

Mechanism of Social Vulnerability to Industrial Pollution in Peri-Urban Danang City, Vietnam

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Abstract—Industrial development has been defined as the key development paradigm in Vietnam which brings to the country both opportunity and challenge. Although economic growth has been introduced to Danang city since the Hoa Khanh Industrial Zone (HKIZ) was set up, local communities around the HKIZ, such as Hong Phuoc village - the study sites have become more vulnerable due to the industrialization process. In the research, observations, in-depth interviews and focus group discussions were used to collect primary data. The study founds that the community is vulnerable because the HKIZ has made them lack access to local resources, such as livable space, land resources, job and diversity sources of income. The community health is at risk while they lack access to the better healthcare systems. Therefore, the development of industrial activities has given little priority to the maintenance of local livelihoods.

Index Terms—Social vulnerability, industrialization, pollution, community development.

I. INTRODUCTION

In Vietnam, since Doi Moi policy, industrialization strategy is firstly considered the most important strategy that target to poverty reduction and World Bank evaluated that Vietnam is the successful case of poverty reduction in 2007. However, in the first period of industrialization, the lack of management, control and monitor industrial waste cause to increase pollution in anywhere industrial zone located. That issue is not only effect to local people's health, it also impact on the agricultural productivities of agricultural land around industrial zones. As the result, the livelihoods of those people are at risk. Again, the policy focus on the 'modernization' of the country but it go along with environmental degradation and the trouble local communities' lives [1].

Danang city is identified as the top of cities in economic growth and the first city target to be the environmental city in Vietnam. However, this city still represent those above unintended consequence as others cities. The industrialization conducts the black side in industrial pollution and vulnerable people who lives around industrial zones. Those people of Danang city already suffer from natural disaster, they now confront with new difficulties. Although HKIZ is the first industrial zone of Danang City that has the waste water treatment plant, its waste water is still over 10 times of the environmental standard. The designed capacity of the plant is 5,000m³/day while total

waste water mass of the industrial zone is 23,000m³/day. Those entire figures mean only 21.7% of the total waste water of HKIZ is treated before being ejected to communities. Hong Phuoc community is the first community that receives the industrial waste water by 2003. And this industrial zone included some kind of companies: Mechanical manufacture, assembly, electronics and garments, Agricultural, forestry and seafood processing, Post-petrochemical products including packaging and plastics. The result of that is the indicator of pollution is also over the environmental stand about 2 to 50 times. Those factories use illegal form of access to gain the local natural environment as the open access for containing industrial waste. They derive benefit from the environment because they can reduce the cost for waste treatment. As a result, the more developed it is, the more polluted it becomes or the more natural resource scarce, impacting local people the most. Hong Phuoc case is representation of what is happening to many communities located around the 219 industrial zones in Vietnam as well as some places in other developing countries.

II. CONCEPT OF SOCIAL VULNERABILITY

A. Definition of Social Vulnerability

From the original meaning of vulnerability as denoting physical pain, the concept of social vulnerability adds greater meaning and different aspects, and is used as a heuristic tool in research from 1980s. It was first used within the discourse on natural hazards and disasters in the 1970s by O'Keefe, Westgate and Wisner (1976). In "taking the naturalness out of natural disasters", these authors argue that people are vulnerable during disasters as a consequence of socio-economic rather than natural factors. In general, social vulnerability means people and their context may be disturbed because they do not have enough capacity to cope with or respond to external or internal stresses [2]. These stresses can be environmental or socio-economic factors at both the individual and collective levels. At the individual level, these stresses can be a lack of capacity to diversify sources of income, or a lack of access to resources. At the community level, collective vulnerability is related to institutional and market structures – those determined by government policies and social trends. However, both levels are interrelated, because when political economy factors change, they not only change the context within which an individual is embedded, but also change an individual's capacity to cope with a new situation.

Although there are a number of definitions of social vulnerability, the concept generally includes three

Manuscript received June 5, 2013; revised September 3, 2013.

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components, namely: (1) an *exposure* to stress, (2) a *capacity to respond to or cope* with stress, and (3) *sensitivity*. Exposure to vulnerability is the degree or duration of negative impacts presented as a consequence of being unable to recover. However, vulnerability is not always damaging, as it also includes a person's response/coping capacity. Thus, in the same situation one person may cope better than another due to this capacity. This component has caused disagreement among scholars; for example, some authors apply "coping ability" to the short-term capacity to deal with stress or the ability to survive, and so employ "adaptive capacity" for longer-term or more sustainable adjustments. Other authors have used the term "capacity of response", meaning a person's ability to take advantage of opportunities and to cope with the consequences of stress. Finally, sensitivity is an important component of social vulnerability, and the interpretation of this also varies across authors. Sensitivity is closely related to susceptibility, but susceptibility only has negative impacts, as it reveals the state of being highly likely to be influenced, harmed or affected by something, whereas the concept of sensitivity is more than susceptibility, because sensitivity is also defined as the degree to which a system will respond to an external stress, and also includes the ability to resist change and the ability to return to a previous condition after the stress has been removed [3].

