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**WILL JAKARTA BE THE NEXT ATLANTIS? EXCESSIVE GROUNDWATER
USE RESULTING FROM A FAILING PIPED WATER NETWORK**

Nicola Colbran

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ARTICLE

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1

INTRODUCTION

Historically, piped water in Jakarta was intended to serve selected residents, industries and businesses in accordance with the politics of the era. Whether to segregate between races under the Dutch colonial government, to indicate modernity under first president Soekarno, or to support economic development under second president Soeharto, the supply of piped water has favoured few and left many without access. Those that are connected frequently complain about the low quality of water supplied, the quantity and continuity of the water, the level of water pressure and high water tariffs. Groundwater, on the other hand, has for centuries been a cheap and reliable water source. The result is that many households in Jakarta, as well as industry, business, luxury apartment complexes and hotels do not connect, and are not connected, to the piped water network. They instead use alternative water sources and distribution methods in particular groundwater. The impact of this on groundwater levels and Jakarta's natural environment is unsustainable. Excessive and unlicensed groundwater use is causing significant land subsidence, pollution and salinisation of aquifers, and increased levels of flooding in Jakarta. It is also lowering the water table, making it increasingly difficult for the estimated 70 per cent of households that rely on groundwater for their daily needs to access the groundwater.

This article examines the connection between a failing, selective piped water supply and groundwater use. It describes the political history of Jakarta's piped water network and the reasons consumers do not, or are unable to, connect to the network. It outlines the link between this failure to connect and the increasingly excessive and unlicensed groundwater use in Jakarta, and its effect on groundwater levels and Jakarta's natural environment. It discusses and assesses current legal and policy reform to address this impending environmental disaster, and asks whether the government is committed to providing a reliable, commercially viable alternative water source to groundwater.

2

THE POLITICS OF PIPED WATER AND HISTORY OF GROUNDWATER USE

The city of Jakarta is criss-crossed by thirteen rivers and flood channels and has a rich supply of groundwater. Its residents (now estimated to be 12 million) have for centuries relied on groundwater as an important source of water for household, business and industrial purposes. However, historically the importance of groundwater has not been reflected in law or government policy. Nor has effective groundwater management been a high priority. The emphasis of groundwater regulation has been on exploitation rather than sustainable use, and little value has been attributed to groundwater. Its economic, environmental, social and cultural value has not been adequately recognised by the government or by consumers.

Instead, successive governments have focussed on piped water, although adequate universal coverage has not been a priority. Rather, levels of access and quality of piped water have reflected the politics of the various administrations. This has influenced consumer choices and preference for water sources, and has in fact encouraged the use of alternative sources and distribution methods, in particular groundwater.

Prior to the construction of Jakarta's first piped water network, Jakarta's population relied on different combinations of river water and shallow groundwater for its water supply. However in 1870, the Dutch colonial government began constructing an artesian water network intended for use by European residents living in the small 'developed' central area of the city. As a result of this exclusion, the local population continued to rely on surface waters for all of their water supply and sanitation needs as it was the most affordable and convenient water source. Artesian water supply was only made available to local populations at the turn of the

century when it was extended minimally to local residents through artesian hydrants.¹

Following considerable debate over the need for increased water production from a more favourable source, in the 1920s the Dutch government developed a spring water piped network, which expanded on the existing infrastructure. Again the supply was intended to predominantly serve the European residents of Jakarta and was seen as essential based on scientific discoveries of the connection between drinking water consumption and health. European residents with household connections paid half the price for water than did local residents who used public hydrants and so Europeans used most of the water supplied through the network. Local households again continued to rely on other cheaper water sources for economic reasons and convenience.² The use of these other sources also prompted the view that local residents were undeveloped as they used traditional sensory assessments to determine water quality without reference to new scientific discoveries.³ The continued use of non-piped water sources was seen by the colonial government as 'temporary solutions' for the local population who were not yet fully 'modern'.⁴

The piped water network built by the Dutch was badly damaged during the four year battle for independence from 1945-1949, and could not meet the demand for water as Jakarta's population increased.⁵ Soekarno, Indonesia's charismatic first president, had a vision for

Jakarta as a modern, progressive, independent city which would be demonstrated by grand public monuments and highly visible infrastructure projects. The new government began rehabilitating existing water network pipes in elite residential areas and constructing water treatment plants. With superior modern water treatment technology, Jakarta could utilise surface water rather than rely on artesian or distant spring water.⁶

Two new water treatment plants, completed in 1957 and 1966 respectively, increased the volume of water available to Jakartan residents by almost ten times the amount circulating during the colonial era.⁷ However, there was little increase in the number of residents who had access to the piped water, but rather an increase in the volume of water that a minority of residents could access. During this period, no money was invested in improving access for informally settled low-income areas, not even through basic infrastructure such as public hydrants. By the end of the 1950s, around 80 per cent of the population continued to rely on sources other than piped water, such as increasingly polluted groundwater, rivers and canals.

