help promote community sustainability.

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Table 1 Household consumption and expenditures

	Very sufficient (%)	Sufficient (%)	Slightly insufficient (%)	Very insufficient (%)
Foods	2.3	46.5	47.2	4.0
Non-durable goods	1.7	48.5	43.2	6.6
Services	0.7	28.6	50.2	20.6
Durable goods*	0.7	14.6	51.5	32.9

\* 0.3 percent of the respondents were not willing to answer this question.

Table 2 Consumption at four levels associated with sending gifts and remittances to others

	Pearson's Chi-Square	P Value
Foods	15.797	0.001
Non-durable goods	14.937	0.002
Services	16.539	0.001
Durable goods	22.574	0.000

Table 3 Consumption at four levels associated with unemployment status

	Pearson's Chi-Square	P Value
Foods	18.233	0.000
Non-durable goods	18.436	0.000
Services	8.814	0.032
Durable goods	8.126	0.043