

This article was downloaded by: [Canadian Research Knowledge Network]

On: 8 September 2009

Access details: Access Details: [subscription number 782980718]

Publisher Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Bulletin of Indonesian Economic Studies

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title-content=t713406865>

The Lapindo mudflow disaster: environmental, infrastructure and economic impact

Heath McMichael ^a

^a Department of Foreign Affairs and Trade, Canberra

Online Publication Date: 01 April 2009

To cite this Article McMichael, Heath(2009)'The Lapindo mudflow disaster: environmental, infrastructure and economic impact',Bulletin of Indonesian Economic Studies,45:1,73 — 83

To link to this Article: DOI: 10.1080/00074910902836189

URL: <http://dx.doi.org/10.1080/00074910902836189>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

THE LAPINDO MUDFLOW DISASTER: ENVIRONMENTAL, INFRASTRUCTURE AND ECONOMIC IMPACT

Heath McMichael*

Department of Foreign Affairs and Trade, Canberra

This note examines the environmental, infrastructure and economic impact of the Lapindo mudflow disaster in East Java province. It outlines unsuccessful attempts to staunch the mud volcano, concerns for human health and plans for long-term management of the mudflow. It considers the impact on transport and logistics networks and the additional costs to the East Java economy. The heaviest economic impact has occurred in the region surrounding the mud volcano in Sidoarjo district, but areas to the east and west are also affected. Individual firms in East Java have found means of accommodating their business operations to the mudflow with some provincial government assistance. PT Lapindo Brantas, the company considered responsible for the drilling that led to the mud volcano, has been slow in compensating victims as required by presidential decrees. Delays in finalising compensation appear to be holding back implementation by the national government of critical infrastructure reconstruction work.

On 29 May 2006, mud and gases began erupting unexpectedly from a vent 150 metres from a hydrocarbon exploration well near Sidoarjo in East Java. The flow of mud has continued since then at rates as high as 160,000 cubic metres per day. Dubbed the 'Lapindo mudflow' after the company responsible for drilling the well, the mud volcano has inundated an area in excess of 6.5 square kilometres, despite attempts to contain it by constructing a series of embankments.¹ The mudflow has inundated factories, farmland and the Surabaya–Gempol toll road in the sub-district of Porong. It has placed at risk a water pipeline connecting Surabaya with the Umbulan spring near Pasuruan, as well as fibre-optic cables carrying broadband data from Surabaya to Kupang in Eastern Indonesia. A gas pipeline near the site ruptured and exploded in November 2006, reducing the

* The views expressed in this note are the author's alone and have no official status or endorsement. They are based on material from public sources and fieldwork conducted during private visits to Surabaya in June 2007 and to Jakarta and East Java in August–September 2008.

1 The eruption site is also called the 'Lusi' mud volcano, from the initial syllables of *lumpur* ('mud') and 'Sidoarjo' (the main location of the mudflow). There are numerous scientific overviews of the site and discussions of the eruption, including those by Cyranowski (2007); Mazzini et al. (2007); and Davies et al. (2007).

supply of gas for fertiliser production; this has in turn led to local fertiliser shortages (Plumlee et al. 2008: 1-2).

Around its centre in Sidoarjo district, the effects of the mud volcano have been particularly devastating (figure 1). Mud flowing from the volcano has displaced over 30,000 people in more than a dozen villages, severely disrupting their livelihoods. The local property market has collapsed: residents are unable to obtain valuations on their properties, which are considered unbankable. New mud and gas fissures continue to emerge. It is unclear whether a mud eruption in March 2008 next to an ammonia condensation plant about three kilometres from the main eruption vent in the village of Siring is a stand-alone event or the harbinger of heightened mud volcano activity (BPLS 2008). While the impact of the mud-flow has been felt most acutely by the local community in Sidoarjo, other regions in East Java have experienced environmental, logistical and economic effects as a consequence of the disaster.

The dangers of drilling for oil and gas in the Sidoarjo area have been known for generations. According to a former senior East Java civil servant, Dutch colonial archives from 1910 show that the area around Porong sub-district was considered prone to gas eruptions.² American oil exploration companies in East Java in the 1950s were also aware of the area's unstable geological nature.