There are two kinds of research approach in terms of social vulnerability – those that assess vulnerable people/situations using objective measurement and those that use subjective assessments. Where vulnerability is considered an objective assessment, the quantitative approach is used to measure and map-out vulnerability factors and the degree to which they occur on the regional or national scale, in order to develop national strategies aimed at reducing vulnerability. However, scholars aligned with the qualitative approach, such as O'Brien (2009) and Adger (2006), argue that the quantitative approach lacks the dynamic processes and heterogeneous outcomes related to vulnerability, because the measurement generates only indicators of vulnerability. They stress that we need to concentrate on the heterogeneous factors that exist within a specific place and time related to a given period of vulnerability [3], [4].

The qualitative research approach considers social vulnerability as a subject, and here those mechanisms which shape the level of vulnerability are emphasized, in order to examine the reasons why vulnerability occurs for certain people in a given context, rather than measuring only the *level* of vulnerability. Also, the qualitative approach takes into account the dynamic aspects of the process of adaptation, plus the underlying factors that determine adaptive behavior. This group of authors consider vulnerability to have two sides: an external one consisting of risks, shocks and stress to which an individual or community is subjected, and an internal side referring to defenselessness, meaning a person's lack of ability to cope with a damaging loss [5]. However, the qualitative research approach camp still has two groups of views. The first group separates the aspect of vulnerability into outcomes and contexts, so that they wish to uncover the geographical conditions or physical exposure of a place or region – as being important factors in the level of

vulnerability experienced. This group focuses on socio-economic and political processes as the root causes of dynamic pressure and unsafe conditions – and hence vulnerability [6], [7]. However, the other group argues that there is a distinction between the outcomes and the process of vulnerability, and that if this is not captured, there will develop more of a divide with the group that ignores physical and biological systems. The context of vulnerability (ecological and social systems) and its outcomes should be integrated, because one is embedded in the other and cannot clearly be separated [8].

B. Vulnerability Due to a Lack of Access to Resources

From the definition of social vulnerability shown above, access to resources becomes an important element of the mechanisms shaping social vulnerability, because it contributes to the capacity to cope and/or the responses to external or internal stresses. Even faced with the same external stresses, those due to geographic conditions or from institutional change and market structures brought-about by government policies, the different groups, distinguished by their ability to benefit from their resources, have a different response capacity, so may be impacted on different levels.

The notion of access is theorized in terms of the differential access to property rights. Access means the ability to benefit from items such as resources, people or institutions, while property rights are focused more on the right to benefit from social relations. Peluso (2003) links the concept of access to a bundle of power rather than a bundle of rights as per property rights. This bundle of power can be looked at through the mechanisms of access such as rights-based access and also the structural mechanisms related to access. Rights-based access includes both legal and illegal access. A legal right of access to resources is the ability to benefit from those resources as determined by the law, by custom or convention, so that is the property right. Illegal access is based on the sanction brought by custom and practice among actors who then gain benefit from such resources. Moreover, the structural mechanism of access means the ability to benefit from resources as mediated by the specific political-economic policies in place. Therefore, access to resources is the ability to benefit from resources based on the bundle of power that exists in terms of legal and illegal access, as well as the structural mechanism in place [9].

Vulnerable people and locations are usually excluded from decision-making and from access to power and resources. Adger (2001) found evidence of this having taken place in Vietnam since the *Doi Moi* policies were introduced, where the changes in property rights and in institutions and resource management activities - moving from common access to privatization - have caused a change in the ability of people to access coastal resources. Some powerful people, including those inside and outside the study community, are more interested in the private utilization of coastal resources because they gain benefits through commercialization. However, the poor or the powerless, those that rely on the mangrove forests, which used to be common property, have lost their common resource pool, and as a result, the income inequalities resulting have increased the level of

heterogeneity within the community, as well as between community members and outsiders [10].

To sum up, using a qualitative approach, social vulnerability in this study is focused on people who suffer because they do not have the capacity to cope or respond to the stresses resulting from contextual change, such as those caused by industrialization. Industrial pollution and unstable land use are external stresses that have impacted upon the local community. Therefore, through the process of industrial development, the ability of local people to access resources has been reduced.

