CASE STUDIES: LAKARDOWO WOMEN GROUP MOVEMENT AGAINST HAZARDOUS WASTE CONTAMINATION

1. INTRODUCTION

Lakardowo is a small village in Jetis sub-district (Mojokerto regency), with 80,018 inhabitants and 21,692 household[1]. The villagers in 3 sub-villages has been suffering from groundwater contamination and it is impacting socio-economic, health, and environmental condition. Women and children are the main victims for the degradation of environmental and socio-economic condition. Villagers has been accusing a hazardous waste management facility later on called PT. PRIA as the only pollution source. Villagers who (mostly) were high school graduate, do not have scientific and law background failed to prove their accusation. In addition, pressure from local government institution and police force traumatized them.

Increasing community knowledge in environmental and regulations, while increasing their skill in doing research to support their lobby and advocacy activities were the outputs of community development activities. Groundwater quality research were done to measure contamination and distribution of contaminant in 3 sub-villages. The data were used as lobby and advocacy materials to government institution related to hazardous waste management and groundwater contamination.

There are 5 joint research were done in the area: (1) groundwater quality; (2) activity analysis; (3) livelihood analysis; (4) economy valuation of groundwater pollution. Two (2) team handled the groundwater research: ECOTON (Ecological Observation and Wetland Conservation) team was led by Daru Setyorini and geophysic team of Technology Institute of Ten November (ITS) led by Prof. Amien Widodo and performed in July to August 2016. Activity analysis were done by Prigi Arisandi and Andreas Agus Kristanto was assisted by three (3) volunteers from UIN Jogjakarta in July 2016. Meanwhile livelihood analysis was done by Riska Darmawanti and Amiruddin Muttaqien in August 2016. Economy valuation of groundwater pollution was done by M. Eka Toar Raja in November 2016.

The final report consists of: (1) introduction; (2) hydrology of water resources system; (3) problem(s); (4) Approach; (5) Result; (6) Lobby and Advocacy; (7) Lesson Learnt.

2. HYDROLOGY OF WATER RESOURCES SYSTEM (WRS)

[1] BPS. 2016. Jetis sub-district in numbers. https://mojokertokab.bps.go.id/website/pdf_publikasi/Kecamatan-Jetis-Dalam-Angka-2016.pdf

The groundwater in the area is part of Brantas groundwater basin. The typical aquifer in the area are weakly cemented pyroclastic flows associated with their derived deposits and coarse sediments such as conglomerate and sandstone of the Kabuh formation. These aquifers are extensively and unconfomably underlain by clayey stones corresponding to Pucangan Formation. Moreover, shallow aquifers are developed extensively in the area, originated from fluviatile washout from the surrounding volcanoes and river deposits. Basically aquifer system in the area is composed of two-stories structure of shallow and deep aquifers intersected by interbedded impervious layers. Transmissivity in the main groundwater basin range in 2 to more than 10 L/sec/m^2.

3. ENVIRONMENTAL AND SOCIO-ECONOMIC PROBLEMS

Lakardowo is a 625.24 Ha village in Jetis subdistrict at Mojokerto regency. Most of the villagers works as farmer with 69.7% of the landuse is farmland which consists of rice field (123.62 Ha) and farmfield (312.03 Ha). Based on Mojokerto regency Statistical Bureau (BPS) in 2015, there was 3,532 household worked in agriculture sectors. The villagers depend on groundwater quantity and quality for irrigation and clean water resources.

In 2010, a factory (PT. Putra Restu Ibu Abadi or PRIA) which manage hazardous waste from 1,518 industries and hospitals was built in Lakardowo village. PT. PRIA is the only factory which have environmental permit to manage all kind of hazardous waste (59 different waste). Since the building process, the factory had already practicing illegal activities, from dumping and burning hazardous waste on barren land, employing local people with minimum protection equipment, inviting local people to scavenge hazardous waste without informed them about the status of the waste, etc. The initial condition of the groundwater quality assessed by the factory as requirement for environmental permit and recorded in environmental impact assessment (EIA) document. The groundwater measurement was done in 2011, with 26 parameters complied with national standards.

Villagers worked (from 3 sub-villages: Kedung Palang, Sambi Gembol, and Sumber Wuluh) in the factory were 12.61-22.84% in 2016. The groundwater contamination has led into social clash[3] inside the impacted sub-villages. Factory workers who defended their source of income and community who wants to have a safe groundwater. Groundwater contamination has been increasing the cost for clean water distribution, where villager needs to buy gallon water for drinking and cooking, more over for those who have newborn baby has been warned by local hospital needs to use bottled water to bath their baby.

Verifying the community's accusation on factory's illegal activity contamination of groundwater, ECOTON

[2] Tsuji, Katsui. Groundwater development in the mountain skirts of volcanic massifs in Eastern Java. Fuji Grouting Engineering Co. Ltd. Japan

[3] Ishomuddin. 2016. Related to hazardous waste management factory, Mojokerto community was divided. https://m.tempo.co/read/news/2016/07/20/206788906/soal-pabrik-limbah-b3-masyarakat-mojokerto-terbelah

performed groundwater sampling with parameters consists of 2 groups: non-EDC and EDC group. Non-EDC group consists of basic parameters such as biological oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solid (TDS), sulphate (SO_4), iron (Fe), boron (Bo), hydrogen sulfide (H_2S), barium (Ba), and microbiology (total and Fecal Coli). EDCs parameters consists of arsen (As), manganese (Mn), zinc (Zn), chromium (VII) (Cr), fluoride (F), lead (Pb), mercury (Hg), polychlorinated biphenyls (PCBs), polyaromatic hydrocarbon (PAH), phenol, and total pesticides. BOD, COD, and TDS are main parameters and measured to get rough indication the amount of ions in the water and or pollutant. While other compounds were chosen based on national regulation on drinking water quality and hazardous waste managed by the factory.

4. APPROACHES

ECOTON used 3 approaches to groundwater contamination at Lakardowo village. Those approach consists of: (1) groundwater sampling; (2) activity analysis; (3) livelihood analysis; (4) economy valuation of groundwater pollution.

A. Water Quality Sampling

The groundwater samplings were done twice in different occasion: July and August. July sampling was done during the visitation and sampling activity of Ministry of Environment and Forestry (MEF) due to community complaint on groundwater pollution and illegal dumping activities were being practiced by the factory. MEF's sample divided into two (2): one for their measurement need and the other for ECOTON for double checking. ECOTON felt the need to double checked it due to data manipulation concern. There were 2 sampling sites: factory (3 monitoring wells, 1 lagoon, and 1 drainage close to brick production) and community wells. Community wells were chosen based on the distant between well and septic tank which should be more than 20 m. MEF choose one site for each sub-villages which surrounds factory. In August, the sampling purpose was due to the big gap between MEF and ECOTON data and added another EDCs parameter to be measured. Three sampling sites were chosen, 2 samples from community wells and 1 sample farmland well. The first sampling was measured in Jasa Tirta private and national certified laboratory in Mojokerto and the second one in Water Laboratory North (WLN) at Manado. As national and international certified, WLN provided measurement services for EDC parameters (PAH, PCB, pesticides, and heavy metals).

Before performing water quality sampling, ECOTON worked ITS geophysics to map groundwater level and distribution main parameters: TDS, pH, electrical conductivity (EC), and salinity in the 4 sub-villages (30 boreholes). Groundwater level affected the direction or flow of groundwater in accordance with hydrodynamic conditions. It is also affected by the layering of rock slope and elevation of land surface. At this preliminary assessment, the groundwater mapping was done by measuring the depth and basic water quality parameters of the community wells around the factory and the height of ground surface of each well. Furthermore, the

calculation of the difference between the height of ground surface and the depth of water levels in the wells for groundwater level[4].

