

# BATUBARA MEMATIKAN

## The high price of cheap coal

How Indonesians are paying the price for the world's dirtiest fuel



Greenpeace Southeast Asia

WALHI

JATAM

October 2010

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Published by:

Greenpeace Southeast Asia  
[www.greenpeace.org/seasia](http://www.greenpeace.org/seasia)

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## **I. Introduction**

Coal is considered the world's cheapest fuel. But it is also the dirtiest and most polluting. Yet, countries continue to dig up this mineral and to build coal fired power plants to burn it. The convenience of coal fuel has largely kept well-hidden all the suffering it causes.

Every step in the processing of this fuel – from the beginning when it is mined, up to the end even after it is burned – carries a consequence. Damages include toxic pollution, destroyed livelihoods, displaced communities, health effects on the respiratory and nervous systems, acid rain, smog pollution, and reduced agricultural yields. But by far the biggest consequence is climate change which will affect all countries and people in the world, and developing nations most of all.

A 2008 study by Greenpeace revealed that, in 2007 alone, coal use has cost the world 360 billion Euros in damages<sup>1</sup>. This amount excludes the massive costs of the impacts of climate change caused by carbon emissions primarily due to coal use. The amount also does not encompass the direct externalities related to coal – which includes impacts from community displacement, loss of cultural and natural heritage, and other societal effects. But the cost, already staggering as it is, gives us an idea of what the world sacrifices for the use of this fossil fuel.

At the centre of all these direct impacts are communities: people who rely on agriculture, or fisheries, or tourism, who live along coastlines, or forests and mountains where the coal is dug out or taken from levelled hilltops; or people in cities, living peacefully under the shadow of a coal-fired power plant, or in some cases just right beside massive coal mines.

These communities are among coal's unseen, long-suffering victims who bear the brunt of the damage of the world's coal use. Around the world, these coal-affected communities share the same story of struggle.

The case is not very different in Indonesia, a country undergoing a coal-mining boom. The coal towns of Samarinda, Cirebon and Cilacap are grim testaments to the dark side of this ubiquitous fuel. While coal has brought prosperity to a select few in the country, it is plunging entire cities and communities into misery. Coal mining is also fuelling deforestation, further aggravating climate change for which coal burning is already largely responsible.

Clearly, coal causes great harm to people and the planet and its negative impacts far outweighs any of its perceived benefits. Leaving coal behind is the only way forward. The world simply cannot afford to continue using coal – the costs to the climate, our planet and our lives is much too high.

Governments must realize that their task is to ensure sustainable development with a future powered by clean, renewable energy. This way, further human and societal damage, as well as ecological degradation and devastating climate change impacts, can be avoided.

Unfortunately, the Indonesian Government would like to believe that coal is the answer to Indonesia's large energy demand, and refuses to acknowledge the vast potential of renewable energy and its abundant sources in the country.

The reality is that the true cost of coal underlines the urgent need for action to avoid the disastrous consequences of a coal-powered future.

The government must prioritize and support green investments which will help put Indonesia on a low-carbon growth pathway, instead of maintaining and carrying on with investments which propagate deforestation and climate changing emissions.

New interventions are needed to secure Indonesia's sustainable future. This requires technological leapfrogging, bold policy innovations, and a new solidarity across social classes and generations.

## II. Indonesia's coal

Indonesia is a country rich with natural resources. Its large reserve of coal has made it a major coal producer and exporter.

### Paleogenic (red) and Neogenic (green) coal distribution in Indonesia

Source: ESDM (2009) Coal Statistics 2008, Ministry of Energy and Mineral Resources  
[http://www.esdm.go.id/download/Statistik\\_Batubara\\_Indonesia.pdf](http://www.esdm.go.id/download/Statistik_Batubara_Indonesia.pdf)



Based on the latest data from the Indonesian Energy Statistics, the country's potential coal reserves are estimated at 104.940 billion tonnes. Measured reserve is around 21.13 billion tonnes<sup>2</sup>. In 2009, total coal production reached 263 million tonnes, of which 230 million tonnes (or 87% of total domestic production) was exported. Only 13% or about 33 million tonnes was consumed domestically<sup>3</sup>. These amounts make Indonesia the world's fifth biggest coal producer and second largest exporter.

Coal exports comprised 200 million tonnes of steam coal<sup>4</sup> and 30 million tonnes of coking coal<sup>5</sup>. It is now the world's second largest coal exporter behind Australia, and Asia's largest coal exporter, (Coal Statistics 2010, Wold Coal Institute)

About 78 percent of the coal was exported to buyers in Japan, China, India, Australia and Africa with the rest used domestically. In 2010 Indonesia is forecast to produce 280 million tons of coal with 75 million tons allocated for domestic use.

Indonesia's 2008 total coal resources are estimated at 104.76 billion tons, located in 12 coal seams over six provinces. Major coal deposits in Indonesia are located in Sumatra (50.1 %) and Kalimantan (49.6 %). The remaining is distributed in Jawa, Sulawesi, Maluku and Papua.



At present, the Government of Indonesia has plans to reduce oil use and shift to coal and gas using coal as the main source for electricity generation. The first phase of the program will build coal fired power plants of 10,000 megawatts. The initial program was supposed to be achieved in 2009, with the completion of 35 coal powered plants — ten on the island of Java, and the rest in other parts of the country. However, so far, less than 60% of the target has been completed.

### **III. Coal's trail of destruction: from mine to mind**

Coal may seem like the most practical fuel because of its abundance. But, from mining, through combustion to waste disposal, and in some cases, recultivation, coal has a dire impact on the environment, human health and the social fabric of communities living near mines, plants and waste sites. Aside from massive CO<sub>2</sub> emissions when this fuel is burnt, coal severely damages ecosystems and contaminates water supplies. It emits other greenhouse gases like nitrogen oxide and methane, as well as black carbon and toxic chemicals like arsenic and mercury which can disrupt human mental and physical development. Leaking waste ruins fish stocks and agriculture, and therefore also livelihoods.

In other words, along its production process, also called its chain of custody, coal leaves an irreparable trail of destruction to the environment and human health.

#### **A. Coal mining**

Destruction caused by coal starts with mining at the beginning of the chain of custody. Coal mining contributes to the irreversible destruction of the community's land, water and air resources and also endangers health, safety and the livelihood of communities that live on the fringes of mining complexes.

At its most destructive, coal extraction transforms mountain tops into giant holes with the use of explosives. This is the cheapest method employed by many coal mining companies in Indonesia. Hilltops are detonated to reach coal layers underneath. Millions of tonnes of mining waste and minerals are tossed to the valley and nearby rivers. Practices such as these cause permanent damage to the ecosystem and landscape. It also alters many mountain peaks, such as in Kalimantan into massive lakes full of dangerous chemicals that are toxic to human health.