During the Soekarno era, the legal approach to water was reflected in the 1945 Constitution, which stated that water was to be controlled by the State and used for the greatest benefit of the people.⁸ However in practice, politics guided the distribution and expansion of the piped water network to the elite. Groundwater was not a government priority.

From 1965 to the late 1980s, following the violent transition from Soekarno's Old Order government to Soeharto's New Order, the government expanded the network to assist and sustain industrial economic growth and to supply upper class residential areas that were politically supportive of the New Order.⁹ This was in line with Soeharto's vision for Indonesia of economic development and social stability. During this period, improvements focused on the expansion of the network with a priority of construction, not rehabilitation; the construction of two additional large scale water

1 Four public hydrants were installed for over 116,740 residents. See Michelle E. Kooy, *Relations of Power, Networks of Water: Governing Urban Waters, Spaces, and Populations in (Post)Colonial Jakarta* 53 (Unpublished PhD thesis, University of British Columbia, 2008).

2 *Id.* at 55, 56, 142.

3 Sensory assessment of water is still used to determine water quality. For example, a taxi driver interviewed on 28 October 2008 stated that to test the quality of water, he makes a cup of tea and examines the colour of the tea.

4 See Kooy, note 1 above at 83.

5 Jakarta's population increased dramatically during this time, rising from 8,00,000 in 1945 to 3.15 million in 1965. See S. Soetrisno, 'Groundwater Management Problem: Comparative City Case Studies of Jakarta and Bandung, Indonesia', in John Chilton ed., *Groundwater in the Urban Environment- Selected City Profiles* 63 (Rotterdam: Balkema, 1999) and Demographia, *World Metropolitan Areas Over 50,00,000: Population Change from 1965: Total, Core & Suburbs*, available at <http://www.demographia.com/db-worldmetro5m-1965.htm>.

6 The city's new water treatment plants changed the bulk of the source of water supply from mountain spring water to treated surface water taken from the city's flood canals.

7 See Kooy, note 1 above at 62.

8 Indonesian Constitution 1945, Article 33(3).

9 See Kooy, note 1 above at 68, 70 and 149.

treatment plants; and new investment into small-scale treatment plants. Water supply production capacity increased threefold, however distribution of the water through the piped network was extended to less than one-quarter of the city's population, and covered less than half of the urban area.

In spite of Soeharto's vision favouring industry and elite residential areas, in 1995 more than 70 per cent of industries in Jakarta used groundwater either because piped water supplies were inadequate or because it was substantially cheaper to do so. For the same reason, many upper class residential areas also did not connect to the network or use piped water in spite of being connected to the network. PAM Jaya, Jakarta's regional water supply company, acknowledged at the time that it could supply barely 60 per cent of the city's daily demand of 1.7 million cubic metres of water.¹⁰

Little was done during the Soeharto era to service the urban poor in spite of unprecedented sustained economic growth rates that averaged nearly 6 per cent per year from 1975 to 1996.¹¹ Those without access to piped water (nearly 80 per cent of the population) then either built their own shallow groundwater wells or connected to other household's wells, or paid up to 20 per cent of their monthly income for water from public hydrants.¹² Sewerage systems were non-existent, a legacy of a government policy treating sewage as a 'private concern'.¹³

In 1990 it was estimated that the amount of piped water consumed by residents in Jakarta was 128 million cubic

metres per year. However, the un-served and under-served residents of Jakarta abstracted almost twice this amount, between 200-250 million cubic metres per year of groundwater.¹⁴ By the 1980s, concerns were growing over water quality in shallow groundwater. The lack of an effective sewerage and waste collection system was contaminating groundwater, in certain areas groundwater depletion and/or salinisation had occurred, and reported cases of water-borne diseases rose.¹⁵ Decades of uncontrolled groundwater abstraction had also changed the hydraulic situation in Jakarta from a relatively undisturbed stage to a stage of exhaustion.¹⁶

During this time, water laws cemented and elaborated on the basic principles set out in the Constitution. The government passed Law No.11/1974 on Water Resources Development¹⁷ which expanded on the Constitution by stating that the use of water from its source for household purposes is free of charge and has no licence requirements. This principle was further elaborated in Government Regulation No.22/1982 on Water Management which set out that the use of water for public drinking water is a primary priority; that everyone has the right to use water as a primary necessity of life; that a licence is not required for this water usage, nor does it have to be paid for.¹⁸ In spite of these requirements in law in relation to the use of water from its source, in practice the piped water network was developed and expanded to support industrial growth and to supply upper class residential areas that were politically supportive of the New Order government.