Table 1. 20 out of 59 type of hazardous waste manage by the factory

Type	Waste composition
Solvent	IPA, MEK, TCE, Aldehyde, alcohol, ketone, ester, and alkana
Used thinner	Acetone, Toluene, hexane
Used oil	HC, Pb, Fe, Co, Ni
Dirty oil	Kerosene, H2O
Sludge oil	Heavy metals, mercaptan
Slope oil	Heavy metals, wax, TPH (total petroleum hydrocarbon)
Grease	Heavy metals, HC, wax
WWT sludge	heavy metals (Cr, Hg, Ti, Sb, Co, Ni, Cu, V)
Crush glass	SiO2, Al2O3, Fe2O3, CaO
Gypsum	CaO, SiO2
Carbon active	Carbon and metals (Fe, Mn, Mg)
Zinc waste	Zn
Aluminium ash/dust/dross	Al, Fe
Brass ash/dust/ dross	Fe, Cu
Copper ash/dust/dross	Cu
Oil filter	HC, TPH, Metal
Absorbant	Organic, VOC, SVOC, heavy metals
Contaminated metal scrap	Used oil, coolant
Drilling mud	Fe, Ba, Natural mineral, polymer
Contaminated soil	heavy metals, HC

[4] Widodo A, Syaifuddin F, Lestari W, and Pandu D. Preliminary study of hazardous waste contamination of groundwater at Lakardowo village, Jetis, Mojokerto. 2016. 13 pg. Unpublished report.

B. Activity Analysis

Two activities were observed: the factory and farming activities. The factory activity was derived from environmental impact assessment (EIA) documents, and investigation from former workers. Farming activity analysis were done by mapping the farmland ownership which surrounds the factory, and interview 14 owners or farmers which have different kind of crop production and distant of farmland with the factory.

C. Livelihood Analysis, Economy Valuation of Groundwater Pollution

Two sub-villages where analyzed for livelihood analysis and economy valuation: Kedung Palang and Sambi Gembol. These villages were chosen based on the basic water quality mapping done by ITS geodesy team has shown that the contamination distribution were concentrated in these area. Livelihood analysis's purpose was to identify vulnerable groups in the villages in polluted environment. Economic valuation aimed to calculate economic lost caused by groundwater pollution and identify factors which influenced household preferences to consume polluted water. Economic valuation research was done in November 2016

D. Participatory mapping of health and hazardous waste utilization

Participatory mapping was done by KPPL and assisted by ECOTON, where KPPL invited women in the three (3) subvillages, with one (1) representative from each RT (rukun tetangga). Indicators use in the participatory mapping was: (1) occupation (factory worker and not); (2) type of hazardous waste distribute or utilize in the neighborhood (coal ash, expired products, medical waste); (3) disease experienced (skin irritation, typhus); (4) medical record (hospitalized). Participatory mapping was done in April 2016

5. RESULT

A. Water Quality Sampling

The map of groundwater flow showed that elevation influenced the flow. There are 2 pattern could be seen from the map (fig 1). Line pattern stretched from northwest to southeast was a valley with the lowest elevation, which formed a river flow, and has a high possibility that this area was easily polluted. The circular pattern which identified close to the factory had the highest probability to be contaminated.

Figure 1 Groundwater flow, elevation (asl), and predicted contaminated area

Four (4) parameters were mapped: TDS, pH, electrical conductivity (EC), oxidation-redox potential (ORP) and salinity. These parameters were basic parameters which give preliminary picture of water quality condition. Salinity is a major water quality limitation on the environmental values (including potential beneficial uses) of groundwater. It is influenced by human action such as irrigation, disposal of wastewater, seawater intrusion in response to excessive extraction from coastal aquifers. Where natural salinities are moderate to high, salinity is a relatively poor indicator of pollution from human activities (except where poor borehole completion results in cross-contamination of aquifers). Other indicators such as petroleum hydrocarbon, nitrates, pesticides, and E. Coli[5].

Total dissolved solid (TDS) is a measure of all dissolved substances in water, including organic and suspended particles that can pass through a very small filter. While electrical conductivity (EC) is the ability of an electric current to pass through water is proportional to the amount of dissolved salt (ion) in the water[6]. ORP is a term used frequently in the water treatment, and is a mesure of the cleanliness of the water and its ability to break down contaminants. More contaminants in the water result in less dissolved oxygen and therefore, the lower the ORP level. While the higher the ORP level, the more ability the water has to destroy foreign contaminants

[5] Department of Water - Government of Western Australia. Understanding salinity. http://wadow.clients.squiz.net/water-topics/water-quality/managing-water-quality/understanding-salinity. Accessed in April 11th 2016

[6] State Water Resources Control Board. 2016. Groundwater information sheet: salinity. 8 pg

such as microbes, or carbon based contaminants[7].

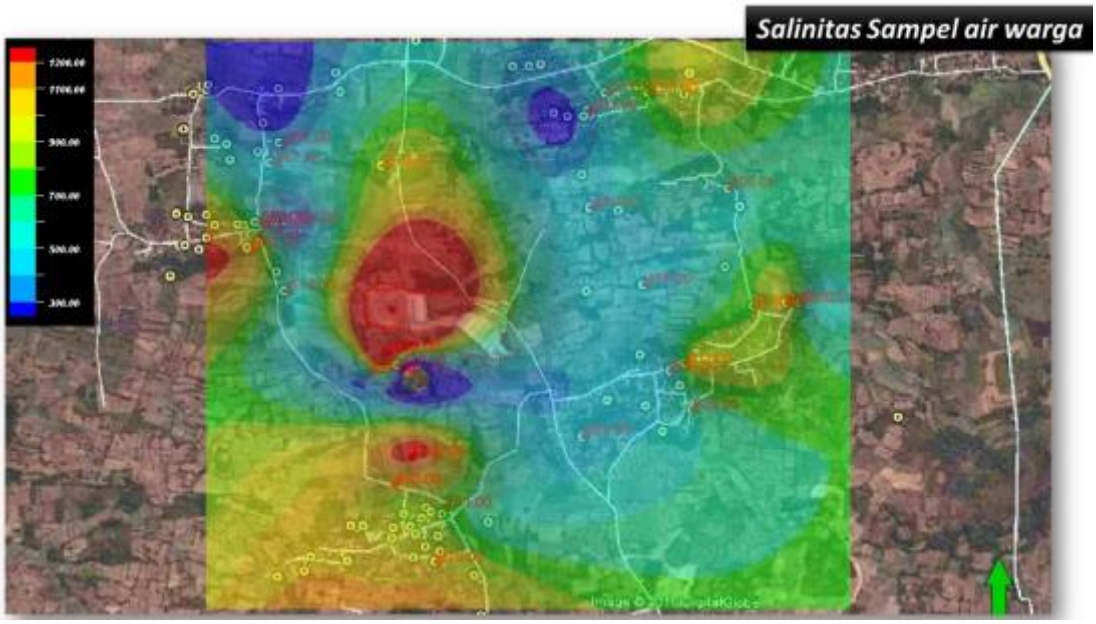

Figure 2. Salinity distribution in the area, where the highest salinity concentration was waste seepage from the factory

The result for measurement basic parameters were: EC 631,000-4,010,000 µS; TDS 567 – 1234 mg/L; salinity 366 – 927 mg/L; pH 7.02 – 7.48; ORP 50 – 168 mV. Concentration of EC in the research area were considered as 4th water class based on Todd (1980) table for irrigation water[8]. Fourth (4th) water class (EC>2250 µS) where the salt concentration is very high, soil should be permeable, have good drainage system, and only certain plant species can be culture. **79.31%** of ORP level was below 150 mV, which means that it has no practical use. ORP level can also be viewed as the level of bacterial activity of the water because a direct link occurs between ORP level and Coliform account in water. The highest recorded ORP was 168, compared to the coliform count (MPN, /100 mL) table, shown that the Coliform count >300 MPN/ 100 mL. Based on classification from Mayer et al (2005)[4], salinity status was fresh to marginal (<500 – 1000) where the application ranged from drinking to irrigation and only **24.13%** was suitable for drinking water.

[7] Ozone solutions. What is ORP. http://www.ozoneapplications.com/info/orp.htm. Accessed in April 11th 2016

[8] Pranowo H, Sholichin M, and Montarcih L. Groundwater quantity and quality analysis in the district Mojokerto. 14 pg.