Research Finding: Mechanism of social vulnerability in industrial process

III. LACK ACCESS TO LIVABLE SPACE

This part consider on the geographical factors of the community's location place as the contextual vulnerability. The concept of livable space is including both natural and social factor of landscape. For natural geographical condition, this section concern to geographical site, topography, climate... In that physical context, social factors focus on people who are living, working in this place. They interact in the mechanism which take away the right to live in the safe place of local people as they have before.

A. Space of Change

The Hong Phuoc community is located in Hoa Khanh ward, Lien Chieu District. Although the whole district is identified as urban district, its characteristics are still a peri-urban area of Northern Danang City which still diverse the physical landscape covering by mountain, river basin, white sand dune, rice field and sea. In Southern of the community, the white sand dune is 1,5m high that HKIZ is established without boundary with the community. In the Western, Thanh Vinh Mountain is the upstream of Cu De watershed which flow cross West-East direction to Danang Sea. So that, the Basin of Cu De River is the rich rice field at Northern of the community and Danang Sea is only 2 km in Eastern (see in the map of research site Fig. 1).

Before the HKIZ establishment in 1997 backing to the Vietnam Independence Day at 30 April 1975, this village had 2630 households lived in the high and clean white sand dune along Bai Sai river, including about 95% of villagers worked as farmers in 360 ha rice field at the basin of river; the rest was a half farmer and a half of officer. Even they were also a poor in term of modern condition, such as having less television, motorbike, etc, they were not absolutely poor because they had opportunities to access to the wealth natural resource. The rice field and garden land were large enough to grow rice and vegetable for seft-supplying and soling. The aquatic production in Cu De River and wetland provided the food for their everyday meal. Some of them collected the forest production for domestic supply from Thanh Vinh Mountain as firewood, animal, mushroom, etc. At this time, the storm and flood sometime happened but the frequency is normal, so that local people could predict and prepared for well adapting and helping. Moreover, the surface water and underground water were clean and free access for domestic using and for agricultural produce.

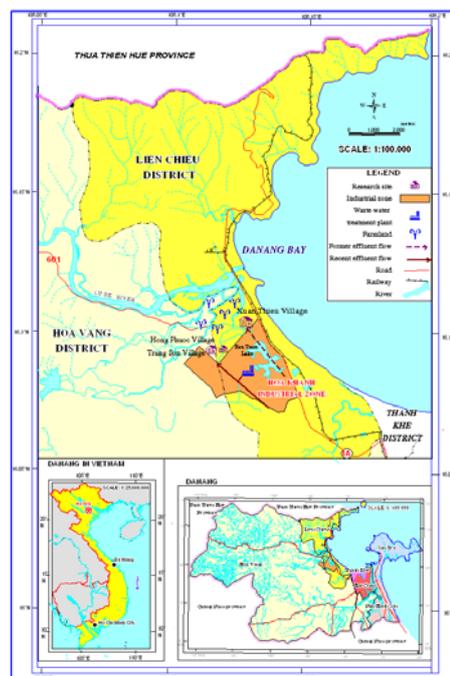


Fig. 1. Research site

Since HKIZ established, the lives of people have been changed. At first period, this community hopes about the increasing of income and living conditions because of the industrial investment. Later on, unfortunately, the trouble of industrial development has added to their live day by day. Their agricultural land and housing land were converted to be industrial land. This causes to the resettlement in unstable way with two or three time moving their house. Each time of resettlement, they were not enough finance from compensation to set up a new life. The community currently is only 86 households within 308 people, which is a third of the former Hong Phuoc village. Each household has around 80m²-150m² for building the house where is illegal converted from their agricultural land. Although they lost the job in farming (100% off-farm now), they are hard to seek a new job because of low education and lack financial investment. Depending on their capacity, their income are diversified sources from working as worker in factory, small seller, waged worker, stolen while sand, official worker, ect. Moreover, since the waste water irrigation of industrial zone move to west-north direction in 2004, Hong Phuoc community become the first place that receives the industrial waste water flowed freely and then through the natural canal of the community to enter to Cu De River. This leads to go up the sickness of local people and to increase the expense for health treatment. Therefore Hong Phuoc community is waiting for migrating because of HKIZ extending and pollution. Although they do not like to move from their homeland, the pollution has made their life was more difficult. They do not focus on working because they are not clear about future.

B. Living in Polluted Environment

From 2003, the state planned to extend the industrial zone with 296 ha to the north-west direction and the waste water irrigation was reconstructed from Bau Tram Lake to the north-west of the industrial zone. Hong Phuoc's area has become the first place where industrial waste water gets in

and its pollution strongly impact into this community member.