## 1. Coal mining: an imminent threat to Indonesia's remaining forests

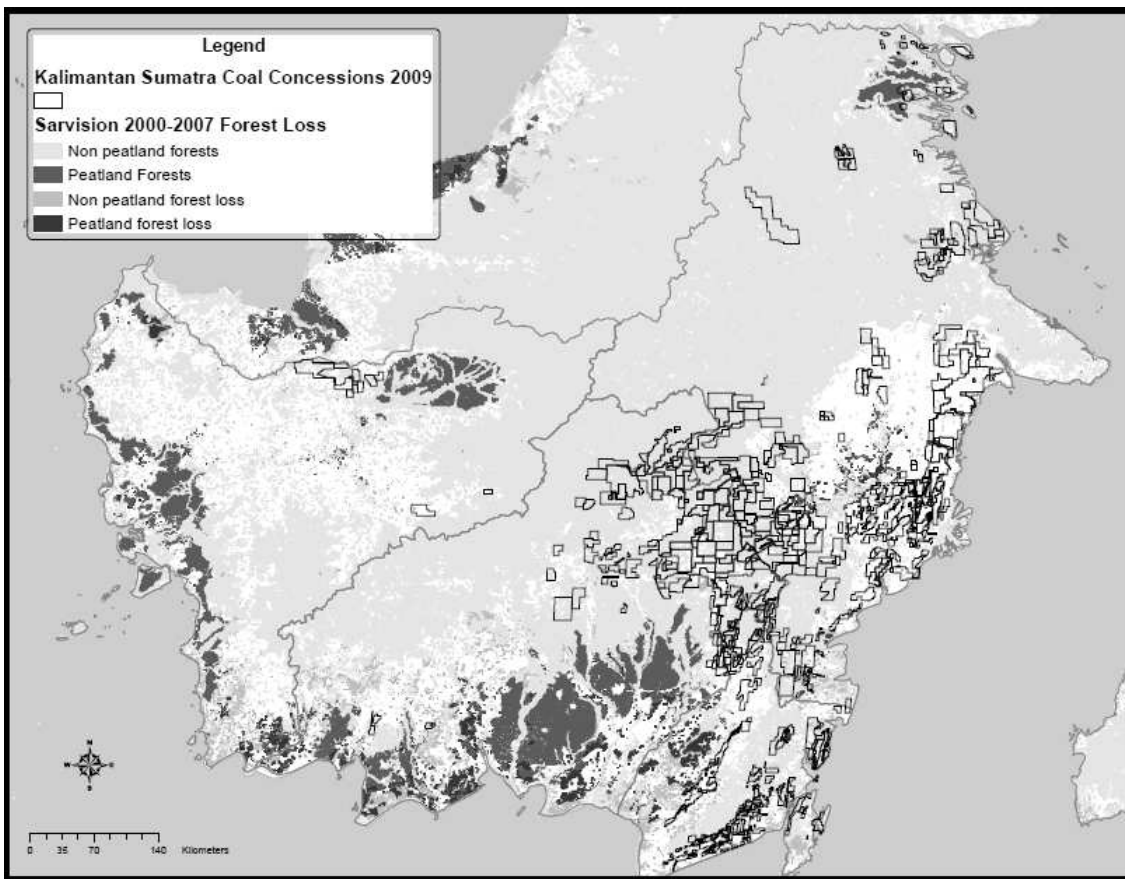
In Indonesia, coal mining is also responsible for forest clearing. Almost all large coal mining corporations in the country extract coal using an open pit mining method. Only the coal mine in Sawahlunto, West Sumatra has an underground mining system. With open pit mining, coal mining undisputedly becomes one of the causes of deforestation.

In South and East Kalimantan, the only two provinces where preliminary concession boundary maps are currently available, there are 400,000 and 323,000 hectares of forests left (2007) within existing coal concessions respectively. And since 2000, in South Kalimantan 85,000 ha and in East Kalimantan 9,000 ha of forest have been lost due to those concessions<sup>11</sup>.

The total forest area covered by mining concessions in these two provinces amounts to 723,000 ha or 0.8% of Indonesia's total forest area as of 2005. In South Sumatra, where concession boundary maps are not yet available, there is rather little forest cover left<sup>12</sup>.

### Kalimantan Sumatra Coal Concessions, 2009

SOURCE



For comparison, according to official figures of the United Nations Food and Agriculture Organization, Indonesia lost 1.87 million ha of forests per year between 2000 and 2005.

From 1966 to 1987, coal exploration and production went through a rapid increase. In 1966, coal production was around 319,829 tons and in 1987 it jumped to 2,813,533 tons<sup>13</sup>.

The period 1999-2008 saw a boom in small scale coal mining (especially in Kalimantan), when the regional autonomy act was implemented. Permit issuance became part of the provincial and district government authority and the royalty from the mining went directly to the province and district.

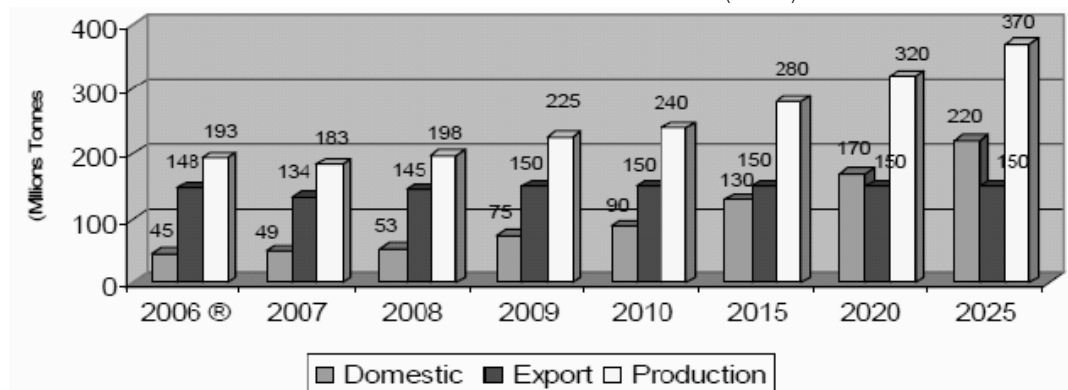
This is also became a period of rampant illegal mining. Most small scale mining operations did not have EIA and had low compliance on site rehabilitation/restoration. In addition, corruption, weak law enforcement and support from powerful interests have allowed the illegal mining operations persist.

Many companies do not fulfil their obligations for rehabilitation. The State Ministry of Environment Report estimates that in 2005, 56% of former mining areas in East Kalimantan have not been restored. The criteria of for land rehabilitation are not well defined in the legislation, and, as a result, it is hard to evaluate the compliance of the companies<sup>14</sup>.

The government’s efforts to increase coal production can be clearly seen from the National Coal Policy (KBN). Plans to exploit low quality young coal (<5100 cal/gr) was planned by building energy plants at mining entrances<sup>15</sup>.

### Indonesian Coal Mining Industry Projection

Hasibuan, S. (2007) Coal Supply Outlook in Indonesia, Dr. Ir. Sukma Saleh Hasibuan  
 Director Directorate of Mineral, Coal & Geothermal Program Supervision Ministry of Energy  
 and Mineral Resources (MEMR) Indonesia 16 October 2007



The chart above shows the Ministry of Energy and Mineral Resources’ projected growth of coal production, domestic consumption and exports

until 2025. Coal production is expected to rise by 90% from 2006 to 2025, mainly for domestic consumption, and expected to account for almost 60% of total production<sup>16</sup>.

The coal-mining boom seemed to have inflicted severe damages to forests due to reckless issuance of mining rights by regional administrations. This is compounded by weak enforcement of forestry, environmental, zoning and mining laws.

Based on analysis using Ministry of Forestry data on forest cover, total threat from coal concessions is 0.18 million ha from active concessions and 0.81 million from future concessions (0.08 million status not available), totalling 1.1 million ha, of which 0.94 million are located in Kalimantan, and 0.13 million in Sumatra.

An aerial view of Kalimantan clearly shows how much forest has already disappeared. Large-scale timber logging cleared much of Kalimantan's rainforests years ago.

In June 2010, a central government team with Forestry Minister Zulkifli Hasan, Environment Minister Gusti Muhammad Hatta and members of the President's anti-judicial mafia taskforce observed that hundreds of thousands of hectares of forested areas have already been damaged by exploitative legal and illegal miners in East Kalimantan, confirming the excesses of the launching of regional autonomy in 2001.

Regional autonomy devolved the authority of licensing general mining operations (outside oil and natural gas) to regional administrations which is further reaffirmed by the 2009 mining law. But this has made mining the second biggest destroyer of forests, in addition to illegal logging and slash-and-burn farming.