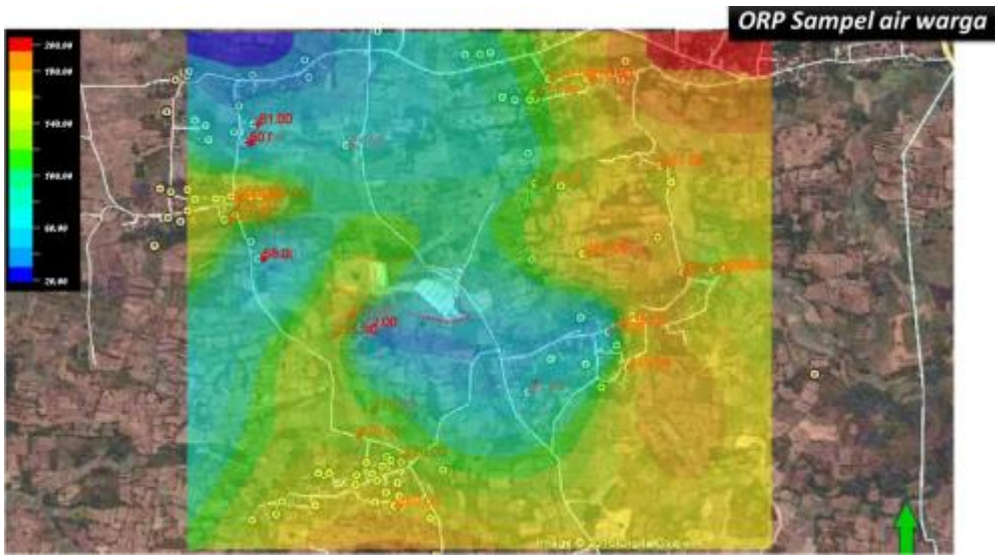

Figure 3 ORP level distribution in research site

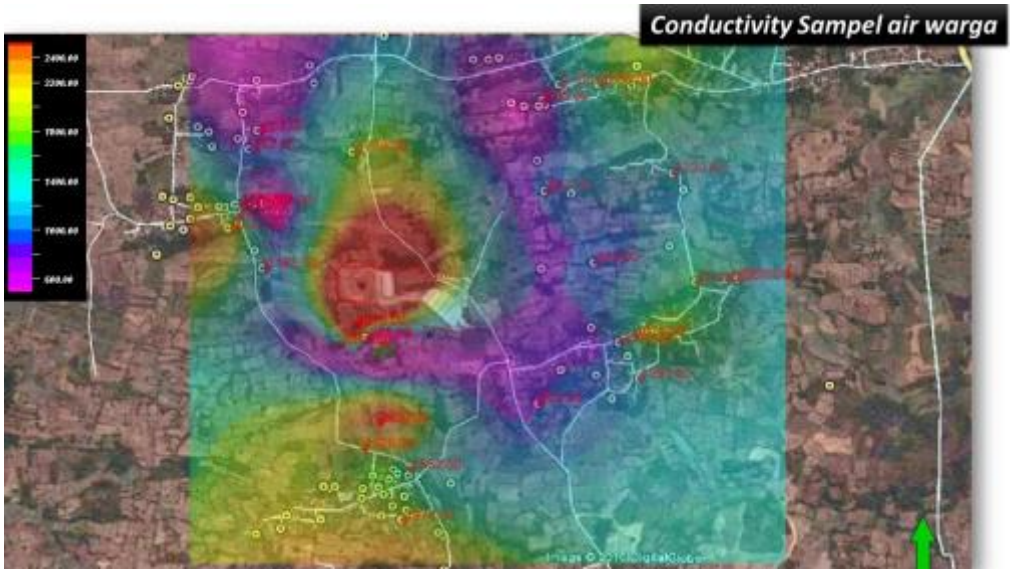

Figure 4 Electrical conductivity distribution in research site

There was 2 sampling site for July sampling, which were PT. PRIA (monitoring wells and drainage close to brick production site) and community wells in 4 sub-villages surrounds the factory (Kedung Palang, Sumber Wuluh, Sambi Gembol and Greol). The laboratory result showed that the groundwater quality in the factory area wasn't suitable for clean water supply. The groundwater was contaminated with sulphate (SO_4), fluoride (F), iron (Fe), zinc (Zn), manganese (Mn), and coliform bacteria. The high concentration of biological oxygen

demand (BOD) and chemical oxygen demand (COD) showed that the groundwater in the factory monitoring wells was contaminated with high contentration of organic and chemical compounds. August sampling resulted that PAH, phenols, PCB, pesticides, and Hg were below limit of detection. While Mn concentration below the national standards, the only sample where Pb concentration exceeded it was farmfield well which close (distance about 100 m) to the factory. Pb concentration was 0,02177 mg/L, and national standard about 0,01 mg/L. The high concentration of SO_4 due to their illegal activity for dumping tonnes of coal ash (fly and bottom ash). Coal ash (fly and bottom ash) are consists of potassium (K), sodium (Na), Sulphur (S), titanium (Ti), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), boron (B), cadmium (Cd), chromium (Cr), copper (Cu), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), strontium (Sr), thallium (TI), uranium (U), vanadium (V), zinc (Zn)[9]

Table 2 July's laboratory result of groundwater quality

Parameters	Unit	Permenkes no.492/Menkes /PER/IV/2010	Monitoring well	Drainage of brick production site	Community well
Non EDCs					
Biological Oxygen Demand (BOD)	mg/L	-	4,512	5,29	2,876
Chemical Oxygen Demand (COD)	mg/L	-	16,574	16,795	11,253
Total Dissolved Solid (TDS)	mg/L	500	**900**	**2058**	**1167,2**
Sulphate (SO4)	mg/L	250	**282,58**	**762,95**	**212,218**
Iron (Fe)	mg/L	0,3	**0,432**	**0,425**	0,1212
Total Coli	MPN/100 mL	0	**44,2**	**430**	**646**
EDCs					
Zinc (Zn)	mg/L	3	0,269	0,405	0,058
Manganese	mg/L	0,4	0,143	**1,025**	<BDL
Fluoride (F)	mg/L	1,5	0,054	0,424	0,6016

Notes: BDL = below detection limit

[9] EPRI. 2009. Coal ash: characteristics, management, and environmental issues. 12 pg

Mn is the only EDC parameters which exceeded the national standards for drinking water. Mn produces neurotoxicity, and its toxicity has been observed primarily in occupational environments such as Mn mining and smelting, battery manufacturing, and steel production (Santamaria et al., 2007). John Couper (1837) was the first to report neurological effects associated with exposure to Mn when he described muscle weakness, limb tremor, whispering speech, salivation, and a bent posture in five men working in a Mn ore crushing plant in France. This collection of symptoms was called "manganism" and it is a neurological syndrome that resembles Parkinson's disease, but there is considerable evidence that Mn preferentially damages different areas of the brain from those that are affected in Parkinson's disease (Calne et al., 1994; Olanow, 2004)[10]. There was numerous well-documented study of environmental Pb exposure which leads to delay growth and pubertal development in girls. The studies showed relationship between blood Pb and puberty was significant even after adjusting for body size. Meanwhile, exposure to PCB resulted in reduced size at birth but advance sexual maturation[11].

EDCs works in very low concentration to disturb body response. Identified EDCs, even when the concentration was below detection limit, have high possibilities to disturb hormone/ endocrine systems. In the case of Lakardowo, EDCs measured only in groundwater, when there are other routes (air and food consumption) that had not calculated. To be able to understand the impact of illegal practice of the factoyr to community health, measuring community health (taking blood sample), air pollution, and pollutant was contaminated in the crop are needed.

The difference of concentration within the same parameter (ECOTON and MEF data) was big (up to two folds). Fortunately, parameters exceeded the national standard was the same one. The result showed that the contamination in factory monitoring well was higher than in the communities, and there was connection from factory's monitoring well and community wells. The connection was clearly stated in the expert discussion minutes, but the final conclusion stated by MEF (Directorate General of Water Pollution Control) was out of nowhere. MEF conclusion were: (1) zero contamination from factory activities to community's well waters; (2) Skin irritation experiences by many households caused by the lack of sanitation. ECOTON rejected the conclusion due to the fact that: (1) it was clear that the groundwater in the factory area contaminated and the concentration was higher than in the community wells based on MEF laboratory result; (2) the sampling sites determined by MEF had complied with sanitation standard (septic tank distance with well is about 20 m); (3)

[10] Iavicoli, Ian and Fontana, Luca. The effects of metals as endocrine disruptors. J. Toxicol. Environ. Health B. 2009;4: 206-223

[11] Dyer, Cheryl A. Heavy metals as endocrine disrupting chemicals. Endocrine disrupting chemicals: from basic research to clinical practice.

sulphate well-known as strong acid chemicals was detected, either in factory and community well and there was high possibility that it was one of the cause of skin irritation.