ENVIRONMENTAL IMPACT

The accumulation of mud from the original vent is accompanied by subsidence in the surrounding area. It has been projected that more than 30 metres of subsidence will occur in the next few years within several kilometres of the eruption vent. The possibility exists that a huge crater will form from the hollowed-out remains of the mud volcano. Dried mud deposits could have adverse effects on river and marine environments and on the health of local residents (Plumlee et al. 2008: 2).

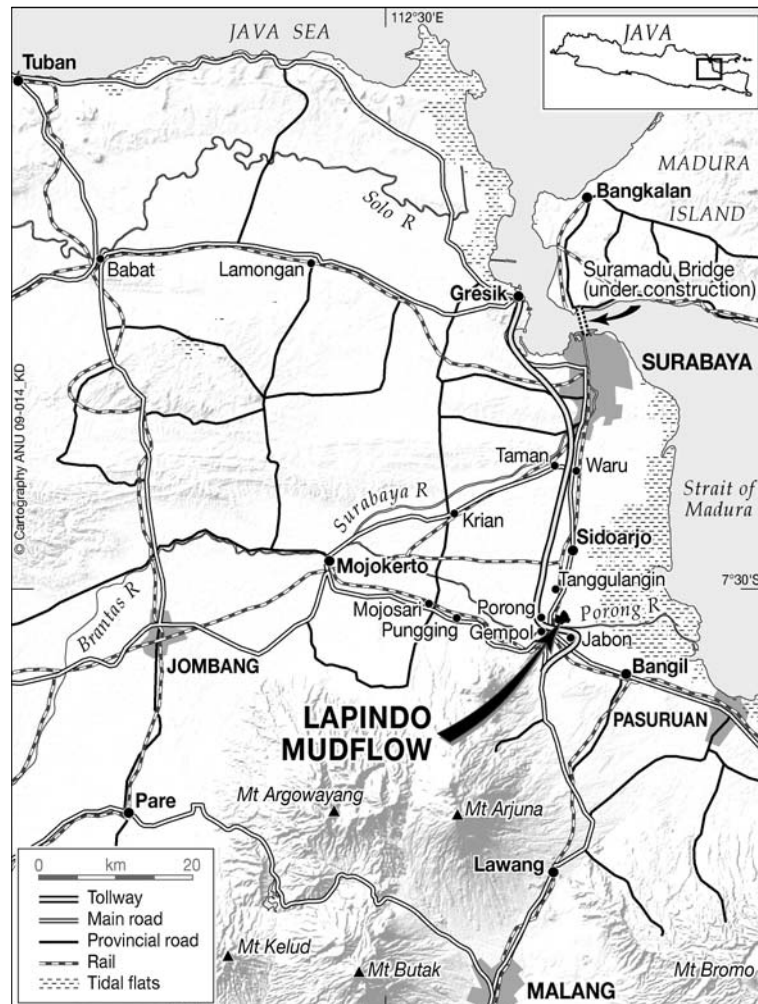
Another cause for concern is the mud's impact on natural drainage patterns in the Brantas River basin. Mud-induced siltation of the Porong River is expected to heighten the risk of wet-season flooding in the vicinity of Mojokerto and Sidoarjo. If flood-waters cannot be contained upstream, it is feared the Surabaya River will overflow, leading to possible widespread flooding in Surabaya (Rumiati 2007: 41-2).

Evidence is mounting that the mud has a harmful impact on river ecosystems and human health. The mud has been assessed as containing phenol in concentrations exceeding the maximum residue limit (Friends of the Earth International 2007: 5).³ Phenol is toxic to fish, aquatic vegetation and humans. A recent report by the United States Geological Service has found that several elements, notably arsenic, are present in concentrations that exceed US government environmental guidelines for residential soil (Plumlee et al. 2008: 8-9). It can be assumed that

2 Interview with Mr Soedarman, former Chair, East Java Investment Board, Surabaya, 6 June 2007.

3 The maximum residue limit as here defined refers to the maximum concentration of chemical residue allowable by regulation to occur in a particular substance (in this case, the Lapindo mud).