The government team saw from the air hundreds of huge black holes abandoned by open-pit coal miners. These holes were supposed to be reclaimed with reforestation by the mining concessionaires.

One of the main problems lies in the long delay in the enforcement of the 2009 mining law. The law clearly regulates the division of authority in the licensing of mining ventures between the central government and provincial and regency administrations, with the delineation of areas opened to mining contractors or reserved for strategic mining areas under direct jurisdiction of the central government.

Three main factors have been identified for the current disorder in regulating the mining industry and holding them liable for forest destruction.

First, changes in spatial planning laws allowed for mining in forest, including protected areas, through the issuance of special permits approved by the forestry minister.

These permits were granted to mining companies under the proviso that they already held rights to mine in forest areas before the changes to the land law were made.

Initially, only 13 companies were eligible under this proviso, but by May 2010, 54 permits had been issued in East Kalimantan alone.

Some 53 of these were issued after a 2008 government regulation that set the tariff rate for exploiting non-forest products, including minerals and coal. This regulation was often perceived as an effort to “sell” forest areas.

Second, the dramatic increase in the price of commodities prior to the global financial crisis increased mining in forested areas.

The financial crisis depressed coal prices, but as of 2010, the price of coal has rebounded, and this has seen an increase in investment in the mining sector.

Third, decentralizing the issuance of mining concessions combined with local direct elections gave rise to local capture and rent seeking.

Today, global hunger for metallurgical or coking coal for steel production may threaten the remaining intact forest in central Kalimantan.



An open pit coal mine in East Kalimantan. ©Henri Ismail/Greenpeace

## **2. Coal mining: causing of water pollution, flooding and the decline of livelihoods**

Samarinda in East Kalimantan is one example of how coal mining has ruined the lives and livelihood of communities.

Flooding, largely caused by deforestation due to coal mining, has been a constant nightmare in Samarinda since the coal mining boom the last three years. Rains of more than two hours immediately transform parts of the city centre into big pools of water. The floods have never occurred before the coal industry altered the town.

Surrounding community rice fields and farmlands have also been adversely affected by coal mining.

Makroman village, Samarinda Ilir was once known as Samarinda's rice production centre. But the town has since been stripped of the title when coal operations began in the area. Dozens of hectares of community farmlands have been badly damaged by coal mining waste carelessly dumped into the river that has been the community's main water source.

Communities living in the fringes of mining locations also complain of various health problems. In 2007, in West Kutai, East Kalimantan as many as 19,375 people suffered respiratory related illness – a 9% increase from previous year<sup>17</sup>. Records from the health centre in Bengalon district, Sangatta regent, the site of PT. Kaltim Prima Coal, the biggest coal mine in Southeast Asia, shows similar statistics. The most feared health complaint of the people in Bengalon are respiratory related illnesses, such as upper respiratory tract infections, asthma, bronchitis, and pneumonia, suspected to be caused by coal dust.

Tragic stories about the various adverse impacts of coal mining in the country become an even greater matter of concern when it is related to the right to live and land rights of indigenous peoples who have been living for generations around areas suddenly transformed into mining locations. Since 1982, the indigenous people of Dayak Paser continue to be forcibly evicted from the land where they have been living for generations by the mining company PT. Kideco Jaya Agung. About 27,000 hectares of their land was cleared for mining<sup>18</sup>, and they are even banned from conducting any activity on their own sacred land.

The same fate was experienced by the indigenous people of Dayak Basap in Bengalon District, Sangatta. The Dayak Basap people, who rely on hunting and farming in order to live, are now all driven out of their land since PT. Kaltim Prima Coal started operations in 1992<sup>19</sup>. After being moved and evicted several times, some of them settled in Segading,

upstream of the Lemba River. But current developments indicate that they will yet again be evicted due to expansion by the same company.

### **3. Coal use: damaging human health and the environment**

The burning of coal for fuel causes a trail of destruction that is even more destructive and far-reaching than coal mining.

Coal is the dirtiest, most carbon intensive of all fossil fuels, emitting 29 percent more carbon per unit of energy than oil and 80 percent more than gas<sup>20</sup>. It is the single greatest cause of climate change-causing carbon dioxide emissions.

Burning coal also releases massive amounts of substances such as mercury and arsenic that are toxic to human health and create acutely detrimental effects on developing economies.

According to the External Cost study conducted by the European Commission (EC) in 2003<sup>21</sup> on different types of power generation, coal-fired power plants registered the highest external cost. In comparison, renewable energy sources exhibited the lowest external cost.

Also known as externalities, external costs arise when the social or economic activities of, for example, a coal mine or a power station, have an impact on a set of people and when that impact is not fully accounted, or compensated for.

Thus, a power station that generates sulphur dioxide which causes acid rain, or mercury which causes damage to human health, imposes an external cost. Environmental and social costs are thus “externalized” because, although they are real costs to members of society, the owner of the power station is not taking them into account when making decisions related to his economic activities.

The EC study considered climate change impacts, human mortality (i.e. reduction in life expectancy, cancers), human morbidity (i.e. respiratory hospital admissions, restricted activity days, congestive heart failure), its impacts on building materials (i.e. aging of galvanized steel, paint), crops (i.e. changes in yields caused by nitrogen oxide, sulphur dioxide, trioxide and acid deposition), amenity<sup>22</sup> losses due to noise or spoliation of aesthetics, and the impacts of acid and nitrogen deposition on ecosystems.

These external costs are staggering. And the communities hosting coal plants end up paying the price of the impacts of burning coal for energy.

First, large amounts of water are needed to “wash” coal and cool the electricity generator plant. This process causes water shortage in many areas.

Coal power plants are also a major source of pollutants such as sulphur dioxide and nitrogen oxide which cause acid rain and air pollution. Fine coal particles (fly ash) are the main cause of pneumonic illnesses.

These pollutants from the plant’s chimney threaten the health of people in surrounding communities and the environment.

### Mercury menace

Coal plants are one of the most notorious sources of hazardous emissions. In the US, for example, coal plants are identified as the largest source of mercury emissions<sup>23</sup>.

Mercury is a substance so toxic that all it takes is 0.002 pounds of mercury accumulated over a year to contaminate a 10 ha lake to the point where fish caught are deemed unfit for human consumption<sup>24</sup>. A typical 100-MW coal plant emits an estimated 25 pounds of mercury a year<sup>25</sup>.

Mercury is an extremely toxic metal that has no biochemical or nutritional function. Most of the toxic effects of the substance that can result from exposure are on the central nervous system<sup>26</sup>.

Mercury is capable of causing severe brain damage in developing foetuses and mild tremors, mental disorders, motor and emotional disturbances, even death, in exposed adults. The exposure to mercury depends on its forms, with mercury vapour and methyl mercury being the most likely forms since they are nearly completely absorbed into the body.

Once mercury enters water – either directly or through deposition from the air - biological processes transform it into methyl mercury, a more toxic form of mercury that bioaccumulates in fish and other animals that eat fish - such as humans. When a substance bioaccumulates, its concentration increases as it moves through the food chain.<sup>27</sup>

### Methyl mercury and extreme risks to children

According to recent studies undertaken by the US National Academy of Sciences (US-NAS), "there is strong evidence for the foetal neurotoxicity of methyl mercury, even at low concentrations of exposure." Exposure to

methyl mercury emitted by coal-fired facilities "causes lifelong loss of intelligence in hundreds of thousands of babies born each year<sup>28</sup>."

Based on the US-NAS study, the resulting loss of intelligence "causes diminished economic productivity that persists over the entire lifetime of these children. This lost productivity is a major cost of methyl mercury toxicity<sup>29</sup>."