B. Activity Analysis

Building process of PT. PRIA started in 2010 when it didn't have environmental permit and had already accepted hazardous waste. Based on EIA document, factory managed hazardous waste into 3 ways: production of alternative fuel and raw material (AFR), paving block and low grade paper; incinerating and processing in electro-coagulation wastewater treatment plant (WWTP).

Table 3 Solid hazardous waste management

Application	Hazardous Waste	Source
Paving block	Fly and Bottom Ash	remains of coal burning
	Dust grinding, and foundry sand	iron and steel smelting, machinery and automotive manufacture, metal industry
	Furnace/steel slag	iron and steel smelting
	Carbide sludge	gas industry
Low grade paper	Paper sludge	paper and cardboard industry
	Used packaging	paper and cardboard industry
	Scrap/ trimming shaving	leather and shoes factory
	Carbide sludge	gas industry

Table 4 Flammable and mixed formed hazardous waste management

Characteristic	Type	Source	Management
Flammable	Solvent	pesticide, resin, petrochemical, textile, automotive, electronic, paint, electroplating, pharmacy, soap, metal, and paper industry	Alternative fuel and raw materials
	Used thinner	Paint, ink, printing, automotive industry	Alternative fuel and raw materials
	Used oil and grease	automotive, garage workshop, maintenance, oil and gas industry	Alternative fuel and raw materials
	Dirty and sludge oil	oil and gas industry, ship/tank cleaning process	Alternative fuel and raw materials

	Slope oil	oil and gas industry	Alternative fuel and raw materials
	Paint sludge	paint, ink, and printing industry	Incinerator
	Contaminated dust cloth	Dust cloth contaminated by oil, solvent, and thinner	Incinerator
	Contaminated saw dust	Saw dust contaminated by oil, solvent, and thinner	Incinerator
Mixed	**WWT sludge**	WWTP process	incinerator; alternative raw material and fuel
	Silica gel	electronic industry	incinerator
	Spent earth	cooking oil purifying industry	incinerator
	Crush glass	Lamp industries	alternative raw material and fuel
	Gypsum	Petrochemical industries	alternative raw material and fuel
	Buffing dust	shoes and leather industries	incinerator
	Active carbon	fertilizer, MSG, oil and gas mining	incinerator; alternative raw material and fuel
	Glass wool	oil and gas, power plant	incinerator
	Zink waste	metal and metal coating	alternative raw material and fuel
	Reject and expired material product	pesticide, polymer, resin, ink, paint. pharmaceutical, soap/ detergent	incinerator
	Used packaging	paint industry	incinerator
	Used toner	printing industry	incinerator
	Used storage battery	maintenance	send to third party
	Used battery	automotive maintenance, power plant	send to third party
	Aluminium ash/dust/dross	metal and aluminium industry	send to third party

	Brass ash/dust/ dross	metal, machinery, and valve industry	alternative raw material and fuel
	Used polymer	polymer, oil and gas, glue	incinerator
	Copper ash/dust/dross	metal, machinery, valve industry	alternative raw material and fuel
	Oil filter	oil and gas, chemical, metal, and machinery	alternative raw material and fuel
	Resin	MSG, paint, and chemical	incinerator
	Absorbant	gas	alternative raw material and fuel
	Contaminated material	oil and gas, chemical, metal, and machinery	incinerator
	Used catalisator	oil and gas, cooking oil industry	send to third party
	Contaminated metal scrap	metal and machinery industry	alternative raw material and fuel
	Electronic waste	electronic product remains	send to third party
	Drilling mud	oil and gas industry	alternative raw material and fuel
	Contaminated land	iron and steel industry	alternative raw material and fuel
	Mill scale	iron and steel industry	send to third party
	Incinerator ash	incinerator	send to third party
	Used lamp	lamp remains that are not used	send to third party
	Medical waste	clinic, hospital	incinerator

Table 5 Liquid hazardous waste management

Type	Source of Hazard Material	Treatment Place
Coolant	Iron/steel, automotive, electronic, metal, manufacture industry	Electro-coagulation WWTP

Acidic and alkaline solution	chemical, manufacture, metal, automotive, textile, laboratory, electroplating, galvanizing	Electro-coagulation WWTP
Used solution (water based)	electroplating, galvanizing, metal smelting	Electro-coagulation WWTP
Expired liquid product	pharmaceutical, food, and flavor essence	incinerator
Used washing	manufacture, insecticide, automotive	Electro-coagulation WWTP
Lab waste	fertilizer, pharmaceutical, soap, cooking oil, and chemical industry	Electro-coagulation WWTP
Developer and fixer	printing, hospital, photography	Electro-coagulation WWTP
Wastewater from other industries	Different kind of industries	Electro-coagulation WWTP

Former worker, Hudha, the factory started the activity around October 2010 and piled different kind of hazardous waste, such as: coal ash, pulp and paper sludge, medical waste, expired dairy products, etc. The hazardous waste was piled up to level up the ground and building concrete (thickness about 30 cm) as a warehouse and administration office. Factory area are 3.5 Ha and surrounds by agriculture. PT. PRIA built 3 incinerators which the first one was established in 2014. Black fume came out from its chimney, which it shouldn't. PT. PRIA makes MoU with hospitals in East Java provinces to manage their medical waste. Some EPA staff become their 'marketing' staff who advice factory/hospital to use the factory service. If they've got client, the factory would pay them some amount of money. The factory becomes famous for it is the only place which accepts 59 kinds of hazardous waste in East Java and offers 1/3 of common price to manage the hazardous waste.

Figure 3. Chili pickers hand went black caused by the incinerator ashes which coated the chilies

Table 6 Hazardous waste management practice done by the factory based on former worker confession

Type of Hazard Material	Management Action
Fly ash and bottom ash	• Raw materials for producing paving block, cast concrete • Bottom ash is being used to pile and level up factory's area • Some of the bottom ash was given to villager and being used as building materials or to level up the land
Medical waste	• The waste is sorted out to separate the ones that can be sold to the factory, such as IV tube, urine bags. Syringes were piled up. • The worthless waste was burnt (open burning). Before 2014, their management practice was buried. The supervisor argumentation was that they need 6,000 L of diesel fuels for each time to burns it. The management wasn't efficient because they mixed it with the wet ones. • Found human body covered with plastic bag • Sheets, cloth contaminated with blood, and medical shirt is burnt and while the rest is taken by the worker • In 2016, the field investigation found that the factory hired villager outside Lakardowo to separate medical waste in their houses. • Barrels of blood were piled with other hazardous materials
Rejected diapers	• In the beginning, it was burnt (open burning) in an empty land and rent it from Sambi gembol villager. • The villagers was hired to separate the cottons and sold it to the factory
Iron slag	• The waste from automotive industry and is being sold by the worker

Used oil	• Sold to third party
Liquid waste (acid and chemical solution)	• It was poured in new hole and mixed it with solid waste. • The barrels which contained liquid waste was moved with forklift into the hole. When the barrel touch the bottom, the workers runs away to avoid strong smell from the liquid waste, eye irritation, and breathing difficulties.
Paper sludge	• if there is visitation, it was turned into low grade paper. • It was buried with other waste
Waste Water Treatment Plant (WWTP) sludge	• Put into sacks and buried with other solid waste
Mercury lamp	• Buried with other solid waste
Resin	• In form of black sand, when it is touched caused skin irritation and it is buried with other solid waste
Expired liquid product	• Ketchup, juice, syrup, etc is poured, and the packaging was sold. • Some of the waste is consumed by the worker and distributed to the villager
Liquid waste	• Managed in the WWTP, but the base of WWTP was not cemented to avoid it become full.