FIGURE 1 Map of Mudflow Area and Surrounding Region



the mud will seriously affect the livelihoods and health of shrimp and fishing communities located adjacent to the Porong River and the Madura Strait, that is, communities in the districts of Sidoarjo, Madura, Pasuruan and Probolinggo (to the east of the map area), and the municipality of Surabaya.

With attempts to staunch the flow apparently unsuccessful, attention has turned to developing a plan for its long-term management. A draft United Nations Environment Programme (UNEP) evaluation in June 2008 identified three mitigation options: pumping the mud directly into the sea (at a cost of Rp 13 trillion over 30 years); pumping the mud to mangrove wetlands to the east while diverting the Porong River (at a cost of Rp 16 trillion over 30 years); and, most expensively, constructing an open channel to allow mud to flow directly to the sea (a one-off cost of Rp 33 trillion) (UNEP 2008: 76–80). None of these options is risk-free: with the first, there is concern that pumping would not be able to move the required

volume of viscous mud; the second increases the risk of flooding; and the third would impinge on production in farming and aquaculture areas.

IMPACT ON TRANSPORT AND LOGISTICS NETWORKS

It is estimated that before the mudflow the Surabaya–Gempol toll road accommodated 20,000–30,000 vehicles per day, including up to 3,000 container vehicles (Yahya 2007). The cutting of the road has heightened congestion on secondary roads to the east and west of the market at Porong and on arterial roads through the centres of Krian, Mojokerto and Mojosari to the west. As a result, the flow of goods and people from Surabaya to the city of Malang and to regions to the east and south of Malang has been disrupted. Transportation times have increased for freight from Malang, Gempol and nearby Pandaan and from Pasuruan bound for Tanjung Perak port at Surabaya. According to a foreign joint venture clothing manufacturer in Probolinggo, road congestion has increased trucking times to Surabaya from four hours before the mudflow to around 10 hours. Up to an extra day is now spent exporting finished product through the port and a further additional day is spent bringing material inputs to the factory.⁴

The additional time needed to transport goods to port or obtain deliveries of locally sourced materials implies a considerable financial burden for many companies in terms of the extra fuel used, the overtime paid to trucking operators and the requirement to pay illegal levies for the use of secondary roads. For some shippers, late delivery of goods to the container terminal at Surabaya has incurred additional demurrage costs of up to Rp 600,000 per container. It has been estimated that the mudflow has, on average, increased transport costs for individual manufacturers by 30%, and one Sidoarjo-based housing tile manufacturer claims that costs have increased by 50–60% for its raw materials sourced from the Malang region.⁵

The existing single rail line between Surabaya and Malang traverses the foot of the mudflow's western embankment and is at risk of being washed away should the embankment be breached. Alternative corridors to Malang through Kertosono, Kediri and Blitar to the west and south-west are circuitous, and their use would add considerably to rail freight times to and from Surabaya.

IMPACT ON THE ECONOMY AND BUSINESS SECTOR

The mudflow has had a marked impact on the province's economy and business sector. Using input–output analysis based on data from the central statistics agency (BPS) and interviews with industry associations, researchers at the Surabaya Institute of Technology (ITS), in collaboration with the Indonesian Environment Ministry, estimate the total cost of the mudflow through August 2007 to be in the order of Rp 28.3 trillion (Rumiati 2007: 36–70). This figure comprises Rp 8.3 trillion in infrastructure asset losses, Rp 5.8 trillion in lost production in Sidoarjo district, and Rp 14.2 trillion in indirect losses to the provincial economy, especially in food and

4 Interview with Mr Joseph Chan, PT Eratex Jaya, Surabaya, 7 June 2007.

5 Interview with Mr Sam Santoso, PT Kuda Laut, Surabaya, 13 August 2008.

leather processing, transport and the hospitality industry. Notwithstanding the difficulty of relating these losses to provincial GDP, the ITS–Environment Ministry report suggests that the East Java economy may have contracted by 4.2% between May 2006 and August 2007 (Rumiati 2007: 46–7). The scale of economic loss is borne out elsewhere: according to the author of an unpublished appraisal by the Supreme Audit Agency (BPK) in 2007, estimated total direct and indirect costs of the mudflow in its first year were around Rp 30 trillion.⁶ In any event, the economic costs generated by the mudflow are likely to continue to grow substantially.