The impact of air pollution is not only depends on concentration of air exhaust, it also cause by wind direction and other factor of the weather in a year. First, Hong Phuoc community is in the wind direction of west – north from HKIZ from February and then May to August every year. Characteristics of this kind of wind are dried and hot. The average temperature is around 37°C – 40°C and humidity is under 40%. It means that all air pollution of 131 factories are working are flow through the communities by this wind direction. Moreover, Phuoc Tuong Mountain is in the communities' back prevent this wind and store those air pollution around those community longer time before they spread out.

In a day, the level of community stress fluctuates according to the level of industrial waste water elimination. To avoid the punishment of environmental managers, factories normally eject their waste water from 5PM to 10PM when the environmental departments stop working this is also the return home time of communities' members after a working day. So Hong Phuoc's members are stress with the air emission from the industrial zone and from the waste water canal at this time. Moreover, other factors of weather and industrial waste also add to the space vulnerability. In the dry Season (January – July), the weather is quite dry and hot (35-40°C) and unwind, so the air pollution of factories is more serious. The industrial waste water is less in quantity but stronger in quality because there is no rainfall to dilute it. Therefore, the affected areas are smaller than in the rainy season but the intensity of impact is stronger. This is a development time of parasitic disease and nose disease because of waste ditch-waters and its smell. However, the community still favor the dry season because they do not have to deal with the storm and flood. They are also more opportunities for earning money.

Although the external factors of effect are the same for the whole Hong Phuoc community, such as air pollution, water pollution, it is different among the community member interm of their house location, their age and gender. Currently, the group of 5% the community's households who are living next to waste water irrigation was elected as the most impact from the industrial pollution because they get directly smell from the industrial zone as well as the waste water flowing in the canal. The results of this discussion also show that the old people and mild age women in the community are more stress to the pollution than others because they spend more time in their area. The young people and the children go out of the community for working or studying in the whole day. They are normally in home at the night time. In opposite, the old people who can not seek the new job since they lack farm land, the old women stay at home for taking their family meals, while the old men just walk around their community and sometime play their role in community activities. For the mild age women group, they have less opportunity to find other job because of less education. So they work as labour for rice growing in the next villages and also back home often for taking the family meal. Those old people and mild age women have more time to touch with the industrial pollution.

The lack ability of access to the clean land is continuing with the water resource in Hong Phuoc community. When community member was be asked about environment and pollution, they firstly think about the contaminated canal, river. They realize that the cost of industrial production is partly paid by local people through transferring the waste treatment fee from industrial factory to the fee for drinking water, for diseases of local people because of water and land pollution.

Both underground and surface water degrade their quality because of the pollution. Khe Trang canal use to a common access resource of both communities. They could fish aquatic product and use the water for their agricultural irrigation which is free of charges. The canal is chosen to be a waste water canal; it became a part of industrial zone service and also spreading their pollution around and into the underground water. In fact, before the industrial zone set up, the underground water is open resources access for both communities in drinking and domestic using. Those people now need to connect with the supple water when it "changed the color and smell". This supply system is providing by Danang Water Companies. Each household have to pay around 60-80usd for the first connection but depend on the distance between the house location and the main pipe supple. Then they spend about 1-3 USD/month for water supply fee. This system is provided in 2007 at Hong Phuoc community after the long process of complains about pollution of the local people during 4 years (2004-2007). Even all community member need to use supplied water to replace for polluted underground water. The less economic capacity limited ability to access the supply water of 6 poor household in Hong Phuoc community can not access to this system.

The argument is that the less capacity of environmental agencies applies environmental policies to the practice of industrial zone open more ability for the factories gain the illegal access form through using the environmental around the industrial zone as open access for containing their waste. It means this actor take more benefit from access to the space outside industrial whereas the local communities lose their benefit from those resources and also must spend more for their life in buying water and paying health care fee (will analysis more in next part). The lack of access to stable land for living and safe land for staying and producing is the mechanism which brings the vulnerability to the life of communities.

C. Man-Made Disaster to Man

Ketsana typhoon in 2009 is chosen for analyzing the vulnerability of community members in storm, flood and industrial waste water pollution. The typhoon was considered the biggest typhoon in 40 years. The storm has caused flooding in Danang from Wednesday to Friday (September 30 – October 1) at the highest level since the storm in 1964. The situation of Hong Phuoc community is most vulnerable because they have double risks: typhoon as well as a flood with industrial waste water pollution. The central storm happened from 28/09/09 – 30/09/09 when Hong Phuoc community was moved to Au Co School, a higher level of land, by helping of state union and district army. After storm is the flood time but the industrial zone started work in

1/10/09. When villagers came back home, the flood was still over 1.5 m compared with ground level. It means the waste water together with the rain water flooded their areas in 2 days while people went back home. "We can not recognize our house after the flood because it is too dirty. I think those wastes are from the industrial zone", women in Hong Phuoc community said. Now Hong Phuoc community members felt sorry that their former land was converted to industrial zone land. That land is at a higher level thanks to the sand dune, so it is never flooded like in this place. They think that the resettlement is one reason to turn their life down to the difficulty.