There are more than 100 farmers from 2 villages (Lakardowo and Sidorejo) who own the land which surround the factory. Their main agriculture commodities are: paddy, corn, chili, and peanuts. The farmers also plant vegetables (eggplants, tomatoes, spinach) for household supplementary nutrition. Two types of agriculture practice: monoculture (paddy) and intercropping. Common intercropping crops are chili-corn, and paddy-corn. Agriculture activities are depended on rain water and groundwater pumping to irrigate the farmland. ECOTON interviewed farmers which own farmland close to the factory and in Kedung Palang sub-villages

Table 7 Farming production processes

Production activities	Commodities	
	Chili and Corn	Paddy and Corn

Nursering	• The farmer lefts some chilies (1 – 5 kilos) to become seedlings • Drying the chili seeds under the sun (3-7 days). • Making seedbed, fertilize it with manure and watering every day. • Some farmer spraying the seedbed with herbicide before planting the seed with gramaxon and roundup • The seedling will be ready to be planted in 2 months • Farmer then will select the best seedling, and the leftover will be given freely or sell 25 thousand rupiah/10-20 seedlings.	• There are 2 brand of paddy seed used by the farmer: Cierang and Cibogoh • Ploughing the land in a day (using hoe) for making seedbed • Nursering paddy take 20-25 days • Farmer doesn't make corn seedling
Planting season	• Rain season	• Wet (paddy) and dry season (corn)
Land preparation and planting	• Tilling the field takes a day if using tractor or hired labour and making seedbed • Spraying herbicides to exterminate grass • Dig holes to plants corn seed and chili seedlings. The distance among the holes 25 cm • Three brand which is being used is B-21 (70,000 rupiah/kilo), Pacific and Pertiwi (45,000 rupiah/kilo) • Farmer used 1-6 kilo of corn seeds/2,000 m^2	• Tilling the field takes a day and farmer rents tractor and hired labour to till and plants paddy seedling • The distance between each between paddy seedling is 20 cm, but when planting corn is 25 cm • The process of land preparation and planting is the same with farmer who plants chili and corn
Fertilizing	• Fertilizing were done twice during the planting season • 20 and 45 days after the planting, by using mixed fertilizers. Common fertilizer that was being used: urea, ZA, NPK, manure. Farmer uses minimum 2 kinds of fertilizer	• The paddy was fertilized twice between 7-10 days old with mixture of manure and chemical fertilizer and 30 days old with chemical fertilizer (such as urea). Farmer who have cattle would use cow manure and bought chicken manure (25,000 rupiah/sack). • Corn was fertilized for the first time when it was around 15 days old • Chemical fertilizer used was urea, NPK, ZA
Watering	• Rain waters are their main water resources, but due to the unpredictable climate, they also rent water pump to watering the land.	• The paddy planting is on rain season, while corn plants in dry season and use water pump to watering the field
Pest Management	• The farmer using 2 types of pesticide: insecticide (active agent: carbaryl and α-cypermethrin) and herbicide (active agent: paraquat dichloride, 2.4 dimethyl amina, and glyphosate).	• During the paddy planting season, there are 2 type of pesticide use: insecticide and herbicide. Three different kinds of insecticide active agent: fipronil, carbaryl, and α-cypermethrin. Herbicide active

	• The price for pesticides around 15,000 – 65,000 rupiah/bottle. The most common pesticide was being used is an herbicide named gramaxon (paraquat dichloride) and roundup (glyposhate). • Extensive herbicide usage among the farmers could reach up to 8 bottles/planting season. • The common practice among the sprayer is that they uses minimum spraying equipment (no mask and glove, short or ¾ sleeves) and mixed 2 or more pesticides • Farmers often experiences pesticide poisoning, but don't recognize it. The usual symptoms are: headache, blurred visions, and breathing difficulties. • Farmers seldom take medicine and usually resting until the symptoms gone. • Farmer who went to community health center got antibiotic as medicine • Pesticide cost varied between 12.05 – 31.27% from total cost.	agent was used: paraquate dichloride and glyphosate • Paddy's insecticide was used 2-3 times/planting season. The application for regent (active agent: fipronil): 1 bottle cup for 16 litres of water • The herbicide will be used when the grasses growing. The herbicides bottles used ½ - 3 bottles for each paddy planting season • Corn's insecticide was being used are: sevin (active agent: carbaryl) and furadan (active agent: carbofuran)
Plant handling	• Spraying growth hormone were done for chili plants and once for every planting season	• Different with corn and chili farmers, the paddy and corn farmer do not use growth hormone
Harvesting	• Corn will be harvested earlier at 2 months old • Corn harvesting only takes a day, but releasing ears of corn takes more time. • Some farmer use the wet corn as cattle feed, and the other sold it to the middle man • Corn harvest varied from 200 – 1,000 kilos. • The price for the common corn is about 2,700-3,000 rupiah/kilo, while for bird corn about 7,000 rupiah/kilo. Some farmers starts to plant bird corn which have higher price and production • First harvest of chilies are in 4 months old and from then on farmer could harvest them weekly for about 3-4 months. • Average prices for chilies around 30,000 rupiah/kilo and the chili harvest varied from 100 – 1,100 kilo	• Paddy will be harvested at 100 days old. • There are 3 harvesting processes: cut the paddy straw, shouldering the paddy, and treshing paddy grains • The farmer usually hires the labour for cutting the paddy straw and shouldering them • The price for treshing the paddy grains is 5,000 rupiah/sack • Harvesting labour costs farmer about 60,000 rupiah/person (including lunch and cigarette) • Paddy production varied from 300 -750 kilos, the prices in the farmer about 5,000 rupiah/kilo. Farmer usually kept their paddy harvest for household needs and sell it if they need cash. • Corn production during the dry season around 200 – 1,000 kilo

Post-harvest	• The remaining plants will be burnt in the field after it dried up	• Some farmer uses paddy stalks 'damen' as cattle feed and other burns it
Season change	• The unpredictable season becomes problematic. This year, East Jawa had long rain season (even in November still have light to heavy rains) and change farming pattern among the farmers. • In confusion, the farmer take opportunity to start chili seedling and planting. If later on, they facing long drought, they accept it as their faith for miscalculating and deal with big lost.	
Working hours	• The farmer goes to the field twice a day, between 06.00-10.30 AM and 01.00 – 04.30/05.00 PM, with total 7-8 hours/day • Before there is air pollution, the farmer would stay at the farmland from 6 AM to 5 PM. • For household, which man becomes factory labour, the women take the main role in farming activities which make them more vulnerable.	
Pollution case	• Toxic ashes and air threatened them, breathing difficulties (especially during the dry season) is a common issue. Mrs. Rumiyati whose farmland right next to the factory, her phlegm becomes black after spending her time in the farmland. • During the interview, ECOTON recorded a case when a farmer (male) forgot to bring his cap, and exposed to incinerator ashes. When he went home, his hair fallen and scalp was itchy and blistering. • Farmer who own cattle plants elephant grass for cattle feed. Elephant grasses are planted close to factory won't be eaten by the cattle	

C. Livelihood Analysis

The groundwater pollution has been impacting 3 sub-villages in Lakardowo which are: Kedung Palang, Sambi Gembol, and Sumber Wuluh. The closest sub-village with factory is Kedung Palang where the distance with the first house about 300 m. Based on contamination zone, the most impacted area are Sambi Gembol and Kedung Palang. To be able to understand the impact of groundwater pollution to community livelihood, ECOTON took samples of household from 2 sub-villages (Kedung Palang and Sambi Gembol) whose groundwater was being polluted.

A household consists of 3-7 people (father, mother, children). The oldest resource person that was interviewed was 47 years old and the youngest family member was 3 years old. The villagers mostly work on agriculture, but due to irregular and uncertain income, it's common that man works on factory while women works on agriculture/ farmland (including taking care the cattle). While women, to attain more income to the family, they will work as farming labour. Payment for working as farmer labour about 40-45 thousand rupiah for half day works (4 hours) and 60 thousand rupiah for full day works (8 hours). Man

who works in factory is hired by a labour broker company or person, receive 40-45 thousand rupiah/days. Man who have ability to become construction worker accept more payment, about 95 thousand rupiah/day. Mrs. Pujihadi, 34 years old, whose husband working in a wood factory (PT. Alam) said that her husband payment around 300-400 thousand rupiah/week, including overtime. As investment, they own cattle (cow(s)) or taking care their neighbour cattle. Common agreement was that the one who took care will receive 50% of the profit of cattle selling. Mrs Sutamah said that she accepted 5 millions rupiah after the cattle owner sold the cow. There was a government program which funded communities by giving them free goats. Farmer who receive goat needs to breed it and after the goatling is born, they keep the goatling and give the goat to other farmer.