If coal-fired power plants are allowed to expand throughout the country, how much will it cost Indonesia in terms of lost productivity due to similar risks of lifelong loss of intelligence among countless infants exposed to methyl mercury emitted by coal plants?

The adverse effects of coal plants to nearby communities can be seen in the example of the Cirebon coal power plant which is built on a coastal area.

Kanci village in Astanajapura District, Cirebon province used to be an important producer of sea salt and traditional shrimp paste (*terasi*). But all that is now gone. Thousands of square metres of traditional salt farms have been taken over to make way for the development of the coal plant. Moreover, fishermen can no longer catch the tiny shrimp (*acetes sp*), locally called *rebon*, used to make shrimp paste. Family industries of *terasi* have gone bankrupt and have lost their livelihoods due to pollution from the plant development.

Green mussel (*perna viridis*) fishermen Waruduwur village have experienced the same problems. Dozens of mussel catchers have lost billions of rupiah, after sludge from the reclamation process for the coal plant construction rendered their catch unfit to eat.

The degree of destruction from coal power plants continues and worsens when it starts operations, as evinced by the experiences of communities around the Karangandri coal plant in Cilacap.

Cilacap's Karangandri plant started operating in May 2006, with a total capacity of 600 megawatts. Since the beginning of its operations, the Cilacap plant has caused various problems directly felt by the surrounding communities. Extremely loud noises due to the cleaning of the pipes in the plant, as well as coal dust, forced dozens of communities to move away from Griya Kencana Permai, a nearby housing complex. The drastic fall of fish catch around the plant and adverse health effects has impacted the communities surrounding the coal complex.

In February 2009, Greenpeace, together with a local community movement, the Community Aspiration Society (KAM), organised free health services for families around Karangandri plant in Cilacap. Examination of 562 people showed that 60% of them suffered acute upper respiratory infections, 20% had bronchitis, 10% pharyngitis, and the remaining 10% suffered other illnesses.

Mrs Munjiah, 50, spends her days at home after she was diagnosed with chronic pneumonic illness. Her chest X-ray showed specks strongly suspected to be coal dust in her lungs. Now she cannot work in the rice fields, because she is too weak. What Mrs Munjiah experiences may not be a strange illness around the Cilacap coal plant. In another health survey carried out by Greenpeace in August 2008, 80% of the people living around the coal plant suffer respiratory problems believed to be caused by coal dust.

#### **4. Coal waste: a dirty legacy**

Damage caused by coal does not stop with its burning. At the end of the chain are the abandoned mines with their mining waste, as well as coal ash from coal fired power plants. Open pit mines are also faced with the dangers of Acid Mine Drainage which usually collects in large pools or lakes.

A flight over the town of Samarinda and the regent area of Kutai Kertanegara, will reveal dozens of large pools filled with greenish coloured water. They may look beautiful from afar, but these pools of mine waste threaten surrounding communities. Rain water mixed with heavy metals from coal mining waste pose significant dangers to community health once they penetrate soil, groundwater and other water sources.



An open pit coal mine in East Kalimantan. ©Henri Ismail/Greenpeace

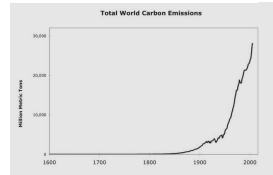
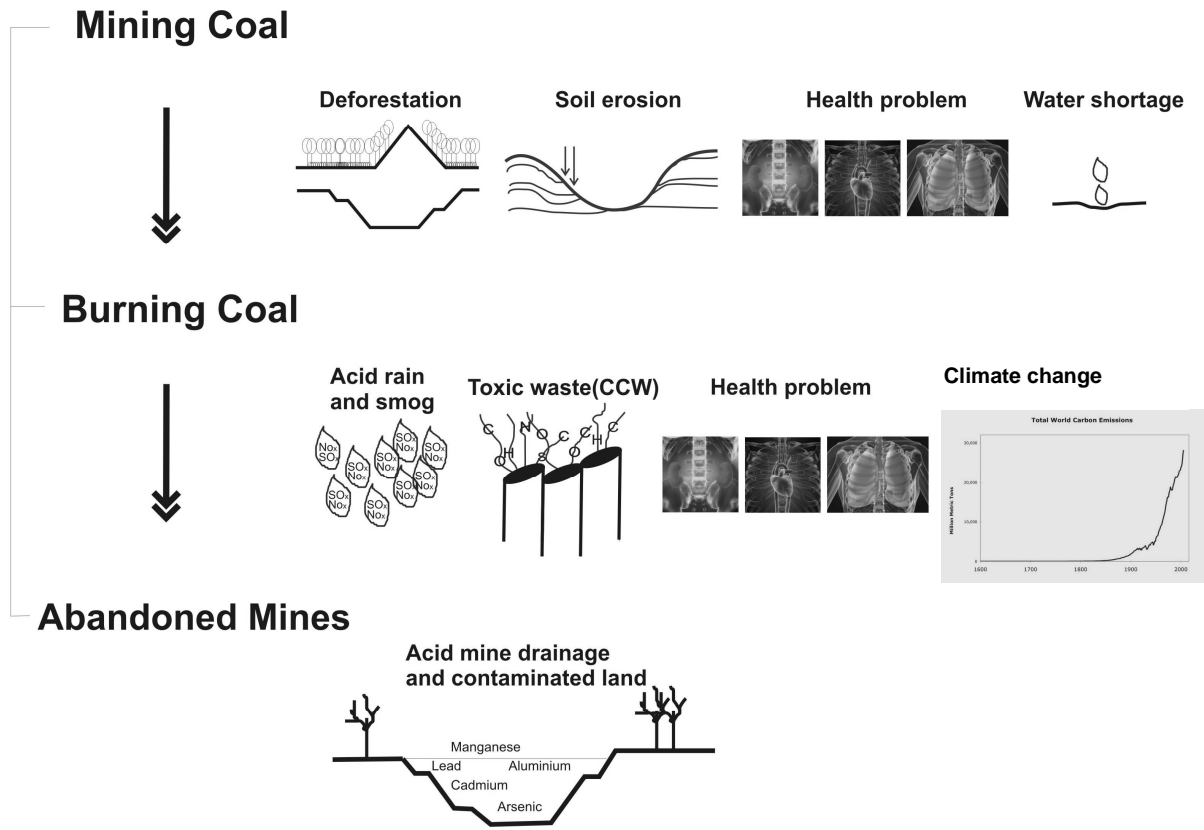
Abandoned coal mining pits are seen as regular phenomena in East and South Kalimantan despite the fact that Indonesian law stipulates that mining companies have the responsibility to restore mined areas once the extraction is over. The law has clearly been ignored.

For instance in South Kalimantan, 16 companies holding Coal Extraction Permits (Perjanjian Karya Pengusahaan Pertambangan Batubara, PKP2B) occupy a total concession area of 236,367 hectares. These companies have only restored 3,132 hectares from around 20,000 hectares of coal extraction<sup>30</sup>.

Open pits left after the coal life is over also cause subsidence and damage structures such as houses, buildings and infrastructure such as roads and bridges. Efforts to repair damage caused by closed mines are never enough. Even when the holes are 'reclaimed' back they will not recover fully; the surrounding community will still experience contamination.

In the scientific world, it is a common fact that the burning of coal produces cadmium, a toxin classified by the US Environmental Protection Agency (US EPA) as a probable human carcinogen, lead, a deadly heavy metal, and hexavalent chromium or chromium VI. Cadmium, for example, is a soft silvery metal that sticks to fly ash and is associated with heart, kidney, lung and liver disease. Chromium VI on the other hand is a major air pollutant whose toxicity is second only to benzene. Chromium VI is among the strongest known causes of lung cancer and can produce internal haemorrhaging and liver, kidney and respiratory damage. Exposure to chromium VI comes from coal plant cooling towers<sup>31</sup>.