The economic impact of the mudflow is unevenly spread through the province. The region suffering the biggest loss is the central corridor from Surabaya south to Malang, which constitutes East Java's manufacturing heartland (Santosa and McMichael 2004: 14). This region, known as the *pita pembangunan* (growth ribbon) of East Java comprises the districts of Sidoarjo, Mojokerto, Pasuruan and Malang.

In Sidoarjo, the mudflow has had a direct impact, with economic growth in the district falling from 6.7% in 2005 to 4.6% in 2006 (Badan Pusat Statistik Propinsi Jawa Timur 2007: 41). The leather processing, food, and hotels and restaurants sectors have been most affected. In Tanggulangin sub-district, it is estimated that output from the flourishing leather industry dropped by 80% after the appearance of the mud volcano.⁷ The mudflow has undermined Sidoarjo's ranking as an exemplar of economic growth and public service (Setiadi 2007: 24–7). Given that 20–30% of East Java's exports and imports originate in, or are destined for, factories in Sidoarjo, the likelihood that the district's economy will remain weak for some time is of particular concern (Yahya 2007).

The economy of the Malang district has also been hard hit by the effects of the mudflow. Growth in the furniture sector declined from 7.2% in 2005 to 5.3% in 2006 (Ananda 2007). Hotels in tourist centres in Malang and in Trawas and Prigen on the northern slopes of Mt Arjuna experienced declines of up to 80% in occupancy rates at the onset of the mudflow, but appear to have recovered somewhat since then. Surabaya trucking firms and *kretek* (clove) cigarette manufacturers in the Malang area have been particularly affected by disrupted distribution channels.⁸ The downturn in the handicraft industry has transferred Malang's competitive advantage in that sector to neighbouring Tulungagung, a traditional competitor of Malang.⁹

Regions to the west of the central corridor have been affected by the infrastructure and transport bottleneck around Surabaya that resulted from the mudflow. According to an independent research institute associated with the economics faculty of Airlangga University, increasing volumes of manufactures from the western districts of Jombang, Kediri and Tulungagung, which are destined for inter-island or international markets, are being exported via Semarang in Central Java. However districts to the north-west of Surabaya – Gresik, Lamongan, Tuban

6 Interview with Dr Candra Fajri Ananda, Brawijaya University, Malang, 16 August 2008.

7 Interview with Dr Kacung Marijan, Airlangga University, Surabaya, 14 August 2008.

8 Interview with Mr Olivier Bernard, PT Tripper Nature, Jakarta, 11 September 2008.

9 Interview with Dr Bambang-Heru Santosa, Central Statistics Agency, Jakarta, 9 August 2008.

and Bojonegoro – do not appear to show any negative effect from the mudflow. This region is experiencing a mini economic boom owing to the emergence of new industries servicing oil and gas projects, such as the Cepu oilfield development in Bojonegoro. The Lamongan Shore Base, a multi-million dollar joint venture between an East Java-owned corporation, PT Wira Jatim, and a Singapore logistics firm, has been established to service oil and gas projects in eastern Indonesia. The facility, located on the north coast near Lamongan, includes a dry dock and bonded warehouse.¹⁰

In East Java's eastern regions the picture is also mixed. In Probolinggo district, the fish canning industry has suffered financial losses stemming from the increased trucking distances required to transport goods to Surabaya. Similarly, seafood exporters using cold storage facilities in Pasuruan district have had to bear additional freight costs to move their product to the port of Surabaya for export.¹¹ By contrast, cane sugar production has been little affected, because of that industry's reliance on local processing and distribution and the use of small trucks to transport cane over secondary roads.¹² Proposals by the East Java Chamber of Commerce and Industry to the provincial and national governments to upgrade Tanjung Wangi port in Banyuwangi (on the eastern tip of Java) to enable it to accommodate larger vessels for inter-island trade have not gained traction. The chamber believes there is potential to expand Tanjung Wangi as a gateway for the export of commodities from Jember (especially tobacco), Situbondo, Bondowoso and Banyuwangi districts.¹³