The different economic status of household creates their diversity of coping capacity. 85 destroyed houses equally received the aid of authority 1,500,000VND for one. For the better off and mild income group, they have more assets and lost more in the storm and flood. However, they have more capacity for recovering from that difficulty which support from their income. By contrast, the poor and absolute poor group loss less because they did not have much asset in their house, but their small assets are valuable with them. For example, after the storm, their animals were swept away anywhere; all their furniture of their house was broken. When they came back home, they have to start again from learn and repair their house. People were hungry since they had to invest their time to repair the house, so most of them could not go to work for earning money.

The disaster currently harder to cope than before because Hong Phuoc community was resettled but the new place is lower and can be damaged more by flood than the former land. And the flood is not normal, it polluted. So the livelihood and health of people are deeply at risk. However, among Hong Phuoc community for dealing with storm, flood and the industrial pollution are different. The group of poor household, the old people and mild age women are more vulnerability from those external factors than others group.

To sum up, the community loss their ability to access the livable space as same as they have before. Factories of HKIZ have more power to gain access to this place becoming their produce place and waste contains. Those gainers used the right-based access process within both legal and illegal access to take away the community benefits of safe living place.

IV. EXCLUSION AND INSECURITY OF ACCESS TO LAND RESOURCE

The ability to access the land of local people can be 'lost' through process of conversion of agricultural land to industrial zone in state plans with result that community members have to relocate. In Hong Phuoc, some group of people on process of relocation, they tried to use the illegal form of access to gain the ability for living in their own land. They just move short step from their house land to their agricultural land and setting their new house, new community in their. However, when the industrial zone land is extended, they have to move again some house several times. Therefore, even access concept has both form legal and illegal in their right- base access, ability access is related to "bundle of power".

A. *Insecure live in Industrial Planning*

According to Law on Land of Vietnam, land is "belongs to the entire people with the State as the representative owner" and the state" decide land use purposes by passing decisions and by considering and approving land use zoning and land use plans (hereinafter referred to as land use zoning and planning)". So "The State shall carry out land recovery for use for objectives of economic development in cases of investment in construction of industrial zones, high-tech zones, economic ones and large investment projects as stipulated by the Government." People are a user who have right to use, sale, inherit but anytime have state planning, they have to resettle for that. People are scare of the work "planning" because it means their lives start to change into whatever way which is over their control about future. Therefore, the powerless in access to their resources are more effected by other actors who have more capacity to practice their ideas.

The location of Hong Phuoc community members is unstable because the plan of HKIZ is very short and changes all the time. The way of resettlement and compensation are also changed and apply follow the extension of the industrial land planning. In general, there are 3 group of people interm of moving their house in current Hong Phuoc community, depend on periods of moving have happened in their life. The first resettlement period is from 1997 – 2003 when the HKIZ is firstly established. The a third of original Hong Phuoc village (80 household in 300 original household) are moved, in order to their original land (A) is converted to the industrial land. Most of household moved to many places in Danang City which are far from their village's area. However, about 20 households who have other land in place near by (A), so they move and built a new house in that land (B).

From 2003 to 2005, HKIZ was extended to place (B), so those 20 household would move the second time into the third place (C). Again, the houses which were located in place B had to move out and 61 houses in those groups also move to place (C) where the current Hong Phuoc place newly set up in this period. In the current place, there are existed 5 houses.

Later on, those people knew from authority that they have to move again from place C (current place) because of the industrial extension and pollution around 2006 and 2007. It should be reminded that the waste water canal shifted to this place in 2005 and brought more pollution compared with the time they decided to set down here. They do not know about shifting waste canal before moving. Since the plan of resettlement is noted, four or five years passed and they are still waiting for the third time moving from 2005 up to now.

Mr. Thanh's family is an example for that group of unstable people who have three time of moving. He told bout his family was first moved from their original place to the place which is now a chemical factory. Then, they moved to Hong Phuoc recent area and now they are waiting for the third time moving. He is so boring and tired with moving and establishing a new life. He uses the Vietnamese idioms to explain his life's difficulty: "A good shelter flourishes one's career" and "a house is the most important place of humans, just as a grave of the death". His felling is represented for the comment aspects of Hong Phuoc community members.

B. Exclusion of Access to Land in Industrial Planning

This part focuses more on the process and relation which marginalize the local community in industrialization. It answers the question why local people are exclusion of access to their land.