Parents send their children to islamic elementary school in Greol sub-village (Sidorejo village). There is another elementary school in Kedung Palang village, but the parents who join in the resistance group avoid it. The reason for this action is that the owner used to be their head of the resistance group but then turn his back and become the vice director of PT. PRIA. Uniform and books for elementary student is free, but the parent need to pay practice books every year and re-administration fee (total about 300-400 thousand). The nearest middle and high school is located outside the village. The state high school in Canggu subdistrict cost parent about 1.3 million rupiah for administration fee and tuition 110 thousand rupiah/month. To get there, parents take their children to school or give them motorcycles. Pocket money for elementary student around 2-5 thousand rupiah/day while for middle or highschool 10 – 15 thousand rupiah/day (exclude gasoline for motorcycle). The highest education's level most villager had is high school. Many young girls after finishing their high school marries man who slightly older than them. Less than 10% of the young people go to college or higher education.

Community holds different kinds of religious group gathering, where men, women, and children had their own gathering. There are 3 women religious group gathering every week and each of them had contribution (arisan): tiba'an (3 thousand rupiah), tahlilan (2 thousand rupiah), and pengajian (4 thousand rupiah). While man only had 1 religious group gathering each month (tahlilan) and its contribution 25 thousand rupiah. Women usually follows 2 religious group gatherings and some of them only join in for contribution. Children (7-12 years old) do have religious group gathering (tiba'an) and it's contribution 2 thousand rupiah. The groundwater pollution had made social conflict between 2 groups: the factory workers and resistance one. The social pressure to factory worker groups is seen in the religious group gathering. The religious group gathering is held in one of member's house and everyone will be taken turn to become the host. When the host is a factory worker (or his/her wife/husband), the resistance group won't come to the gathering. There is a big difference of social pressure in two sub-villages. Social pressure in Sambi Gembol is stronger than Kedung Palang. The cause for it is that their resistance voice is more solid

and less factory (PT. PRIA) worker in the sub-village. When there is resistance group meeting, the factory worker is afraid to come and it's the other way around in Kedung Palang sub-village. The women have another social activity at village level which also government program called family welfare program (PKK) and the wife of the head village was become the chairwomen. The head of villages and his staff favours PT. PRIA for they become the factory workers. In August, hundreds of people demanded the village head responsibility for groundwater pollution. The demand based on the village head agreement to give permission for the establishment of the factory. The next day, village head sent his resignation letter to the subdistrict government and since that day, PKK was inactive.

Figure 3. Children in Lakardowo suffers skin irritation (dermatitis) in genital area, palms and feet

It's becomes habit for parents to build their children house or the children to own house close by. The villager house was a simple house (house type 36-45), consist of: 2-3 bedrooms, cemented/ceramic floor bathroom and septic tank, well equipped with water pump. Electrical equipment which commonly have by the villager: radio, television, table fans, rice cooker, and sewing machine. The electric bill around 50-120 thousand rupiah. People who have electric bill around 80-120 thousand rupiah have washing machine and refrigerator. A household could have up to 2 motorcycles and they prefer to pay it in cash rather than credit due to uncertain income. Women (particularly farmer) avoid money lending practice because of the high interest. If they need cash for urgent needs, for paying hospital fee, lending money from family member or neighbour and take their saving

are main options. For those who have cattle or land, they would sell it later on to pay the debt. Government health insurance program (BPJS) wasn't popular among the villager, for they need to pay monthly around 100 thousand rupiah. Once there was a government health program called Askes, but the one of the requirement was the house wall made from bamboo and dirt floor and only 36 people who accept the AsKes in Kedung Palang sub-villages.

Groundwater pollution have great impact to the villager. For those whose groundwater has changed (color, smell, taste) use bottled water for drinking and cooking. To save money from buying bottled water, some household still washing their food with polluted water. Average gallon water used is 1 gallon/2 days (1 gallon = 20 littres; 4 thousand rupiah/gallon). Bathing and washing clothes is using groundwater and there is no other option to gain other clean water resources. Mr. Mulyadi have a daughter (7 years old) got skin irritation. The doctors diagnosed the cause of it is skin irritation is allergy to meat and eggs. Mr. Mulyadi asked his daughter to stop eating meat and eggs and take a bath at his brother houses which groundwater isn't being polluted. The skin irritation was cured but when she took a bath at her own house, it came back. From then on, she took a bath at her uncle house. The victims of groundwater pollution are mostly women and children, in form of skin irritation and without health insurance it burdened the household financial. A mother of a 3 years old girl, Mrs. Ifa, had to go to doctor twice in September to cure her daughter skin irritation and cost about 50-80 thousand rupiah/visitation. While others, choose to buy antiseptic, body talc, and buy medicine from small store.

The livelihood of household in the contamination area is categorized as coping to adapting. The minimum household budget picture (see table 4) with total income around 1.5 million rupiah would be minimum income for a household with 4 members categorized as adapting.

Table 4. Household budget picture

Item	Income	Expenditure
Head family payment cheque (working as factory labour with payment Rp 300.000/week)	Rp1.200.000	
Farming income (using the calculation of the lowest monthly income from the corn and chili farmer)	Rp326.875	
Pocket money for elementary school child (Rp 3.500/day; 26 school day/month)		Rp91.000
Pocket money for high/middle school child (Rp 13.000/day; 26 school day/month)		Rp338.000
High school tuition		Rp110.000
Male religious group gathering		Rp25.000

Women religious group gathering (2 times/week, Rp 5.000/week)		Rp20.000
Children religious group gathering (once/week; Rp 2.000/week)		Rp8.000
Electricity bill		Rp60.000
Dailly needs (Rp 15.000/day, 30 days)		Rp450.000
Gallons of water (1 galon/3 days, 10 times, Rp 4.000/day)		Rp40.000
	Rp1.526.875	**Rp1.142.000**

D. Groundwater Contamination Valuation[12]

94 households were involved in the research where 51 household live in Sambi Gembol and the other 43 in Kedung Palang. Most of the household (92.5%) knew that their area was contaminated with hazardous waste and average distant from house to the factory about 233 m. Before the contamination, villager in 2 sub-villages (Kedung Palang and Sambi Gembol) used groundwater as their clean water resources for washing, drinking, cooking, and sanitary activities. In the last one year, the groundwater was being contaminated and 77% household weren't used groundwater as drinking water, while 63% used for cooking and only 1% didn't use it to bath. Household which didn't use for bathing is household who have newborn baby. About 83% respondents stated that their family experienced skin irritation and caused by usage of groundwater for daily activities such as bathing and washing. Replacement cost in groundwater contamination was calculated from the cost spent by household to buy gallon water. Household spent in average about Rp 46,925/month to buy gallon water. For cooking, household had to spent Rp 34,938/month and Rp 32,000/month for sanitary activities.

Cost of illness were calculated from interview of 87 households who have member(s) experienced skin irritation. Research result shown that in the last one year, skin irritation was experienced by children (61%), women (21%), and man (13%). Villagers have different preferences to examine their health, 19% went to hospital, 36% to midwife, 7% to local health center and 38% bought medicine directly to the drugstore. The research also included cost spent to buy anti septic, which total cost of illness about Rp 28,689/month. Groundwater contamination valuation was estimated by calculating by adding up cost of replacement and illness which is Rp 78,054/months or 4,3% from average income of the household. 670 households experienced groundwater contamination and based on the calculation economic valuation of it for each sub-village Rp 52,290,150/ months. All of the household interviewed agreed to not accept compensation and want to factory to clean up their environment particularly the groundwater.

E. Participatory Mapping

There were three sub-villages mapping for its hazardous waste utilization and health problems occurred in the household: Kedung Palang, Sambi Gembol, and Sumber Wuluh. Average percentage of factory workers was

[12] Raja, M.E.T. Contamination valuation and preference of groundwater usage: case study of Kedung Palang and Sambi Gembol sub-villages, Lakardowo village, Mojokerto. 2016. Paper. Faculty of economic and business. Airlangga University

17.12%, with highest percentage in Kedung Palang (22.84%) and the lowest in Sambi Gembol (12.61%). It was common knowledge in the community, that before community group actively voiced their complaint, factory only accepted people who sold their land to them. After demonstration happened regularly, factory recruited more workers from local area.