The degree to which the mudflow has affected individual manufacturing enterprises in East Java appears to be related to the scale of their logistics and distribution networks. Larger manufacturers with more diverse distribution networks have been less disadvantaged than their small and medium enterprise counterparts. One of the jewels in the province's economic crown is the *kretek* manufacturer, PT Gudang Garam. The company employs a workforce of 41,000 in Kediri and generates nearly a third of the district's local tax revenue. Gudang Garam's output and distribution has not been affected significantly by the mudflow. Notwithstanding the sudden death in July 2008 of the company's President Commissioner, Rachman Halim, who was the son of its founder, business confidence in Kediri remains strong.

Individual firms have found means of accommodating their business operations to the difficult circumstances wrought by the mudflow. For example, the bottled water manufacturer PT Ades Waters Indonesia, a subsidiary of PT Aqua Golden Mississippi (Danone Group), sources its raw material from springs in Pandaan and has relocated its packaging plant to Surabaya to reduce transport costs. Leather handicraft companies from Tanggulangin village, situated near the

10 Interview with Mr Eugene Lim, PT Eastern Logistics, Lamongan, 3 June 2007.

11 Interview with Mr Johan Suryadarma, Indonesian Frozen Seafood Association, East Java branch, Surabaya, 12 August 2008.

12 Interview with Mr Adig Suwandi, PT Perkebunan Nusantara XI (Persero), Surabaya, 2 September 2008.

13 Interview with Mr Erlangga Satriagung, East Java Chamber of Commerce and Industry, Surabaya, 11 August 2008.

source of the mudflow, have joined together to open exhibition halls in Surabaya as a means of obviating the need for prospective buyers to travel to the mud-affected area. The East Java government has taken concrete measures to assist industries affected by the mudflow, including the establishment of a new trade centre in Mojokerto to showcase handicrafts and leather goods manufactured in the Sidoarjo area.¹⁴

It should be recognised that, aside from the mud volcano, a wide range of factors have a bearing on the rate of economic growth in the province. For example, regulatory barriers to domestic trade in East Java are a significant obstacle to business sector growth (World Bank and The Asia Foundation 2005: 108–11). Inadequate transport infrastructure (especially in the rail network), a chronic shortage of reliable power for industry and rising electricity tariffs are acknowledged as impediments to domestic and foreign investment.¹⁵ Moreover, a lack of clarity in government decision making with respect to mudflow compensation and reconstruction arrangements has had a negative impact on local business confidence.¹⁶

THE GOVERNMENT RESPONSE

Since September 2006, when President Susilo Bambang Yudhoyono declared a 400 hectare area in the Sidoarjo district a disaster area unfit for human habitation, the national government has sought to mitigate the complex environmental and social impact of the mudflow. So far, its efforts have achieved little in concrete terms. On 16 October 2006, the president authorised mud to be pumped into the Porong River. However, the viscosity of the mud, subsidence around the eruption vent and a low gradient towards the sea approximately 20 kilometres to the east rendered this containment strategy largely ineffective.

In April 2007, the president issued a decree (PP 14/2007) ordering the company responsible for drilling the initial well, PT Lapindo Brantas, to compensate victims of four villages at the centre of the affected area. A further decree in July 2008 (PP 48/2008) provided for compensation for another three villages, bringing the number of residents to be compensated to nearly 13,000 households. The decree ordered Lapindo to pay compensation in two phases – 20% in the first phase and 80% in the second – to cover lease payments on new houses for the victims. By mid-2007, the president had ordered Lapindo to pay Rp 4.35 trillion in compensation to victims and for efforts to halt the mudflow (Friends of the Earth International 2007: 7).