# Coal impacts along its chain of custody



## IV. Stories from communities

### A. Samarinda: Indonesia's coal mining capital

If there is a world record category for the city with the biggest area earmarked for coal mining, Samarinda will probably be the record holder. Around 70% of its total area of 71,823 hectares is already allotted for coal mining concessions.

Samarinda also holds the title as the country's coal mining capital. The town is a living snapshot of how destructive coal mining can be: all adverse impacts of coal mining that is happening around Kalimantan can be seen in this city: from lost livelihoods and floods, to gaping holes of toxic sludge left by coal mines in the middle of the city.



#### Loss of livelihoods

Mrs Soniya, 40, a resident of North Samarinda, tells her story emotionally: "Since the coal mine started operating in our village our rice fields and fish ponds have been damaged by the coal waste. We also lost the water we use for drinking and washing. We can no longer drink the water in the river behind our house.<sup>32</sup>"

The people of Rimbawan village, Tanah Merah in North Samarinda District have been living in the shadow of coal impacts for the past three years. Waste from the coal mines has caused damage to their rice fields, affecting their harvest. The waters of Rimbawan River, which flows through the town is already polluted and unusable. Before the arrival of the coal mines, Rimbawan River was the town's main source of drinking water.



Mrs Soniya. ©Henri Ismail/Greenpeace

Mr Atek, a fish pond owner, said his pond is now polluted by coal mining waste. But Mr Atek still counts himself lucky. Compared to Mrs Soniya and many of his neighbours, he can still rent out his fish pond to support his family.

### Floods

Flooding was never a serious threat to residents of Samarinda before the drastic increase of large scale coal extraction activities in the provincial capital. Major floods used to follow a cycle of around 5 to 10 years. However, in the past 3 years residents have observed that major flooding is now a frequent occurrence during the rainy season. According to Mrs Soniya, just two hours of heavy rains is almost certain to inundate some areas in North Samarinda.

Lia, a student in Mulawarman University relates that: “for the past two years, floods have disrupted my life as a student. There was a time when my friend and I were almost washed away by flash floods in our campus.”<sup>33</sup>

But environmental damage caused by unrestrained and careless exploitation of coal not only causes direct negative impacts to the community. It is also a burden the municipal government. According to the Mining Advocacy Network, in 2008 regional income from mining was 399 million rupiah or about 4% of the yearly income of Samarinda (around 112.5 billion rupiah)<sup>34</sup>. Frequent flooding however, means that the local government also spends billions of rupiah to build water gates, dikes and other infrastructure.

### Mining pits in the middle of the city

An aerial view of Samarinda will reveal hundreds of mining pits scattered across the city. Some of these pits have now turned into toxic lakes, abandoned without clean-up and restoration by mining companies after they finished exploiting the land for coal. Most of these pits can be found in Sempaja, a populated district just 15 km from the city centre.

### The irony of poverty in the city of black gold

Coal is also known as black gold in the coal business. It has made coal investors into multi-millionaires in a country where about 32 million people live below the poverty line, on an income under 7,000 rupiah a day<sup>35</sup>. Almost all of the ten richest people in Indonesia in 2009 are involved in extractive industries such as coal mining as well as in the palm oil plantation business.<sup>36</sup>

But although coal has brought spectacular wealth to a chosen few, not all who work with coal have benefited from it. If at all, coal mining has brought only very little to the residents of Samarinda whose city is being laid to waste.

Mrs Yanti, a resident of Selili of East Samarinda District, is one of these people. She lives close to a mining area. The municipal government has identified her as one of the millions in the country who live below the poverty line. Every day, Yanti and many other villagers work as small scale coal mine workers around their home. They jokingly call themselves workers of KPC – but not PT. Kaltim Prima Coal but “*Karungan Prima Coal*” or ‘coal in bags’.

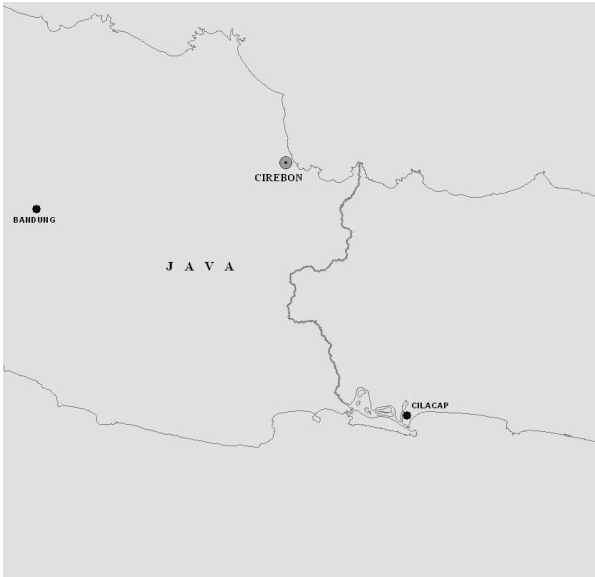
Their job is putting newly-extracted coal chunks into plastic bags. When the 50-kilogram bags are full, they have to sew it shut. For this work, they receive 800 IDR (around 0.08 USD) per bag. Quite often Mrs Yanti and her friends have to work from afternoon until the early hours of the next morning.

“I have no choice but to work as a coal picker since I lost my old job. Some of my friends still have to continue work even during the advanced stages of pregnancy. We have no other choice,” she explains<sup>37</sup>.

Government officials at the national and local level always claim that coal mining in East Kalimantan, especially in Samarinda will boost the welfare of local people. But the facts show the opposite: communities have been at the losing end in the past years since the coal mining surge in Samarinda. Claims that the coal boom has led to better welfare for the people is are proven false by stark pollution and ruin left by abandoned mines, increased incidence of floods due to deforestation from coal mining, and the resulting loss of livelihoods and heightened poverty — all in the midst of a city rich with black gold.

## **B. The development of Cirebon coal plant and the resulting community impoverishment**

Since operations began in the Cirebon coal-fired power plant in early 2008, 48-year-old Kasneri no longer has a steady job. These days she spends her time in her small and rundown home in Kanci Kulon village, Astanajapura District, Cirebon. Once a while, her neighbours will offer her work on their rice fields. Mrs. Kasneri would get an additional income of 10,000 rupiah for slaving six harsh hours under the blazing Cirebon sun.



She used to work as a traditional shrimp paste (*terasi*) maker. She could get at least 200,000-300,000 rupiah each day from selling her *terasi*. *Terasi* made the traditional way in Kanci Kulon village is famous for its distinct and delicious taste. The villagers are proud that their product is made purely of *rebon* shrimp (*acetes sp*). They catch the tiny shrimp along the coast of Astanajapura district which covers Warumundu, Temu, Kanci Kulon, and Kanci Wetan villages. Kasneri works together with her husband, Dalim, 54, who catches the shrimp along the coast of Astanajapura.

Since the Cirebon coal plant started operating, Kasneri and Dalim and 26 other families who make traditional *terasi* have lost their income. They can no longer catch *rebon*. Dalim used to catch more than 10 kilograms of *rebon*, but now the shrimp have disappeared. Villagers later discovered that land reclamation for the coal plant, which covered the coast line of Astanajapura, was the main reason the *rebon* shrimps – the very shrimp from which Cirebon got its name – have vanished. The reclamation process used sludge and other waste from the coal plant to bury the corals where the shrimp thrive.

A year ago, Kasneri was reflecting about her life after two days with no shrimp catch. Her husband Dalim was lying sick and they had no money for medical treatment. When asked why she didn't take her husband to the doctor, Kasneri said: "we don't have enough money even for a meal, let alone a doctor."