Groundwater management was outside the scope of Law No.11/1974, which was limited to the quantity management of surface water. The responsibility for groundwater management lay with the Department of Energy and Mineral Resources as groundwater was seen mainly as a mining resource and not as a renewable

10 Michael Richardson, 'Water Woes Threaten Growth in Indonesia', *New York Times*, 26 June 1995, available at <http://www.iht.com/articles/1995/06/26/water.php>.

11 Paul McCarthy, *Understanding Slums: Case Studies for the Global Report on Human Settlements 2003. The Case of Jakarta, Indonesia*, World Bank, 2 (2003) available at www.ucl.ac.uk/dpu-projects/Global_Report/pdfs/Jakarta.pdf.

12 Karen Bakker et al., *Disconnected: Poverty, Water Supply And Development In Jakarta 11* (United Nations Development Programme, Human Development Report Office Occasional Paper, 2006), available at http://hdr.undp.org/en/reports/global/hdr2006/papers/bakker_et_al1.pdf.

13 *Id.* at 11. Less than two per cent of households in Jakarta are connected to a sewerage system and the majority of wastewater is disposed directly to rivers, canals, or to often poorly functioning septic tanks. *Id.* at 14.

14 *See* Kooy, note 1 above at 90-91.

15 *See* Bakker et al., note 12 above at 11.

16 Urban Groundwater Database (Information Supplied by Haryadi Tirtomihardjo, Directorate of Environmental Geology, Bandung, Indonesia, 2 July 1996), available at <http://www.scar.utoronto.ca/~gwater/IAHCGUA/UGD/jakarta.html>.

17 Law No.11/1974 replaced the Dutch General Water Regulations of 1936. Law No.11/1974 contains 17 Articles and is a framework Act with further elaboration in implementing regulations.

18 *See* Articles 13-29 of Government Regulation No.22/1982.

resource. Regulation of groundwater consisted of guidelines with an emphasis on the technical aspects of groundwater extraction. The historical emphasis of groundwater regulation was therefore on exploitation rather than sustainable use.

As both the piped and non-piped water quality in Jakarta continued to decline, the city's water supply increasingly created serious problems for human health and the environment, and hindered economic development and poverty alleviation. Private sector participation was seen as the best solution to address the decline in Jakarta's piped and non-piped water and ultimately to assist in the transition from a predominant use of groundwater to piped water.

3 WHY HOPES FOR A PRIVATISATION- LED SHIFT TO PIPED WATER FAILED

Prior to privatisation, Jakarta's centralised piped water network had numerous problems. These included a water supply distribution network that was not capable of distributing the available water; limited water coverage; poor water quality; high levels of unaccounted-for-water; inequitable access to piped water; and a regional water supply company that was inefficient and underperforming.

In January 1998, two 25 year contracts for the management and expansion of Jakarta's water supply system were awarded to Thames Water International (United Kingdom) and Ondeo (Suez-Lyonnaise des Eaux) (France). Jakarta was split in half, using the Ciliwung River as the dividing line and Thames was awarded the eastern half of Jakarta and Ondeo the western half. The contracts were signed with PAM Jaya (the Jakarta regional water supply company) which retained ownership of the water supply assets.¹⁹ The two companies promised to improve water production,

¹⁹ The contracts were renegotiated in 2001 following the devastating Asian financial crisis of 1998.

reduce water losses, increase the number of connections, improve service coverage ratio, increase the volume of water billed and improve the service standards. PAM Jaya agreed to assist the two companies to force the closure of deep wells²⁰ where piped water was available.²¹ The two private water companies also signed a Memorandum of Understanding in 2004 that required them to supply clean water in order to minimise groundwater use.²²

However, according to Achmad Lanti, the former Chair of the Jakarta Water Supply Regulatory Body,²³ the private companies are as inefficient as the previous public utility they replaced. Their only incentive is to improve the bill collection system and shut down illegal private wells. The companies have no incentive to improve the system as a whole and have not met key performance targets set out in their contracts.²⁴ In spite of this under-performance, water tariffs in Jakarta are reportedly the highest in Indonesia. This bleak picture impacts on the quality, quantity and continuity of Jakarta's piped water, and on the willingness of consumers to connect to the network.