Compensation has been slow to reach the victims. In August 2008, the Minister for Public Works said that the national government would allocate Rp 1.19 trillion in the 2009 budget to deal with the mudflow, including compensation for the victims, but a finance ministry spokeswoman declared that government funding

14 Interview with Mr Kresnayana Yahya, Surabaya Institute of Technology, Surabaya, 15 August 2008.

15 Interview with Mr Djoni Irianto, East Java Investment Board, Surabaya, 12 August 2008.

16 Interview with Mr Erlangga Satriagung, East Java Chamber of Commerce and Industry, Surabaya, 11 August 2008.

would only be disbursed once Lapindo had discharged its compensation obligations in full (*JP*, 12/9/2008). For its part, Lapindo asserted that it was fulfilling its compensation obligations and had, by August 2008, paid victims 20% of their entitlements (*JP*, 1/9/2008).

While Lapindo acknowledges its compensation obligations, it does not accept responsibility for the initial eruption, claiming that scientific analysis (such as that by Mazzini et al. 2007: 375–88) shows that it was linked to tectonic activity after an earthquake in Central Java two days earlier. This stance flies in the face of overwhelming scientific opinion that the initial mud eruption was caused by Lapindo drilling.¹⁷ Lapindo's tardiness in discharging its compensation obligations in full, and the government's apparent unwillingness to force it to do so, have been the cause of vocal frustration on the part of Sidoarjo residents (*JP*, 9/12/2008).

Large-scale infrastructure rehabilitation work by the national government has not yet commenced. A recovery blueprint coordinated by the National Development Planning Agency, Bappenas, with input from national and provincial government agencies, academic institutions, foreign donors and UNEP, remains on hold.¹⁸ The government's Sidoarjo Mudflow Handling Agency (BPLS) has identified a parcel of land 12 kilometres long and 120 metres wide to the west of the mudflow, for new toll road, rail and gas pipeline infrastructure. However, BPLS appears unwilling to use the government's power of eminent domain to purchase the land.¹⁹ One explanation for the delay in starting reconstruction work is that the government believes the cost of relocating affected infrastructure should be borne by Lapindo (Harsaputra 2006) as required in Presidential Decrees 14/2007 and 48/2008. Clearly, though, the huge cost of rehabilitation is beyond the capacity of the private sector alone to bear, and further delay in starting the reconstruction effort seems difficult to justify.

At provincial government level, the East Java Development Planning Agency has proposed a new inter-modal transport hub and industrial estate at Tarik, about 20 kilometres to the west of Porong. This so-called 'New Town' will require coordinated central, provincial and local government planning and extensive land acquisition. Unfortunately, the history of land acquisition for infrastructure works in East Java is replete with cases of speculative land deals concocted by well-connected former public figures. A recent example was the negotiation of land access to build Surabaya's Juanda airport toll road, which took 10 years to complete (Graham 2006).

Provincial planners are keen to obtain foreign assistance for mudflow mitigation, infrastructure and housing reconstruction work and efforts to restore community livelihoods.²⁰ The United States and Australian governments have

17 'Geologists blame gas drilling for Indonesia mud disaster', source: Durham University, <<http://www.physorg.com/news144596883.html>>, posted 30 October 2008.

18 Interview with Mr Suprayoga Hadi, Directorate for Disadvantaged Regions, Bappenas, Jakarta, 4 August 2008.

19 For a discussion of the national government's powers of eminent domain, see McLeod (2005: 146–7).

20 Interview with Mr Hadi Prasetyo, East Java Development Planning Agency, Surabaya, 2 September 2008.

contributed technical expertise towards analyses of the geophysical aspects of the mudflow, but it is unlikely that foreign donors will be willing to provide cash grants or loans without an assurance that money will not fall into the hands of land speculators.

THE POLITICS OF THE MUDFLOW

The company widely considered responsible for the mud volcano, PT Lapindo Brantas, is a subsidiary of the Bakrie Group, which is indirectly owned by the family of the Coordinating Minister for People's Welfare, Aburizal Bakrie.²¹ Until very recently, Bakrie was reputed to be Indonesia's richest man. He has a close relationship with President Yudhoyono, having helped bankroll Yudhoyono's presidential election campaign in 2004 (Latul 2008).