#### The decline of fish catch in Waruduwur Village

Waruduwur village is the closest village to the Cirebon Coal Power Plant. Majority of the villagers are fisherman. Before the Cirebon plant was built fish was easy to catch a few meters from the shore. But after the construction of the coal plant they found that they have to fish much further than before. In the past, fishermen only needed around three litres of fuel for fishing, now they use more than 15 litres. But despite the increased distance, fish catch is much less than in the previous years before the plant was built.

Mr. Romansah, a 38 year old Waruduwur fisherman said, "three years ago we were easily found crab and shrimp in coastal area, but since the

since the construction of the coal plant, we can now only catch five shrimps for one day. Our fish catch reduced drastically.<sup>38</sup>

Land reclamation due for the coal plant construction has also severely affected the river in Waruduwur village. As a consequence, village houses



Mr Romansah, a fisherman from Waruduwur. ©Arif Fiyanto/Greenpeace

are flooded during high tide. “I’ve never seen floods like this since I was a child,” said Mr. Wahyudi<sup>39</sup>, one of Waruduwur villagers.

#### The lost livelihoods of traditional salt makers

Samsu, 50, is a salt maker from Kanci Kulon village. Samsu and his family have been salt makers for generations but they were forced to give up their family livelihood when the coal power plant was built in their village.

Samsu’s land, all 4,000 square metres of it, suddenly became useless for making salt. His land was located in the site earmarked for the coal plant project. The developers, supported by government officials, pressured local residents to sell their land and a very low price. Although most of landowners disagreed, the developers forced them to give up their land. Samsu is one of the residents who resisted. He said he refused to sell his land at any price. It was his most valuable possession, the source of his salt-making livelihood. During harvest season Samsu can make around 20 million rupiah every six months. With that income he can send his children to school and live quite well.

With the start of the coal plant development project came the end of his salt-making cottage industry. He held on to his property as long as he

could but because the land is in the middle of the coal project, Samsu can no longer work. The developers cut the main flow of sea water to his land. Without seawater, he wouldn't be able to make salt, and his land is also useless for farming. Samsu said he is determined to fight the coal plant's tyrannical treatment.

Samsu's experience is similar to dozens of other salt makers who were left without a living with the construction of the plant.

### Social and economic impacts of the Cirebon coal plant

The Cirebon Coal Powered Energy Generating Plant is in the process of development. It stretches over four villages: Kanci Kulon village, Kanci Wetan, Warumundu, and Citemu villages. Despite its size, this power plant is not part of the central government's ambition to build 35 coal plants totalling 10,000 megawatts in the country before the year 2010.

Aan Anwarudin, one of the student activists that rejected the development of the plant in his village said that the Cirebon plant was built before an Environmental Impact Analysis (EIA) was completed. There was also no public consultation with the surrounding communities.

Aan said that the project location is very close to the village houses. The plant is a mere ten metres to the nearest house in Kanci Kulon village, 450 metres from the nearest house in Kanci Wetan, and 15 metres from Waruduwur and about a hundred 100 metres from Citemu village.

Aan and local residents rejected the development and united themselves under a group called the Environment Savers People (Rapel). Rapel has conducted demonstrations a number of times, to send a message to the developers and also to the Cirebon local government to stop the coal plant project in their village.

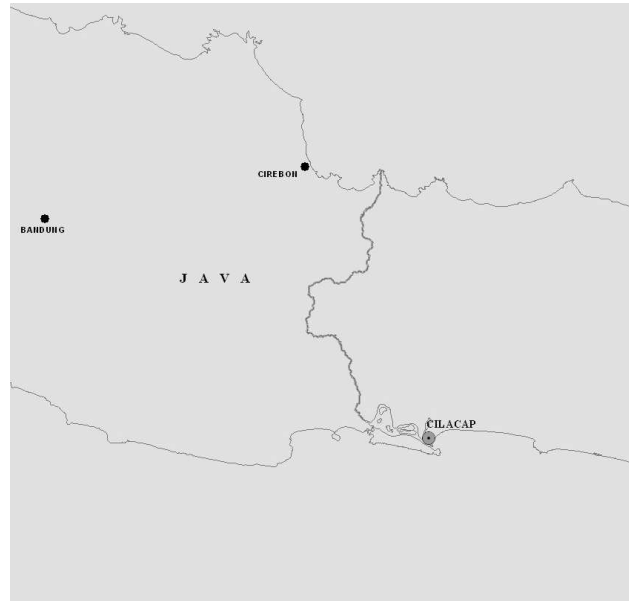
"The coal plant will not bring anything positive to the people of Astanajapura. From the beginning, it has systematically impoverished salt makers, terasi makers and green mussels catchers,<sup>40</sup>" Aan said, explaining his concern.

The people of Kanci, according to Aan, are afraid of the negative impacts of coal once the plant operates. They are aware of the experience of communities in Cilacap. People living near the Cilacap coal fired-power plant face a number of problems: from the increase of respiratory illnesses, unusable and irreparable farm lands, and the constant rain of coal dust that makes their air unfit for breathing.

### C. Cilacap

In 2006, the bustling industrial town of Cilacap was filled with optimism. President Susilo Bambang Yudhoyono had announced the opening of a new coal fired power plant in the area. But despite the initial hope for local economic growth, the real cost to the Southeast Java town soon became shockingly clear.

The original aim of building the power plant was to encourage local economic growth. In turn, this would help expand Cilacap's industrial area to around 2,000 hectares – more than ten times its former size<sup>41</sup>. At the beginning of the project, the government watched proudly. The plant was delivering 600 megawatts of electricity to the Java - Bali electricity grid. Many new jobs had been created, causing a booming trade in building materials. Other locals earned money by renting their houses to construction engineers.



But soon the reality hit home – and it all started with a black cloud of dust that covered the local town.

Alia is four and lives with her parents and two older siblings. An abandoned rice field is the only thing separating their home from the coal-fired power plant, 300 metres away. In the early days of the power plant, Alia played happily with her friends outside her house. The only small sign of danger was the persistent coughing that all the children began to pick up.

It was an early sign of something far more serious: seven months ago, Alia was diagnosed with bronchitis. Her father has been affected, too. He worked at the plant for over a year, unloading the coal trucks without a breathing mask, inhaling the soot and fumes. Now he has lung spots.

Another local girl who suffers is three-year-old Safira. She is small for her age and has had coughs and colds at least twice a month since she was born. Her mother, Rohimah, can't afford to take her to the doctor. The only medication Safira gets is over-the-counter fever tablets and cough syrup.

Purwanto, a local doctor, told us: "A lack of nutrition caused many of the mothers in the area to be unable to nurse their children, reducing their

babies' resistance to infections. I have seen a shift to more cases of respiratory infections in children than adults in the area since the plant started operating.<sup>42</sup> Purwanto is all too familiar with the suffering of children caused by the power station. He was forced to leave his own home in a nearby complex after two of his children developed bronchitis.

### Air pollution

Unlike Purwanto, Imam Sarjono, a 59-year-old pensioner, chose to stay in his home. He worked hard to buy it for his retirement, after a long career as a warden in a high security prison. When he bought it, he was one of 200 buyers in the complex, all attracted by the prime location, fresh air, and distance from the hustle and bustle of the city centre.

Now, black soot covers Sarjono's white orchids and the jasmine he planted in front of his house. Trees around the area have layers of black dust on their leaves. Dozens of people have been driven away by the coal dust and constant humming coming from the plant.