On the one hand, those people also lack access to the plan information for preparing their long living. They have no opportunity to participate in decision-making of the top-down development plan in both setting up the industrial zone and then extending this. Normally, the first meeting between industrial zone managers, authorities and community members are the meeting in which local people will know information about the state planning and resettlement policies such as the price of land compensation, the new place of compensation, the condition of compensation... local people can discuss about their requests for their future or about the price of compensation. The organizer recorded those requests, which may not be responded. Hong Phuoc community leader said that they are required the priority of job for their community member in the industrial zone. This requirement is agreed by state but when the industrial zone started to work, each factory owner selected workers by themselves without priority, so that their community member was selected as same as worker who come from other provinces.

On the other hand, the plan of HKIZ is top-down planning in a very short period and changes all the time, life of close zone also must change following it. The total area of planning for HKIZ is 423.5ha, including 150ha of existing factories. The first process is 92.5 ha. In 2002, HKIZ was approved to extend 216.5 ha into West-North Industrial Zone so totally using area is 693.5 ha. In 2005, the industrial zone planning extended 110 ha into extending part of industrial zone. This area is remove and compensation by decision of private companies. At that time, the strategy of resettlement depends of demand from rent industrial land of factory. If there is a factory applies for renting industrial land, this inventor will move the local citizen to convert enough land for renting. The strategy is recognized as adaptation with Asian economic crisis. Those issues of industrial planning ford community members to become a passive reaction and suffering in industrial development processes.

Community member is also recognized that they are displacement by process of resettlement. The compensation price on land is normally cheaper 10 time or more compared with the price of market land. The resettlement household has one piece of land in compensation which is more expensive than their own land. For example, the price of compensation is 318,000 VND/m² for compensation of Hong Phuoc community and they have to buy the relocated land which is 1million VND/m². So they are not enough money to buy the compensation land or if try to buy they will not have money for building the house. Some of them are “clear hand” when they invest all compensation money to buy land and build their house. They have no more money for investment of new business. For instance, case of the rich household in Hong Phuoc, who own largest land before resettlement, analyzed that they are loss 22,8000,000 VND after use the compensation to invest for relocation. They had 400m² living land and 5 sào agricultural lands which is total compensated

197,2 million VND. However, they bough a new land and built their house is 220 million VND. They are debtor of the bank now whereas they don’t have agriculture land for cultivation, losing their job and don’t have money for investing a new business. So they have no way to return to the bank (see in Table I).

TABLE I: ANALYSIS COMPENSATION AND INVEST FOR RELOCATION

Items	Area	Compensation fee (VND) per unit (in “1000”)	Compensation(VND) (in “1000”)
Living land	400 m2	318 VND/m2	127,200
Agricultural land	5 sào	8,000VND/sào	40,000
House + others			30,000
Total compensation			197,200
Buy relocated land	100m2	1,000 VND	100,000
Build house			120,000
Total invest for relocation			220,000
After resettlement			- 22,8000

Other choice to deal with that situation, the poor like to buy the land in further central city because it is cheaper price. They sale their right of buying the relocated land which is prior price. They add this money with compensation money and buy the cheaper land which is normally far from central city. Each step, they are further several kilometers from original land and deeper into the mountain now. Most of them seems unlike the new place where they will move to because it is ‘too rural’ compared with his peri-urban area now.

To sum up, the community is exclusive of access to land because of several factors in the industrial development process. First, they lack access to the plan information for preparing their long living while the plan of HKIZ is top-down planning in a very short period and changes all the time. Second, they have no opportunity to participate in decision-making of the top-down development plan. It fords community members to become a passive reaction in industrial development processes with moving their house so many times. Third, by the cheap compensation price on land, the industrial planning is displacements resettlement process to local people. Therefore, the exclusion of access to industrial planning is one of mechanism turning the life of people down to vulnerability.

V. LACK ACCESS TO JOB OPPORTUNITY AND DIVERSITY SOURCE OF INCOME

The capacity of access to job and diversity source of income is import to deal with the contextual vulnerability. Levels of income and assets are critical to determining who is poor and who is not, and employment is a key source of income. If one household has a better situation in terms of income, assets and employment, they will likely have better access to healthcare, educational services, land, water sources and a safe space, so they may also have a better capacity to cope with external stress.

The notion of ‘poor’ in this research refers to those households who are poor according to a definition created by community members, a definition which reflects the perceptions of local people regarding their economic status.

