

## **Knowledge co-production (expert and local) toward three communities affected by the mining industry in Thailand**

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### **Abstract**

In this paper, we present three communities affected by contamination from mining in Thailand. First, Klity Creek, a Karen ethnic community, faces lead poisoning of water sources from mining. Second, Mae Tow, previously a well-known rice farming community, was contaminated by cadmium resulting in an enforced change to sugarcane farming. Third, Wang Sapung is a community where mine pollution has affected villagers' health and livelihoods. All these communities have mobilized and asked for help from academics, such as advice on restoring the environment. This paper focuses on how the community can be involved in environmental justice through cooperation and knowledge co-production between experts and locals. This process enhances the pursuit of environmental justice and empowers the community.

**Summary Statement:** How experts and the local community cooperate to co-produce knowledge to empowers the communities and promote environmental justice in three communities affected by mining in Thailand.

**Keywords:** Knowledge co-production, affected communities, mining industry

### **Introduction**

The Environmental Impact Assessment (EIA) is a tool designed to facilitate good environmental management, however, an EIA in Thailand has its limitations. A project owner informs the communities about the project, alternatives, opportunities and solutions; nevertheless, this communication results in few changes or impact due to the fact that communities do not have a chance to be involved, collaborate or make a final decision. In Thailand, generally, local knowledge and context on risks are excluded; cultural aspects of impacts are ignored; processes of monitoring are not in place. Three cases affected by mining industry actions in Thailand presented here illustrate these concerns. We also construct the frame of dynamics of lay people struggle to have their voices heard and suggest that knowledge co-production (expert and local) should be applied.

### **Klity Creek Case**

Klity Creek, the home of ethnic Karen, has been experiencing lead poisoning from 1967 until present. The lead mine started operations in 1967, at that time, an EIA was not required. After 10 years of the Lead Concentrate Company's operations, Klity villagers started noticing the environment and health effects of lead contamination. Many villagers suffered with the symptoms of lead poisoning. Some women had miscarriages while others experienced infant

mortalities both of which were increasing in the community. Lead affects children's brain development resulting in behavioral changes and growth retardation (Lertsatienchai 2006). In order to restore their livelihoods and take of the fight for justice, the Klity Creek residents organized public protest with the help of the media and academia. Legal action against Lead Concentrate Company commenced in 2003. The Klity villagers struggled to prove the source of toxic. Furthermore, there is a debate on source of toxic related to lead potential area, this claimed legitimize mine company and indirectly force villagers to move out. With this force, the villagers fought for their rights by suing mine company and Pollution Control Department.

### **Mae Tow Case**

Mae Tow, which was famous for rice farming, is contaminated with cadmium. The land use in this area is suitable for agriculture. International Water Management Institute (IWMI) which conducts research on water and soil resources in developing countries found that water, soil and rice were contaminated by high levels of heavy metals such as arsenic, copper, zinc and cadmium. This information was published in several newspapers in 2004 resulting in public environmental awareness. This contamination severely affected the health of local people; many villagers faced diseases related to cadmium toxicity. The experts' advice on adaptation, which recommended that the villagers' poisonous rice had to be destroyed, were unrealistic and Mae Tow residents changed their agricultural product to sugarcane. For this community, rice is not only the symbol as their quality product (second best in premium rice grade in 2002, Thailand rice award) but also their culture, belief and pride. Additionally, rice cultivation is related to community's relation and interaction. This situation affirmed that cultural dimension had been ignored.