Most households base their choice of water source and distribution methods on the least cost solution that meets

²⁰ Deep wells are defined in the Contract as those wells that require groundwater permits under the provisions of DKI Jakarta Regulation No.10 of 1998, as amended and replaced (see Article 1.1 of the Contract).

²¹ See Articles 9.2(b) and 12 of the Contract.

²² Mustaqim Adamrah, 'Palyja, Aetra Boost Supply, Reduce Use of Groundwater', *Jakarta Post*, 9 July 2008, available at <http://www.thejakartapost.com/news/2008/07/09/palyja-aetra-boost-supply-reduce-use-groundwater.html>.

²³ The Jakarta Water Supply Regulatory Body was established to independently monitor and regulate water policies and tariffs at the macro level, supervise the private water companies on behalf of the Governor of Jakarta and the Ministry of Public Works, and mediate disputes between PAM Jaya (the Jakarta regional water supply company) and the two private companies. This was provided for in the revised contracts signed by the private companies in 2001 and subsequently in a regulation issued by the Governor of Jakarta. See Schedule 20 of the Contract for a draft of Keputusan Gubernur Propinsi Daerah Khusus Ibukota Jakarta Pembentukan Badan Pengatur Pelayanan Air Minum (Decree of the Provincial Governor of the Special Region of the Capital Jakarta regarding the Regulatory Body).

²⁴ International Consortium of Investigative Journalists, *Water and Politics in the Fall of Suharto* (February 2003), available at <http://www.geocities.com/RainForest/vines/4301/water04.html>.

their basic needs. If piped water cannot meet their basic needs, households will not connect (or advocate for connection) to the network, or they will not utilise the network even though it is connected to their residence.

In 2005, official estimates of the number of households connected to the central network ranged from 46 per cent to 56 per cent.²⁵ However, if informal (and therefore illegal) settlements are included, only an estimated 25 per cent of Jakarta's 12 million habitants are actually connected.²⁶ These figures also do not differentiate between households that want access to the piped water and those that have opted out of the network in favour of other alternatives. A significant number of households choose not to connect to the centralised network or are in fact connected but are zero consumption customers.²⁷ In 2006, there were 110,000 zero consumption households, or around fifteen per cent of network customers. Data from PT PAM Lyonnaise Jaya (Palyja), the private water operator in the western half of Jakarta, shows that in its operating area, 86 per cent of the zero consumption customers 'simply chose to rely on other water sources'²⁸ such as deep and shallow groundwater wells with filters, pumps, and pipes, and bought bottled water.

There are several reasons why piped water is not the least cost solution that meets the basic needs of households. A high initial expenditure for connection fees and additional charges added to the monthly bill²⁹ can mean that the total cost of piped water is more expensive than informal water supply methods.³⁰ The

initial connection fee affects the urban poor in particular, with connection fees more than a month's minimum wage, often to be paid in a lump sum. Many poor households have irregular incomes, making this up-front connection fee prohibitive. Connection fees are also more expensive the further the dwelling is from the piped network.³¹ Poor households are more likely to be in areas without networks or in areas of lower network density.³² Methods of payment for monthly bills are also not convenient for low income households, with payment by internet or by automatic teller machine transfer a common method of payment. However, many low income households do not have bank accounts or internet connections in their homes.

Informal settlements face additional legal obstacles to connection. Access to public services in Jakarta is contingent on two requirements. To connect to the network, residents must have state recognised residency for Jakarta and legal occupation of land documented by the State. The former takes the form of a Personal Identification Card which pre-supposes government permission to live and work in Jakarta³³ and the latter means that residents must have a certificate for the land on which they live, indicating a State sanctioned right to live on or use the land. Many poor households do not have such certificates, either because they forgo the formal registration process, are renters of poor quality housing, or are illegal 'squatters' of unoccupied public or privately owned land. In other cases, residents just do not have certificates to prove legal occupation of the land.³⁴ They are therefore considered to be illegal occupiers of the land, even though many have lived or worked on the land for years, have paid for the land, and have electricity and in some cases telephone

25 See Bakker et al., note 12 above at 13. However, Indonesia's Report on the Achievement of Millennium Development Goals (83, 2007) states that 63 per cent of Jakarta's population is connected to the piped network. See Ministry of National Development Planning, Report on the Achievement of Millennium Development Goals, Indonesia 2007 (Jakarta: Ministry of National Development Planning, 2007), available at <http://www.undp.or.id/pubs/docs/MDG%20Report%202007.pdf>.