The economic status is not so different among each community members; it is evaluated by income level, asset and construction of their house. Basing on income level, the categories of better off, mild, poor, absolute poor are classified by group discussion in this community. In Hong Phuoc, the better off household have an income of 3-4 million thousand VND per person per month, including only 6 household within 7.06% total community's household. The middle income group who earns 1.5 million VND/month/person that occupies the highest percent with 35.29% total community's household. The poor is highest group (within 49, 11%) which has income lower than 800,000 VND/person. They are separated into two smaller groups: the first poor group is 22 household (25.88%) and the second group is 20 (23.53%). The reason of this separation is explained by living better condition of the first poor group in compared with the second poor group. The last, an absolute poor has 6 households (7.06% total community's household) because they do not have any income and their lives depend on the social security system (see in Table II).

TABLE II: INCOME OF THE COMMUNITIES ARE BASED ON THE HONG PHUOC'S SCALE

Groups of Income (person/month) (unit:1000VND)	Income (person/month) (1000VND)	Number of household	% in total community household
Better off	3,000 – 4,000	6	7.06%
Middle	1,500	30	35.29%
Transient Poor	400-800	22	25.88%
Chronic poor	<400	26	30.59%
Total		84	100%

The local people's job have been changed a great deal since HKIZ was set up. Before the industrial zone was established (1997), almost of them are farmers. After HKIZ was established, the local people's life was more miserable. Their agricultural lands and living lands were converted to industrial land. 100% farmers of Hong Phuoc village lost their rice field land and their garden which used to be grown vegetable for using and selling. Now, all people in the community have to seek a new job for them. Young people work as workers in HKIZ, woodworkers, and security guards. In addition, white sand is the only local mineral resource in this place. It is managed by HKIZ. Some of the local young men steal white sand for sale. It is illegal yet if it is stopped, they do not know how they can earn money. The mild age women normally work as free labour for agricultural activities in the next villages or free and small seller. However, those people are hard to change the jobs. On the one hand, it is not easy to get a job in that industrial zone as its requirement of high education. Hong Phuoc has 50% population in working age meeting education requirement (high school) but some of them are over the age requirement (under 35 years old). So the number of community members are working in HKIZ is limited (only 30 workers is community members). On the other hand, the salary of workers in HKIZ is so low (e.g. the average salary is 1 – 1.5 million VND/month). Those incomes are not enough for their household's expenditure.

VI. HEALTH PROBLEM AND HEALTH SERVICE

A. Industrial Pollution and Health Problem

Health risk is one of the indicators to show the exposure vulnerability in pollution context. The most concern of community members in the interview and group discussion is about their health. People of the community is living with so much worry and stress about the cancer but there is no evidence in the state's record and research presenting the relationship between industrial pollution and cancer patients. The community members pointed out their only evidence: "Cancer appears nearly several years after the industrial zone started to work. Before that our village did not know and have any cancer patient." (The elder of Hong Phuoc community said in an interview January 2010). There are 4 cancer patients and all get sick with liver cancer. Two of them died in 2007. In other case, Ms. Van who is 40 years old. Her mother died because of liver cancer and she 'may' have it because she has some same symptoms with her mum. However, she refuses to see a doctor because she has a poor family with the main income from her small business (selling fish). Her husband is one of the sand stolen workers in the community and they have 3 children in study age. She said "I will keep the 'happy life' until the final day. If I go to see a doctor and the doctor says I have cancer, I can not live in a happy way with my children. And I also do not have money for treatment. So, I will wait until when the God take me". This way of thinking is dominant in both communities, so those patients are normally detected at the final period of sickness.

There is two group of explanation about cancer sickness. The first group of people thinks about the punishment from the God. If he takes any one, it means that person is unlucky and may do some wrong thing in the last life. This kind of cultural belief still remains among community member. People scare to talk about and keep in touch with the patient. However, the second group of members thinks about practice reason of this health problem. Industrial pollution is mainly a cause of this. They explain by the time when cancer appear in their village is overlap with the waste water irrigation change its direction to their area from 2005. Their evidence is that the cancer was not happened before but after the waste water directly flow through their area, the number of cancer patient has increased.

B. Access to Health Care Service

Health care service is the most concern of people who are living in this polluted area. Before industrial zone established, especially before industrial waste water canal shift to their areas, local lives are normal, so that their normal sickness can be treated by local knowledge as using the herbal medicine. If they got some more serious health sickness trouble, they went to hospital and they feel satisfy with this system. However, when the new form of risk come from the new activities in industrial zone which is over their knowledge, so they do not know how to deal with the trouble in their health. They rely more on the health service of the city. But the system now is not enough capacity to response their new requirement.

In the community, the poor households and official people have the health insurance which is given by the state.