"We pay double our water bill to clean our houses. Dust keeps us sweeping the floors many times a day," Sarjono tells us. "Many of my neighbours have moved away. Who can stand living like this?"<sup>43</sup>

### Job losses

The pollution from the plant has had a devastating effect on the ability of many to make a living from the land. About 12 hectares of productive rice fields in two villages were effectively ruined after the plant flooded them with a mixture of hot salt water and effluent from the plant. This incident forced one farmer, Noto, and his son off their land. Now, to earn money, they dig sand and transport it back to his village in a small boat. With a 10-hour day starting at 6 a.m. it's backbreaking work just to fill a small truck. Noto's tiny earnings are never more than about 80,000 rupiah a day, about US\$8<sup>44</sup>. Along with many of his neighbours, losing his rice field meant Noto had no choice. In fact, Noto and his son are among the lucky ones – many of his neighbours have no work at all.

### A local uprising

The illnesses, pollution and deterioration in quality of life have taken their toll on the locals living near the power station. One day at dawn, in late 2005, the neighbourhood was woken by a loud noise from the plant. Residents said it sounded like a plane taking off nearby.

"The noise kept coming on and off every five minutes. We couldn't even hear ourselves talking. Later we found out it was the plant cleaning their

pipes,” said Sugriyatno, who also lives in the complex<sup>45</sup>. The incident drove the people of the housing complex, and three surrounding villages, to gather together and protest about the many problems by the plant. They formed a committee so they could take their complaints to the local government and the power plant.

Sugriyatno, who led the effort, said: “We are negotiating compensation for the damage in the three villages and Griya Kencana Permai complex caused by the plant’s operation. There has been a lot of damage already. However, we are still hopeful that a positive solution will come out of this.”<sup>46</sup>

He also pointed out that the power plant’s owners had never showed sympathy or offered support to the neighbourhood they destroyed. The locals won’t back down; but neither, it seems, will the polluters.

## **V. Time for an Energy [R]evolution in Indonesia!**

In this report, we've shown the damage caused by coal right along its chain of custody – from digging it out of the ground to what remains after it has been burnt.

We've exposed the destruction caused by mining – from black lung disease to coal fires and acid mine drainage. We've uncovered the effects of coal-fired power plants locally and globally, including the urgent threat of greenhouse gases building up in the atmosphere. We've also spotlighted coal's legacy – the often-forgotten harm caused by abandoned mines and the reclamation attempts that never really work.

The true cost of coal underlines the urgent need for action to avoid the disastrous consequences of a coal-powered future.

There are options available to us other than coal – options that work. Greenpeace's *Energy [R]evolution: A Sustainable Indonesia Energy Outlook* <sup>47</sup> provides a practical blueprint.

### **Renewable Energy**

Nature offers many renewable energy sources. The matter is how to transform sunlight, wind, biomass or water into electricity, heat and kinetic power efficiently, sustainably and affordably for the people.

Sunshine reaches the earth surface at an average of 1 kilowatt/m<sup>2</sup> power. According to the Solar Energy Research Institute, energy can be supplied by renewables as much as high as 3,078 times more than what the earth needs it today. In one day, for example, sunlight that reached the earth can be used to produce energy needed for the earth for eight years. Although only a fraction of a per cent from the whole potential can be technically accessed, it is still six times more than the world demand today.

### **Renewable energy resources in Indonesia**

Indonesia is a vast network of islands located on the equator. This means that the average daily radiation in most places is relatively intense (approximately 4 kWh/m<sup>2</sup>), offering abundant potential for solar energy. Indonesia also has great potential for exploiting other renewable energy resources such as geothermal, hydropower, wind energy and biomass.

At the end of 2005, renewable energy sources were contributing just under 5% (or 1,345 MW) to Indonesia's total installed power generating capacity of 28 GW. This does not include the power produced by large-

scale hydroelectric plants, which account for roughly 15% (approx. 4,100 MW).

The development plans for the individual renewable energy sources are specified in the MEMR's 2005 National Energy Management Blueprint and place a strong focus on local production or assembly in order to build up a renewable energy industry in Indonesia.

### Hydropower

Indonesia has a theoretical hydropower potential of 75,000 MW. Small-scale hydropower plants, which can generally be accommodated more readily in natural river landscapes than larger scale plants, currently account for 84 MW of installed capacity. A basic distinction is also drawn in Indonesia between micro-hydropower plants, with outputs up to 25 kW, and mini-hydropower plants with outputs of up to 500 kW. The potential for micro-hydro energy is located mainly in West Sumatra, Bengkulu, West Kalimantan and Central Sulawesi, whilst larger micro-hydro schemes could be installed in North Sumatra, Bengkulu, Central Java and West Java.

Until 2007, more than 200 mini hydropower plants have been installed to date, most of them in rural areas with no grid access. Since both micro- and mini-hydropower plants are relatively inexpensive and easy to operate, they often make attractive opportunities for individual investors and local cooperatives.

In the future, water fuelled power in the form of tidal and wave energy is also ready to be exploited. The theoretical potential from these sources is estimated at around 240,000 MW. The technologies required for tapping this potential, however, are still at the experimental stage: one pilot project with a capacity of 1.1 MW is ongoing at Baron Beach, Yogyakarta (Java).

### Wind energy

Due to the minor influence of trade winds in Indonesia, the country has relatively little potential for wind energy, amounting to just 9,290 MW. The average wind speed is 3-5 m/s. In the eastern regions, however, it exceeds 6.5 m/s. Hence the Indonesian wind regime is mainly suitable for small and medium-sized wind turbines requiring wind speeds of 2.5-4 m/s and 4-5 m/s respectively, with corresponding outputs of up to 10 kW and 10-100 kW. At only a few locations is the wind potential sufficient to power large wind turbines with a capacity of more than 100 kW which require wind speeds in excess of 5 m/s.

The main wind energy potential is located in East and West Nusa Tenggara, which has an average wind speed of more than 5 m/s. Given the total current installed generating capacity of 5 MW, only a small fraction of Indonesia's overall wind power potential is being utilised. Small wind generators are used in Indonesia for rural and/or decentralised electrification, for driving water pumps, charging batteries and for mechanical purposes such as aerating fish farm ponds.

### Biomass

Indonesia has major theoretical potential for generating energy from biomass, totalling some 50,000 MW. This is based on the energy content of more than 200 million tonnes of agricultural biomass, forestry and plantation residues and urban waste produced every year. According to official estimates, 35% of all energy consumed in Indonesia, particularly in rural areas, stems from biomass – mainly unsustainably managed firewood.

At the end of 2005, total installed capacity for power generation based on biomass had reached 445 MW. Landfill gas from rubbish dumps could also be used for power generation in Indonesia. It is estimated that twelve major Indonesian cities have a combined potential of 566 MW for generating electricity from communal waste.

### Solar energy

As a tropical country with an average daily insolation rate of 4.8 kWh/m<sup>2</sup>, and 300 days of sunshine in a typical year, Indonesia has major potential for exploiting solar energy.

Photovoltaic systems, especially solar home systems (SHS), can be used in rural areas in particular for generating power for such applications as lighting, water pumps, telecommunications equipment and medicine cooling systems in health centres. Since the early 1980s some 50,000 SHS have been installed, and relatively large hybrid plants, for example in combination with diesel generators, are also in widespread use. By late 2005 the installed capacity in Indonesia had reached about 8 MW, over 1 MW of which was feeding into the central power grid.

In the 1990s the Indonesian government began to systematically promote the use of isolated photovoltaic systems for providing rural, off-grid regions with electricity and since 2004 private banks have been offering loans for the purchase of PV systems. National plans envisage the transfer of further parts of the solar system production chain to Indonesia in order to reduce the country's dependence on imports. The use of photovoltaics is to be promoted not only for rural, decentralised

applications but for urban areas in which grid feed-in mechanisms can be utilised.