26 See Bakker et al., note 12 above at 13.

27 Zero consumption customers are customers who are connected to the piped water network and pay monthly connections fees and other costs, but do not use the piped water.

28 See Kooy, note 1 above at 107.

29 Monthly bills also include more than charges per unit volumes of water consumed. Additional charges such as the meter fee and a fixed charge are also included in the monthly bill.

30 See Bakker et al., note 12 above at 13.

31 Connection fees are approximately Rp.10,00,000 (USD 100): interview with KRuHA (People's Coalition for the Right to Water), 11 November 2008.

32 See Bakker et al., note 12 above at 17.

33 See for example Article 56 of Jakarta Government Regulation No.8/2007 on Public Order which states that every person intending to live and settle in Jakarta must have, among other things, '...d. skills and qualifications; ... e. a guaranteed place of abode and guaranteed employment...?'

34 There are over 80 million land parcels in Indonesia, of which only 17 million are currently registered. See World Bank, Land Policy, Management and Administration, (Washington: World Bank, 2005); Human Rights Watch, *Condemned Communities: Forced Evictions in Jakarta* (New York: Human Rights Watch, 2006).

connections provided by State owned corporations. The result is that many of the city's lowest income residents do not qualify for public water supply services,³⁵ and must seek water supply from alternative sources such as groundwater.

Aside from expenses and difficulties in regard to connection, there are also ongoing additional expenses as a result of the low network pressure for all households. Low pressure and intermittent water flow requires financial costs for storage containers and pumps, and physical space to store the containers and pumps.³⁶ Jakarta is a city with an extremely high population density and many residents do not have the money or the space for such additional requirements.³⁷ In the area of Pluit and Ancol in North Jakarta, water provided by Palyja only flows between 2 am and 4 am and if residents do not stay awake to collect water to store in the early hours of the morning, they are forced to purchase water from hydrants or water vendors at an increased price. Consumers must still pay Palyja for their piped water connection. This is the case even for wealthy households in the area, who install pumps on the piped network to ensure they are able to access piped water. However, in some cases even they are unable to extract the water from the piped network, but are charged anyway because when the pumps suck air not water, the water meters continue to register water consumption.³⁸

Water tariffs are also high, recorded as the highest in Indonesia.³⁹ Since privatisation in 1998, tariffs have risen dramatically, increasing by fifteen per cent in February 1998, 35 per cent in April 2001, 40 per cent in April 2003⁴⁰ and 30 per cent in January 2004.⁴¹ In early 2004 it was determined that there would be a regular increase of tariffs every six months until 2007 without the previously required approval by the Jakarta regional parliament.⁴² In 2007, the increase was ten per cent, and Palyja has submitted a proposal to the Jakarta administration to increase water tariffs by an average of 22.7 per cent in 2009.⁴³

35 This is contrary to the requirement that no households should be denied the right to water on the grounds of their housing or land status: United Nations Committee on Economic, Social and Cultural Rights, General Comment 15 (The Right to Water), UN Doc. E/C.12/2002/11, para.16(c). Indonesia ratified the International Covenant on Economic, Social and Cultural Rights in 2005 and is discussed further below. It is also contrary to the statement by Indonesia's Constitutional Court that 'a person's need for water does not depend on their residence': Judicial Review of the Water Resources Law (No 7/2004) No 058-059-060-063/PUU-II/2004 and 008/PUU-III/2005, at 488.

36 See Kooy, note 1 above at 174.

37 In 2003, it was estimated that five per cent of Indonesia's 210 million people lived in Jakarta which is only 0.03 per cent of Indonesia's total land mass. See McCarthy, note 11 above at 3.

38 'Dari Saluran Tersendat sampai Sambungan Liar' ('From Blocked Pipes to Illegal Connections'), *Kompas*, 9 May 2005, available at <http://westjavawater.blogspot.com/2005/05/dari-saluran-tersendat-sampai.html>.