However, they do not like to use it because they think the insurance service is not good enough to help them. They do not trust the local hospital and local dispensary. If they have a health trouble, they individually go to the central hospital or private clinics for treatment. In that case, they have to pay by themselves. However, local people can hardly find enough money for that treatment, so they mostly treat the illness by their experience or local knowledge which is transferred through generations or among community members. For instance, they use salt water to wash the skin sickness which is caused by polluted water in rice fields where they have worked... It is acceptable with some normal health problems but also leads to more serious issues. People delay to come to hospital, and they go there when their sickness becomes very serious.

The result from analyzing of low income, asset and jobless showed the poverty of Hong Phuoc, which are caused by reducing the coping/ response of the community in the changing situation from a farmer life to an industrial citizen. First, the limitation of finance is preventing the investment into the new business when the farmer lost their agricultural land, so that it is hard to adapt their livelihood to new context. Second, the low income limits the expenditures for health care and health treatment, leading to more health risks in living in a polluted place. Third, because they have the weak house and less recovery capacity, those poor households are more vulnerable in disasters which are more serious in global climate change and more pollution from industrialization. To sum up, poverty is one of the reasons contributing to the vulnerability of community under industrialization.

VII. CONCLUSION

The aspects of change ability of access to resources are the mechanism of vulnerability in Hong Phuoc community which represents for the vulnerability communities around industrial zone development of Vietnam. Those communities loss their ability to access the livable space as same as they have before because factories of HKIZ have more power to gain access to this place becoming their waste contain. Those gainers used the right-based access process within both legal and illegal access to take away the community benefits of safe living place. The change access to land of local people is considered by losing ability to use of their land through process of convert agricultural land to industrial zone. Then, in their activities, they use illegal form of access to the local natural environment as the open access for containing industrial waste; the factories of industrial zone derive benefit from the environment because they can reduce the cost for waste treatment. The community member have to pay the fee for this pollution through reducing benefit from their land and spend more for their water access and health care service. Health risk is one of the indicators to show the

exposure vulnerability in pollution context. The health care service is considered as a one factor to help the suffer people overcome their risk situation. Even local health is suffered from new stress of industrial pollution, they access to the same quality of health service as before. Finally, the access to employment, ability of gaining income source diversification is very important inside capacity to recovery from contextual vulnerability. The result shows that the poor are more vulnerable from stress than other group.

The main argument that the mechanism of vulnerability are formed under process of losing access to those resources which reduce their coping capacity to external stress as industrial extension planning and industrial production with less environmental control.

REFERENCES

- [1] Dieu, T. T. My, P. T. Phuong, J. C. L. van Buuren, and N. T. Viet, "Environmental Management for Industrial Zones in Vietnam," in *The Ecological Modernisation Reader: Environmental Reform in Theory and Practice*, Arthur P. J. Mol, David A. Sonnenfeld and Gert Spaargaren, Ed., London: Routledge, 2010, pp.39-58.
- [2] R. E. Kasperson and J. X. Kasperson, "Climate Change, Vulnerability and Social Justice", in *The Social Contours of Risk: Public, Risk Communication and the Social Amplification of Risk*, Roger E. Kasperson and Jeanne X. Kasperson, Ed., London: Earthscan, 2005.
- [3] A. Neil, "Vulnerability," *Global Environmental Change*, vol. 16, no. 3, pp. 268-281, 2006.
- [4] K. O'Brien, T. Quinlan, and G. Ziervogel, "Vulnerability interventions in the context of multiple stressors: Lessons from the Southern Africa vulnerability initiative," *Environmental Science & Policy*, vol. 12, no. 1, pp. 23-32, 2009.
- [5] C. Robert, "Vulnerability: How the poor cope," *IDS Bulletin*, vol. 20, no. 2, pp. 1-7, 1989.
- [6] B. Piers, T. Cannon, I. Davids, and B. Wisner, *At risk: Natural hazard, people's vulnerability and disasters*, London: Routledge, 1994.
- [7] S. L. Cutter, "Vulnerability to environmental hazards," *Progress in Human Geography*, vol. 20, no. 4, pp. 529-539, 1996.
- [8] B. Malin, "Resilient society, vulnerable people: a study of disaster response and recovery from floods in central Vietnam," PhD Dissertation, Swedish University, Uppsala, 2006.
- [9] Peluso, J. C. Ribot and N. Lee, "A theory of access," *Rural Sociology* vol. 68, no. 2, pp. 153-181, 2003.
- [10] W. N. Adger, P. M. Kelly, N. H. Ninh, and N. C. Thanh, "Property right, institutions and resource management: Coastal resources under Doi Moi," in *Living with Environmental Change: Social Vulnerability, Adaptation and Resilience in Vietnam*, W. Neil Adger, P. Mick Kelly and Nguyen Huu Ninh (eds.), London and New York: Routledge, 2001, pp.79-92.



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