### Geothermal energy

The volcanic belt extending along the islands of Sumatra, Java, Nusa Tenggara, Sulawesi and Maluku has blessed Indonesia with abundant geothermal potential, roughly 40% of the world's total resource. According to MEMR estimates, the country has 217 geothermally useful sites – mostly on Sumatra, Java and Sulawesi. Indonesia's theoretical geothermal potential is calculated at around 27,000 MW. As of late 2004, a mere 807 MW, or 3 % of that potential, had been harnessed.

The existing geothermal power plants are currently being operated by the state electricity company PLN and its contractual partners. In the future, however, independent power producers are expected to play a larger role in the development and exploitation of new thermal sources.

In 2005 the government designated 28 new sites with a combined potential capacity of 13,500 MW and attracted the interest of several private sector actors. Until now, many of the designated sites are still reserved for government projects. PLN alone is planning to put up 16 geothermal power plants with a total capacity of 1,150 MW. The state-owned oil and gas provider PT Pertamina is also involved in the construction of several new plants.

### **Energy [R]evolution: Equal access and sovereignty of energy for all**

After the economic crisis of 1998, the Indonesian energy sector experienced a dynamic change triggered by the increase of energy demand, policy changes in the energy sector and other changes caused by the increase of oil price in the international market. Indonesia today is a net importer of oil because domestic oil production is decreasing. Gas production also drops following the dipping oil production. This means it is imperative for Indonesia to consider the sustainability of national energy supply and increase the use of other energy sources that are more environmentally friendly – i.e. renewable energy.

However, without the needed political will, renewable energy will never develop and will be considered unprofitable because of the distortion in the electricity market created by the large amount of financial, political and structural support for conventional electricity technology. Thus the development of renewable energy absolutely needs political and financial support from the government, especially in the form of policy that guarantees price stability for a period of 20 years.

**The following are Greenpeace's recommendation to open the deadlock in the development of renewable energy.**

An ambitious renewable energy target

In the past few years, triggered by the need to drastically decrease greenhouse gas emissions, a number of countries set a target for the implementation of renewable energy. The target is set for installed capacity and the consumption of energy. Although this target is often not a legally binding target, but this is important as a catalyst in increasing the allocation of renewable energy in the national energy mix.

Based on the 2005 National Energy Management Blue Print, the Indonesian government only targeted less than 5% of the energy mix from renewable energy. This number is far from ambitious, especially considering the abundance of renewable energy resources in Indonesia.

Demands for the energy sector

The main demands for the development of renewable energy are:

- Phase out all subsidies for fossil and nuclear energy and internalise external costs;
- Establish legally binding targets for renewable energy;
- Provide defined and stable returns for investors;
- Guarantee priority access to the grid for renewable power generators; and
- Implement strict efficiency standards for all energy consuming appliances, buildings and vehicles.

Below are number of points that are needed to eliminate, or compensate for, some of the distortions in the electricity sector:

- Removal of energy market distortions

A major barrier preventing renewable energy from reaching its full potential is the lack of pricing structures in the energy markets that reflect the full costs to society of producing energy. This situation requires a number of responses.

- Internalisation of the social and environmental costs of polluting energy

The real cost of energy production by conventional energy includes expenses absorbed by society, such as health impacts and local and regional environmental degradation – from mercury pollution to acid rain

– as well as the global negative impacts from climate change. These costs, or external costs, are never included in the price of conventional energy.

- Introduce the “polluter pays” principle

As with the other subsidies, external costs must be factored into energy pricing if the market is to be truly competitive. This requires that governments apply a “polluter pays” system that charges the emitters accordingly, or applies suitable compensation to non-emitters. Adoption of polluter pays taxation to electricity sources, or equivalent compensation to renewable energy sources, and exclusion of renewables from environment-related energy taxation, is essential to achieve fairer competition in the world’s electricity markets.

- Electricity market reform

Renewable energy technologies could already be competitive if they had received the same attention as other sources in terms of R&D funding and subsidies, and if external costs were reflected in power prices. Essential reforms in the electricity sector are necessary if new renewable energy technologies are to be accepted on a larger scale. These reforms include:

- removal of electricity sector barriers by:
  - Streamlined and uniform planning procedures and permitting systems and integrated least cost network planning;
  - Fair access to the grid at fair, transparent prices and removal of discriminatory access and transmission tariffs;
  - Fair and transparent pricing for power throughout a network, with recognition and remuneration for the benefits of embedded generation;
  - Unbundling of utilities into separate generation and distribution companies;
  - The costs of grid infrastructure development and reinforcement must be carried by the grid management authority rather than individual renewable energy projects; and
  - Disclosure of fuel mix and environmental impact to end users to enable consumers to make an informed choice of power source.

- Priority grid access for renewables

Rules on grid access, transmission and cost sharing are very often inadequate. Legislation must be clear, especially concerning cost distribution and transmission fees. Renewable energy generators should be guaranteed priority access. Where necessary, grid extension or reinforcement costs should be borne by the grid operators, and shared between all consumers, because the environmental benefits of renewables are a public good.

- Support mechanisms for renewables

Overall, there are two types of incentive to promote deployment of renewable energy. These are Fixed Price Systems and Renewable Quota Systems.

Fixed Price Systems is a system where the government dictates the electricity price (or premium) paid to the producer and lets the market determine the quantity. While the Renewable Quota Systems is a system where the government dictates the quantity of renewable electricity and leaves it to the market to determine the price.

A number of mechanisms in the fixed price system are:

- investment subsidies
- fixed feed-in tariffs
- fixed premium systems
- tax credits

While mechanisms in the quota system are:

- tendering systems
- tradable green certificate

***In Indonesia, as with many parts of the world, communities are waking up to the harsh realities of dependence on coal for energy, and are mobilizing to defend their rights to a clean and healthy environment. These movements are strong and gaining momentum. The Indonesian government must listen to their call and lay the foundation for green and environmentally just development that would secure the well-being of the country's future generations.***

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- <sup>3</sup> Coal Statistics, World Coal Institute, September 2010.
- <sup>4</sup> A grade of coal between bituminous coal and anthracite.
- <sup>5</sup> Processed coal used for iron smelting.
- <sup>6</sup> Geology Department, Ministry of Energy and Mineral Resources, 2006.
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- <sup>8</sup> Henderson, C., 2003. Clean Coal Technologies, report no. CCC/74. London: IEA Clean Coal Centre, October 2003.
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- <sup>12</sup> *Ibid.*
- <sup>13</sup> Centre for Data and Information on Energy and Mineral Resources (2009) Key Indicator of Indonesia Energy and Mineral Resources, 2008.
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- <sup>19</sup> *Ibid.*
- <sup>20</sup> Worldwatch Institute, “Phasing out Coal: Environmental Concerns, Subsidy Cuts Fuel Decline,” Press Release.
- <sup>21</sup> External Costs: Research results on socio-environmental damages due to electricity and transport, Luxembourg: Office for Official Publications of the European Communities, 2003.
- <sup>22</sup> Amenity is defined as an enhancement to a piece of property that is not essential to the property's use, but may increase the property's value. Examples include a swimming pool, tennis courts, scenic view, access to a body of water, etc. [www.secured--loan.co.uk/glossary-loans.html](http://www.secured--loan.co.uk/glossary-loans.html)
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- <sup>26</sup> <http://www.epa.gov/mercury/effects.htm>
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- <sup>28</sup> *Ibid.*
- <sup>29</sup> *Ibid.*
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- <sup>38</sup> Interview with Mr Romansah from Waruduwur village, Cirebon, 17 October 2010.
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- <sup>42</sup> Interview with Dr Purwanto. Cilacap City, Indonesia. 22-23 September 2008.
- <sup>43</sup> Interview with Imam Sarjono, local resident in the Griya Kencana Permai housing complex. Karang Kandri village, Indonesia. 22-23 September 2008.
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