Bakrie is also believed to be close to Vice President Jusuf Kalla. During a collapse in the share price of the Bakrie Group mining subsidiary PT Bumi Resources in November 2008, allegations of government favouritism arose over the suspension of trading in Bumi stocks (Hick 2008). Kalla reportedly claimed that the suspension of Bumi shares was necessary 'to prevent sharp falls in share prices and ease market speculation [and to protect] the interests of investors, publicly listed companies and the overall economy'; he argued that suspending trade in company shares was common practice around the world (Simamora 2008).

These relationships complicate the government's handling of the mudflow problem and appear to account for its reluctance to force Lapindo to expedite compensation payments. In December 2008 it was reported that Lapindo had reached a deal with mudflow victims to pay the remaining 80% of compensation through monthly instalments of Rp 30 million to each affected household (Nurhayati 2008). State Secretary Hatta Rajasa claimed that since Lapindo had been facing financial difficulties because of the global economic crisis, 'it would be difficult for us to push for more than this' (*JP*, 5/12/2008).

Lapindo is widely believed to be actively attempting to influence Indonesian public opinion in favour of its position. The company has taken steps to ensure that it has a voice through the media: in 2008 it bought the venerable local daily, *The Surabaya Post*, and installed the company's spokesperson as its new chief editor.

Lapindo's efforts to mould public debate suffered a setback during campaigning for the East Java gubernatorial elections in June 2008. At a public forum in Surabaya, two of the leading candidates for the position of governor, Khofifah Parawansa, representing a coalition of parties headed by the United Development Party, and Soekarwo, from the National Mandate Party (PAN), refrained from apportioning blame for the disaster to Lapindo. However, the candidate from the Indonesian Democratic Party of Struggle, Sutjipto, openly accused Lapindo of negligence leading to the initial mud volcano eruption (*JP*, 23/6/2008). Although East Java law officers have been accused of being 'blinded by politics' in failing to prosecute the company for its actions (*JP*, 1/9/2008), the question of legal liability

21 See Friends of the Earth International (2007: 8-9) for an outline of PT Lapindo's relationship to the Bakrie Group.

should eventually be settled in the Supreme Court (*Australian Financial Review*, 15/9/2008).

To date, there has been minimal public commentary on the ethical and corporate responsibility aspects of the Lapindo disaster because of the sensitivity surrounding the interests of the main players involved. However, continuation of the mudflow, possibly for years to come, will attract increasing national and international concern. Compensation is unlikely to be resolved soon: the Bakrie Goup's financial difficulties as a result of the downturn in global coal prices will further delay finalisation of payments to the victims of the disaster (*Asia Times Online*, 27/11/2008). Businesses faced with increased costs arising from the mudflow will be forced to rely on their own mettle until critical infrastructure rehabilitation and reconstruction work commences. The government's failure to deal decisively with the disaster is likely to be a factor in voting in the April 2009 elections, particularly in East Java (Ashcroft and Cavanough 2008: 335).