Table 8 Health condition of household at 3 sub-villages

Sub-village (household)	Factory Worker		Non-factory worker	
	No health problem(s)	Health problem(s)	No health problem(s)	Health problem(s)
Kedung Palang	28	17	121	31
Sambi Gembol	17	10	152	37
Sumber Wuluh	32	7	171	36

Villagers got hazardous waste from their neighbor who works as factory worker. Workers used to bring medical waste (doctors robes, hospital sheets contaminated with blood), expired products (foods, drinks, insect repellents, baby products), and coal ash (fly and bottom ash). Coal ash was given freely to factory workers and used as building materials, while villager need to pay 100 – 150 thousand rupiah for transportation. Without knowledge in hazardous waste management, villager used it as sand substitute to build road between sub-villages and improper storage. Expired food products which circulated in the community were yoghurt, canned food, ketchup, and syrups. In a religious meeting, community cooked expired products and then served to the participants. Participatory mapping identified that in average 31% factory worker household experienced health problems.

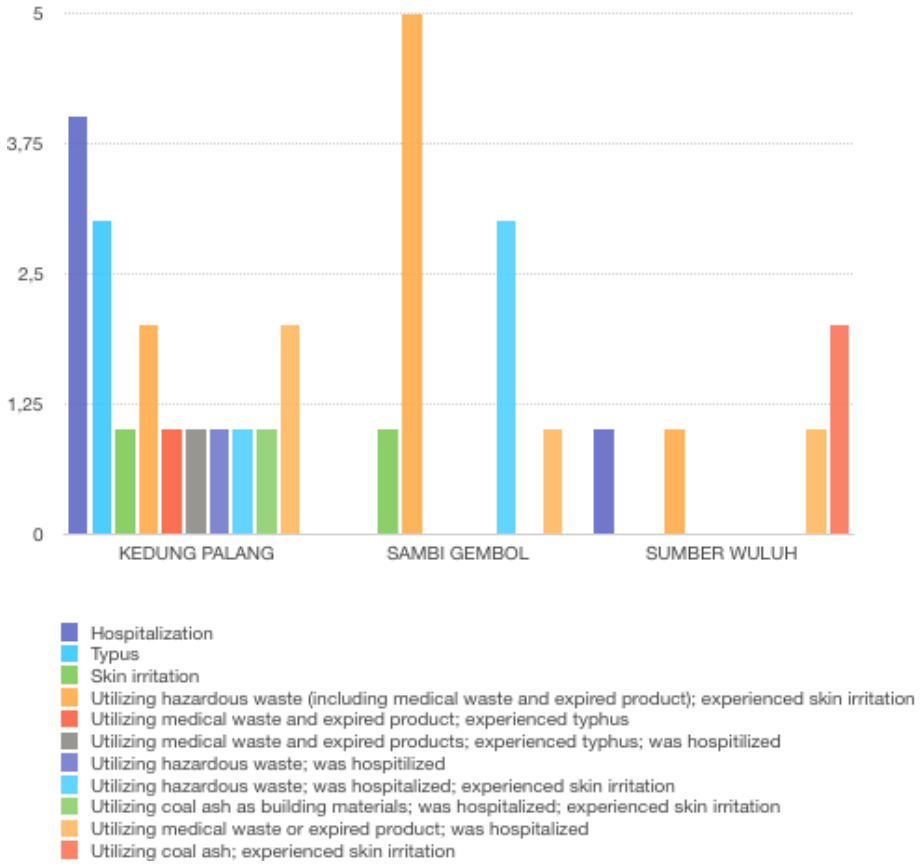

Figure 5 Hazardous utilization and health problems in factory worker household

Average percentage of non-worker experienced health problems allegedly caused by contamination was 14.48%. The highest health problems for non-worker was skin irritation (45-75%) (fig.6). Villager who experienced skin irritation at Sumber Wuluh and Sambi Gembol was tend to gather, while at Kedung Palang was dispersed. Sambi Gembol villager who experienced skin irritation were farmers who owned lands close to the factory. Sumber Wuluh villager who experienced it were those whose house close to the factory. The pattern of villagers who experienced skin irritation in Kedung Palang was disperse was suspected due to the closeness of settlement with factory and distribution hazardous waste and its utilization was spread evenly.

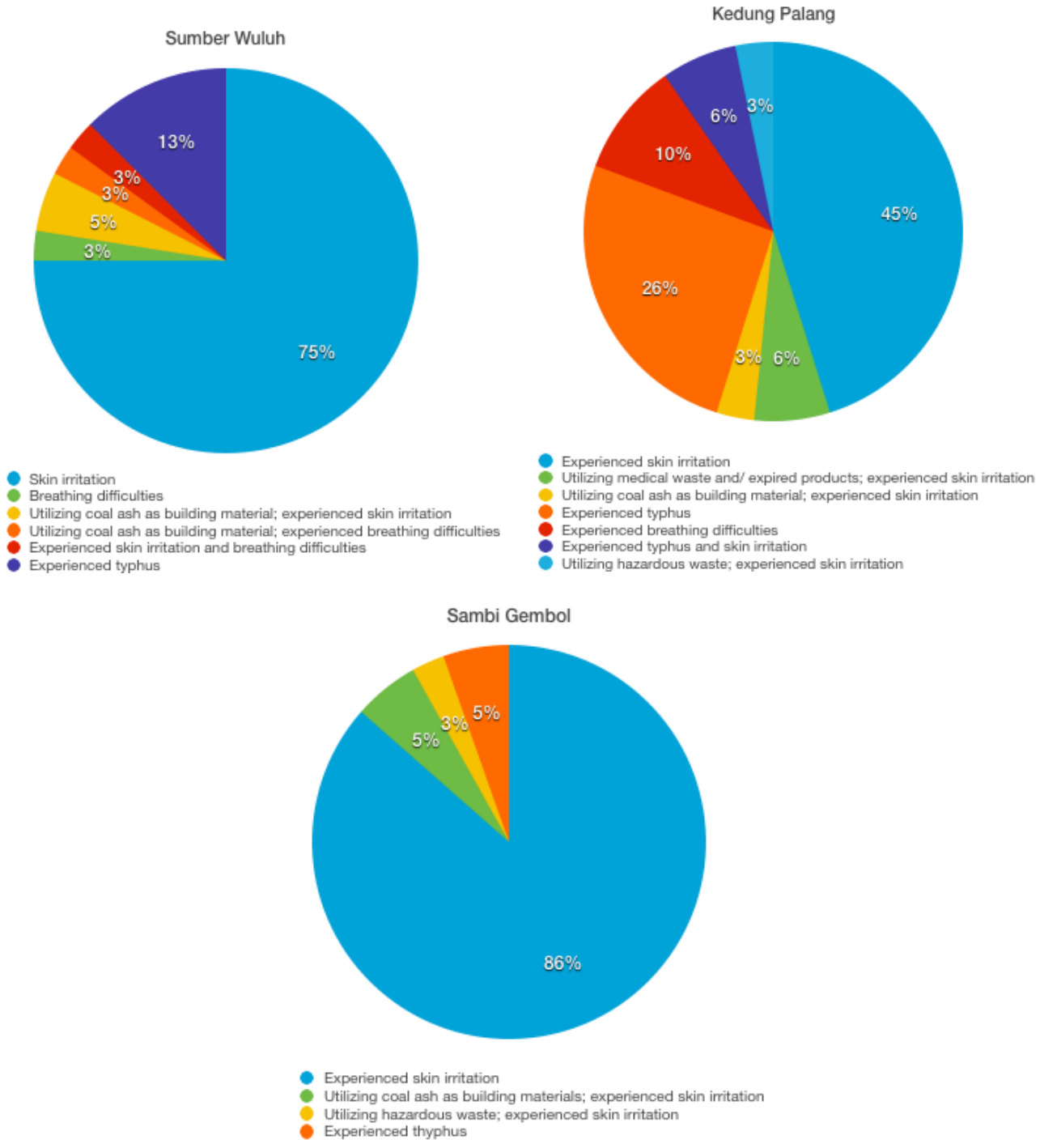

Figure 6. Utilization of hazardous waste and health problems in non-worker household

There were 2 basic reason for the high percentage of worker whose household experienced health problems: (1) improper personal protective equipment (PPE); (2) lack of training on hazardous waste management and implementation.