### **Wang Sapung Case**

In the case of Wang Sapung, the suspected toxic source is a gold mine. In a concession for gold mining was granted Thung Kham for an open pit mine with a drilling capacity of between 1,200-1,500 tons per day. It is important to note that gold ore contains other heavy metals, including manganese, mercury and arsenic. Importantly, the process of gold purification needs cyanide, which is a toxic substance. In two years there was a report by the environment protection office on cyanide contamination in the main creek of the village. Manganese and arsenic were also detected. There was a concurrent report after finding contamination in underground water. At the same time some villagers noticed common symptoms among the residents including allergies, fatigue, and eye soreness. Initially, the villagers' response was to survey their surroundings for environmental changes and impacts. Even without any scientific instruments for measurement, they tried to obtain empirical evidence by using photographs. Later, the department of public health collected villagers' blood samples and found that some villagers had levels of heavy metals including cyanide above health and safety standards in their blood. Later, with help from an outside researcher, a group of these villagers began to plot the location of each contaminated person along with the measurement of his or her level of contamination onto a map of their community and nearby area which included the mine and the creek. This 'risk mapping' was used to make sense of their indicators and to connect their symptoms to the source of the toxins. However, there was no compensation or action from the mine authorities. The mining venture continued to be run as usual.

Although this was a controversial case, the mining company asked for expansion of the concession area. When the villagers' symptoms became more severe and worsened, they

decided to protest by closing down the gate of the mine and requested the immediate shut down of the mine. This resulted in violence in May 16, 2014 (Kom Chad Luek 2014) when a group of gangsters captured the protestors to pave the way for gold ore transportation. Eventually, the protest at the gate was resolved but there were still many skirmishes around the mine. This conflict made the villagers' stressed and tired, and their numbers also declined. Later, with help from academics and their expansive networking with other contaminated communities, they organized more systematically. Their risk map has been updated to the present day.

### **Methodology**

This study was conducted by using the interview, focus group, timeline and risk map methods. The timeframe of the study was in January 2017 – November 2017 and data was collected in 3 communities affected by the mining industry which are Lower Klity Creek in Kanchanaburi Province, Mae Tow in Tak Province and Wang Sapung in Loei Province.

### **Without knowledge co-production**

The three cases of contamination above show that there is an enormous 'knowledge gap' between lay people or those who suffer from contamination, mining companies and government agencies concerned with the problem or those who have the authority needed for resolution. This 'knowledge gap' means that most of the impacts observed by the lay people cannot be communicated to authoritative agencies or cannot be translated in proper ways and categorized as scientific facts or evidences for critical decision-making, and perhaps can even be treated as uncertain or trivial. Social or cultural impacts may not be counted. Consequently, most of the policies needed to protect the well-being of affected villagers are delayed or never implemented.

### **Knowledge co-production existing in three cases**

#### **Klity Case**

The villagers fought through lawsuits while the media published the Klity story and made the public aware of the villagers' suffering as well as the environment and social injustice. However, the courts require scientific proof, such as blood tests results to indicate health problems or calculation of the damage from the contamination of Klity Creek. To meet the courts' standard of proof, the villagers needed help from academia, NGOs, media, lawyers and public health experts to prove their suffering with scientifically acceptable data. Moreover, restoration of the creek requires knowledge co-production with universities. Actions stemming from engineering knowledge or technical knowledge with consideration of villagers' needs and their ways of life. Also, the villagers need to understand the mechanism of creek restoration because they are directly affected.

#### **Mea Tow**

The lawyers and NGOs assisted the villagers and sued the mining company, winning the case. The mining company had to pay for the medical bills and set up a rehabilitation fund. At the same time, academic researchers worked on the removal of toxins and soil remediation while health educators and public health officials provided medical care and healthcare education for villagers. Going forward, academics and villagers have to co-produce knowledge about food security and local economy in this area because rice cannot be cultivated, if contaminated with cadmium. This is because in case, they try to sell their rice, they will receive a very low

price. However, sugarcane as an energy bio-mass crop is a low-priced plant. The challenge is to find the type of crops the villagers should plant in order to help the local economy.