REFERENCES

- Ananda, C. (2007) 'Development and environment in East Java Province', in *Empowering Regional Economic Development toward Sustainable Poverty Alleviation*, eds C.F. Ananda, B.P. Resosudarmo and S. Nazara, Indonesian Regional Science Association, Jakarta.
- Ashcroft, V. and Cavanough, D. (2008) 'Survey of recent developments', *Bulletin of Indonesian Economic Studies* 44 (3): 335–63.
- Badan Pusat Statistik Propinsi Jawa Timur (East Java Provincial Statistical Agency) (2007) *Produk Domestik Regional Bruto, Kabupaten/Kota se-Jawa Timur* [Regional GDP, East Java Districts/Municipalities], East Java Provincial Statistical Agency and East Java Provincial Development Planning Agency, Surabaya, November.
- BPLS (Badan Penanggulangan Lumpur Sidoarjo, Sidoarjo Mudflow Handling Agency) (2008) *The Chronology of the Collapsed Water Reservoir Tower at PT Lion Steel, West Siring Village*, Unpublished report, BPLS, Surabaya.
- Cyranowski, David (2007) 'Muddy waters: how did a mud volcano come to destroy an Indonesian town?', *Nature* 45: 812–14.
- Davies, R.J., Swarbrick, R.E., Evans, R.J. and Huuse, M. (2007) 'Birth of a mud volcano: East Java, 29 May 2006', *GSA Today* 17 (2): 4–9.
- Friends of the Earth International (2007) 'Lapindo Brantas and the mud volcano, Sidoarjo, Indonesia', June, Background paper, accessed 5 January 2009 at <http://www.foeurope.org/publications/2007/LB_mud_volcano_Indonesia.pdf>.
- Graham, D. (2006) 'Surabaya's new airport: no speedy access', *Indonesia Now with Duncan Graham* blogspot, <<http://indonesianow.blogspot.com/2006/03/juanda-surabaya.html>>, posted Friday 10 March.
- Harsaputra, I. (2006) 'Lapindo again ordered to pay up', *Jakarta Post*, 29 December.
- Hick, J. (2008) 'Bakrie looks exposed in meltdown', *Asia Times Online*, posted at <http://www.atimes.com/atimes/archive/11_27_2008.html>, 27 November 2008.
- Latul, J. (2008) 'The Bakrie empire and Indonesia's government', posted at <<http://www.asiasentinel.com>>, 25 December.
- Mazzini, A., Svensen, H., Akhmanov, G.G., Aloisi, G., Planke, S., Malthe-Sørenssen, A. and Istadi, B. (2007) 'Triggering and dynamic evolution of the LUSI mud volcano, Indonesia', *Earth and Planetary Science Letters* 261 (3–4): 375–88.
- McLeod, R. (2005) 'Survey of recent developments', *Bulletin of Indonesian Economic Studies* 41 (2): 133–57.
- Nurhayati, Desy (2008) 'Mudflow victims, govt agree to settle compensation', *Jakarta Post*, 12 March.

- Plumlee, G.S., Casadevall, T.J., Wibowo, H.T., Rosenbauer, R.J., Johnson, C.A., Breit, G.N., Lowers, H.A., Wolf, R.E., Hageman, P.L., Goldstein, H., Anthony, M.W., Berry, C.J., Fey, D.L., Meeker, G.P. and Morman, S.A. (2008) 'Preliminary analytical results for a mud sample collected from the LUSI mud volcano, Sidoarjo, East Java, Indonesia', US Geological Survey Open-File Report 2008-1019, USGS, Reston VA.
- Rumiati, T. (2007) 'Analisa resiko terhadap hasil prediksi aspek teknis 5 tahun [Risk analysis of technical aspects of 5-year prediction results]', in *Analisis Resiko Bencana Lumpur Porong, Skala Lokal Sidoarjo dan Skala Regional Jawa Timur* [Porong Mud Disaster Risk Analysis, Sidoarjo Local and East Java Regional Scale], Report published by the Department of the Environment and the Surabaya Institute of Technology, Surabaya, August.
- Santosa, Bambang-Heru and McMichael, Heath (2004) 'Industrial development in East Java: a special case?', Working Papers in Trade and Development No. 2004-07, Arndt-Corden Division of Economics, Research School of Pacific and Asian Studies, College of Asia and the Pacific, Australian National University, Canberra, November.
- Setiadi, R. (2007) 'Memantau daerah menyemai kemajuan: otonomi daerah dan Otonomi Award di Jawa Timur [Observing the regions propagating progress: regional autonomy and the East Java Autonomy Awards]', Jawa Pos Institute of Pro Otonomi, Surabaya, January.
- Simamora, Adiando P. (2008) 'VP denies talk of split between Mulyani, SBY', *Jakarta Post*, 11 August 2008.
- UNEP (United Nations Environment Programme) (2008) Evaluation of Mud Flood Disaster Alternatives in Sidoarjo Regency, Draft final report, UNEP, Jakarta, June.
- World Bank and Asia Foundation (2005) *Improving the Business Environment in East Java: Views from the Private Sector*, The World Bank and The Asia Foundation, Jakarta.
- Yahya, K. (2007) Tantangan Penyelesaian dan Penanggulangan Lumpur Porong [The Challenge of Solving and Overcoming the Porong Mud Problem], Powerpoint presentation for briefing to Sidoarjo Mudflow Handling Agency, Jakarta, February.