Figure 7 Mapping activity of the women group

Figure 8 Community map on hazardous waste utilization and health problems in Kedung Palang

6. LOBBY AND ADVOCACY

Date	Activity	Output and or outcome
1st March 2016	Holding training on hazardous waste management with keynote speaker from provincial EPA	• Community gained information or knowledge in hazardous waste management and able to identify factory violation in its management
7th March 2016	Community and ECOTONs team visited provincial EPA and met with vice governor to complaint on ground water pollution and environmental nuisance The team also visited Governor's office	• Vice governor agreed to have ground check with government team to verify the complaint and support community efforts to get their rights.
12nd March 2016	ECOTON delivered complaint letter to the Ministry of Environment and Forestry (MEF) to report the environmental pollution and to ask government suspend the hazardous waste management activity of PT PRIA	• MEF requested EPA of East Java Province to do verification on Lakardowo complaint and to take ground water samples in PT PRIA and nearby community wells.
21st-22nd March 2016	Field survey and ground water sampling done by EPA and MEF to verify complaint of Lakardowo people.	• ECOTON and community only could join water sampling at community wells nearby the factory.
8th April 2016	Meeting facilitated by Governor Office involving ECOTON, PT PRIA, Health Agency, Environment Agency, Development Plan Agency and Researcher from Public Health Department of Airlangga University.	• Government institution saw the need to do environmental research and impacts of hazardous waste landfill activity, but the provincial government do not have funds to do the research and will search for fund resources.
10 – 18th April 2016	Focus group discussion (FGD) to map hazardous waste usage in 4 village and establishment of women group; socialization of women group mapping to the community	• Maps of hazardous waste usage and distribution, health impact • Women have understanding the impact of hazardous waste usage and its impact to community health • Lakardowo women group (KPPL) was established and structure was determined where Sutamah as the head, Puji as vice, Rumiyati as secretary • KPPL was able to mapping groundwater quality and perform campaign in neighborhoods, other sub-villages, and government institution on groundwater quality

21st April 2016	Presentation of verification results by EPA, Governor office and MEF in Jakarta with ECOTON and community from Lakardowo.	• Result shown some parameters exceed standard for clean water quality but they conclude that pollution was not caused by PT PRIA and presumed to be caused by lack of sanitation facility and hygiene in the community. • ECOTON also presented data that was collected by community where 53% of the water samples in Lakardowo have TDS 600 to 900 mg/L that categorized fair taste level. About 20% of the water samples have TDS more than 900 mg/L, and only 27% of well water samples categorized as good taste level.
4th May 2016	ECOTON sent letter to MEF demanded open data of water quality analysis that shown groundwater contamination and asked the government to do environmental audit in Lakardowo to identify illegal activities done by the factory	• MEF sent raw data of water quality (soft copy)
1st June 2016	ECOTON sent letter to Rector of Airlangga University in Surabaya to ask for assistance in doing research to assess environmental pollution in Lakardowo and its impacts to community livelihood and health.	• Rector appointed university research and development institution to do research
13th June 2016	ECOTON sent letter to rector of Institute Technologi Sepuluh Nopember ITS Surabaya to ask for assistance in doing research on ground water hydrology.	• ITS Team from Department of Geophysics came to Lakardowo and did research on groundwater hydrology to identify groundwater flow in surrounding area of PT PRIA • Map of groundwater flow and contaminant distribution.
8th August 2016	MEF released the results of groundwater analysis in Lakardowo and sent letter to ECOTON. The result discussion and analysis was done by ministry of environment, water pollution expert from ITB and geology expert from University of Gajah Mada. The results summary stated 3 points: 1) skin dermatitis was not correlated to contamination in groundwater, but presumed to be caused by activity above ground such as lack of sanitation facility, animal husbandry and agriculture done by community; 2) Location of polluted ground water in the	• ECOTON sent letter to Ministry of Environment to refuse the summary on water quality analysis in Lakardowo. ECOTON asked for more deep investigation on groundwater pollution and its impacts on health of people in Lakardowo through Environmental Audit by independent auditor and funded by PT PRIA in 16th August.

	community had different groundwater hydraulic with suspected pollutant sources (PT PRIA); 3) No pollutant was found in all well water in the factory; The letter was signed by Director General for Pollution and Environmental Degradation Control.	
13th October 2016	ECOTON sent letter to Commission 7 of National Legislative Board in Jakarta to report false summary made by MEF on Lakardowo case and asked for assistance to push government to enforce the environmental law in illegal hazardous waste dump and perform environmental audit[13].	• Public hearing with Commission 7 of National Legislative Board with community group and ECOTONs team in 20th October. • Commission 7 agreed to have ground check and involved law enforcement division of MEF
14-17th October 2016	Demonstration at MEF, sending letter of complaint to Human Right Commissions (Komnas HAM), Police Watch Commission	• Komnas HAM sent letter to Ministry of Environment to ask for clarification from Ministry of Environment in responding community complaints in Lakardowo case in January 2017
24 November	Commission 7 of National Legislative Board visited Lakardowo for work visit in response to people complain a month ago[14].	• The legislative members found hazardous waste dump in the village and held meeting inside the factory. • The legislative members stated that the factory has problems in hazardous waste management and annoyed by bodyguard involvement during the visit and would invite ECOTON, community group representative, MEF, and the factory in a hearing.
8 December 2016	Commission 7 of National Legislative Board held public hearing meeting with PT PRIA and Ministry of Environment to discuss recommendation for Lakardowo case.	• The legislative board recommendations were 1) push ministry of environment to do environmental audit by involving independent auditor. If the environmental audit results show negative impacts to the community, the factory have to fulfill responsibility as regulated in laws and regulations; 2) push PT PRIA to rehabilitate soils contaminated by waste dumping activity in the community houses under control of ministry of environment and reported to Commission 7 of National

[13] LBH Surabaya. To Jakarta, Lakardowo community fight for healthy environment. 2016. http://bantuanhukumsby.or.id/2016/10/25/ke-jakarta-warga-lakardowo-perjuangkan-lingkungan-yang-baik-dan-sehat/

[14] Misti. PT. PRIA hazardous waste was suspected contaminated community groundwater, Parliamentary House findings in ground check. http://beritajatim.com/politik_pemerintahan/283209/diduga_limbah_pt_pria_cemari_sumur_warga,_ini_hasil_sidak_dpr_ri.html

		Legislative Board; 3)demand Ministry of Environment to give data on waste producers, kinds and volume of hazardouse waste to Commission 7 of National Representative Board.
Februari 2017	Ministry of Environment is doing selection on independent auditor to do environmental audit in Lakardowo	• MEF environmental auditor team examined hazardous waste piled up in community residents

7. LESSON LEARNT

Slow responds due to company's strong influence and bargain power to government. The company tends to bribes government and media to protect them from being published and punished. The process to prove the illegal hazardous dumping activity is still blocked by ministry of environment that hesitate to investigate on dumping activity inside the factory. The small win in this case so far was that Ministry of environment agree to do environmental audit by independent auditor and mandate PT PRIA to cover the cost. The other win was Ministry of Environment mandated PT PRIA to clean up contaminated soil in the community land outside the factory. The lessons learnt from this case that

- Most of media company is not independent and vulnerable to bribery
- Environment Agency at regency and province level has low empathy to protect its area and citizen, therefore denies to take responsibility to deal with this case since the operational permit was issues ministry of environment at national level, and tend to defend the company from community protests
- The ministry of environment responds so slow and tend to defend the company and blamed community activities causing the ground water pollution, although the hazardous waste company has far bigger potential causing the pollution.
- We have to use all channel and opportunity provided by the regulations to solve Lakardowo case, such as build national network with national NGOs and media, report to human right commission and police watch commission, and legislative members to raise the issue.
- It's also important to build international network such as with foreign embassy, international media and NGOs to raise the issue and gain attention from government

Next actions will be taken

- Updating information on process in Environmental Audit implementation
- media campaign to raise issue and gain public support
- Lobbying with Police, Village and District Leader, Environment Agency Regent and Province
- Legal suit to Ministry of Environment and PT PRIA
- Developing toxic tour to increase public awareness and supports to solve the hazardous waste management


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