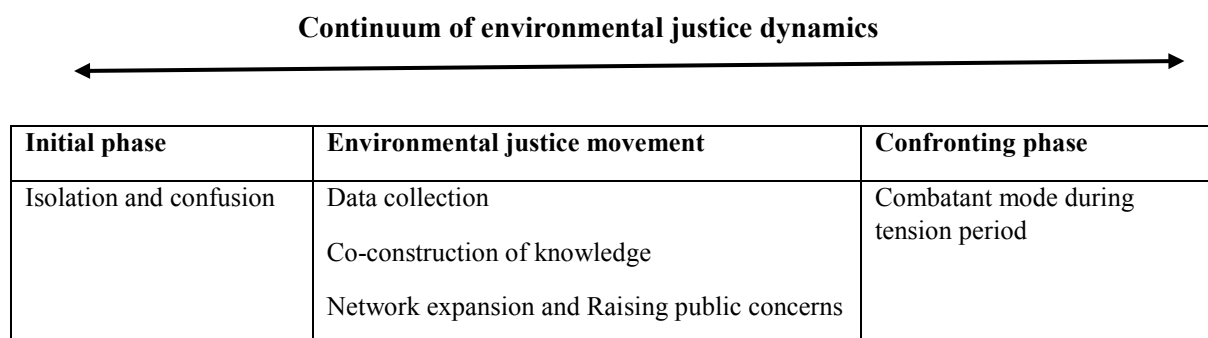
**Wang Sapung**

The risk map of the villagers’ blood tests mapped to their home location assisted in identifying high risk or low risk areas (of heavy metals in blood such as arsenic, and manganese mercury). Furthermore, the villagers worked with the academia and public health sectors in order to understand those risks. For their their living, the villagers are now initiating work with designers to help them design cotton cloths and scarves to build the local economy.

**Discussion**

At the beginning, knowledge co-production was a problem between locals and experts due to strong differences between positivist science and local knowledge (Brent Taylor and Rob C. de Loë, 2012; Jurian Edelenbos, et al, 2011) This knowledge gap needs to be closed and the people’s movements of the cases we mentioned are actively doing this. As can be seen, these struggles usually portray a long time. Thus far, the movements to fight for justice have followed, what we call ‘continuum of environmental justice dynamics’ (See Figure 1). The initial phase is when the movements first recognized any sign or indicator of unusual changes or impacts but somehow they were confused and unable to explain cause-and-effect relationships. There was no local investigation on the toxic site but only suspicion. At this time, the movements actually were not consolidated but were forming. Later on, they developed into ‘environmental justice movements’ which gained expansive networks, strength, and knowledge (Capek 1993). As the histories of the cases show, they observed and recorded many of the changes and impacts on the environment and also the villagers’ symptoms of illnesses. Some experts were invited to help with scientific and legal processes. Data were systematically organized by techniques such as ‘risk mapping’ which projects scientific measures and community characteristics on a single map so that diffusions and suspected sources of toxins can be traced back, and this was done by a co-production process that included both villagers and experts. Moreover, the movements tried to reach out to other movements, forming a network of learning. They also tried to raise their cases to public audiences to strategically pressurize authoritative responsible agencies. Notably, tension in any case may rise to the point that there would be conflicts between the local powers that benefit from mining and the villagers that are affected by the mining operations. This situation can cause confrontations and this confrontational phase can last for some time and include physical violence, as in the case of Wang Sapung. This can cause a movement to be exhausted; after that, it drifts back to be an ‘environmental justice movement’ again.

Figure 1 Continuum of environmental justice dynamics. Adapted from Capek (1993)



The integration of local knowledge into a collaborative environmental scientific process becomes productive when experts understand the value of lay people and their knowledge (Judith Petts and Catherine Brooks, 2006). Knowledge co-production is important as both locals and experts can learn through uncertainty and environmental change, or learn to be adaptive (Derek Armitage, et al., 2011), as demonstrated in the Mea Tow and Klity Creek cases. Knowledge co-production will broaden knowledge, and at the same time it could help specific issues at the local level.

## Conclusion

Conclusively, environmental justice movements play an important role in impact assessment. The cases mentioned above imply that they can create trust, inclusive assessment, pressure to responsible agencies, and empowerment. Their core competency is knowledge co-production which is also an important activity for mobilizing their expansive network. We suggest that knowledge co-production should be implement along with formal IA process and for monitoring possible risks during mining operations. It can be used to collect local indicators of risks and to have them taken seriously by experts. In addition, local cultural context can be included to make restoration and mitigation suitable for local economy and livelihoods.

Figure 2 Risk map of Wang Sapung. Taken from the field work.



Picture 1 Risk map process. Taken from the field work.



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