39 'Sutiyoso Ngotot Naikkan Tarif Air Minum' ('Sutiyoso Refuses to Increase Water Tariffs'), *Suara Pembaruan*, 4 February 2006, available at <http://www.suarapembaruan.com/News/2006/02/04/Utama/ut01.htm>. See also Anonymous 'Jakarta, Tarif Air-nya Tertinggi di Kawasan Asia Tenggara' ('Jakarta, Water Tariffs the Highest in Southeast Asia'), 2008, http://www.lintasberita.com/Bisnis/Jakarta_Tarif_Air-nya_Tertinggi_di_Kawasan_Asia_Tenggara.

40 PT Thames Pam Jaya (at the time majority owned by Thames Water International) and Palyja (majority owned by Suez) threatened to break their contracts if the price increase was rejected. If they pulled out, PAM Jaya would have been liable for a Rp.3 trillion (USD 362 million) penalty fee under the contracts. The fee was to reimburse the companies' costs and losses, as well as to pay 50 per cent of projected profits for the remainder of the contractual term. See Bill Guerin, 'Indonesia: How Not to Privatize Water', *Asia Times*, 19 November 2003, available at http://www.greatlakesdirectory.org/111903_great_lakes_privatization.htm and Bambang Nurbianto, 'PAM Jaya Could Face Rp. 3 trillion Fine for Any Contract Termination', *Jakarta Post*, 17 November 2003, available at <http://www.thejakartapost.com/news/2003/11/17/pam-jaya-could-face-rp-3t-fine-any-contract-termination.html?1#1>.

41 Damar Harsanto, 'City Administration Quietly Raises Water Rates by 30 Percent', *Jakarta Post*, 6 January 2004, available at <http://www.thejakartapost.com/news/2004/01/06/city-administration-quietly-raises-water-rates-30-percent.html>.

42 Surat DPRD DKI Jakarta Nomor 550/-1.778.1 tanggal 23 Juli 2004 (Letter of the Jakarta Province Regional Parliament Number 550/-1.778.1 dated 23 July 2004).

43 Anonymous, 'Water Quality Tops Complaints in Consumer Survey', *Jakarta Post*, 22 December 2008, available at <http://www.thejakartapost.com/news/2008/12/22/water-quality-tops-complaints-consumer-survey.html>. According to Palyja Commissioner Bernard Lafronge, this is in accordance with the 20 per cent inflation rate of the past two years; Agnes Winarti, 'Palyja Seeks Rate Hike, Vows Investment', *Jakarta Post*, 8 January 2009, available at <http://www.thejakartapost.com/news/2009/01/08/palyja-seeks-rate-hike-vows-investment.html>.

The low quality of piped water is a further disincentive for rich and poor households to connect to the network. Many residents doubt the quality of piped water,⁴⁴ seeing no significant difference between the water quality of piped water and groundwater sources (excluding North Jakarta, a poorer, more water deficient area in Jakarta, where the groundwater is brackish and cannot be used for household purposes).

There is good reason for Jakartan residents to be suspicious of the quality of piped water. As a result of delayed network rehabilitation and negative pipe pressure, the vacuum within network pipes allows wastewater (pipes flow through wastewater gutters and storm drains) to be sucked into the pipes, contaminating the water supply. A 2004 research report by the Ministry of Health indicated that only 46 per cent of the piped water samples in Jakarta met its requirements for 'clean water' standard.⁴⁵ Residents can also see and smell the poor quality of the water. For example in Penjaringan in North Jakarta, piped water is brown-black in colour and sometimes mixed with dirt and mud.⁴⁶

Many Jakartans are therefore ambivalent about piped water as it is costly, unreliable and does not provide noticeable benefits when compared with groundwater.⁴⁷ On the other hand, groundwater is free, excluding the cost of subsidised electricity used to pump the water; the quality is sufficient for most household uses; and Jakartans have relied on groundwater as a source of water for over a century.

However, it is not only households that experience problems with Jakarta's centralised piped water network. As recently as the end of 2008 the government acknowledged that 'it cannot provide surface water' adequately,⁴⁸ and is only capable of supplying 54 per cent of the water needs of Jakarta.⁴⁹ Such problems mean that business and industry also demonstrate a strong preference for groundwater and drill deep wells to access a cleaner, cheaper and more reliable source of water. In recent years, the level of extraction has become excessive and groundwater theft is common.

With households, businesses and industry relying to a large extent on groundwater, concern then turns to what effect this is having on groundwater levels and Jakarta's natural environment. As discussed below, this is having a devastating effect.

4 THE EFFECT OF EXCESSIVE GROUNDWATER USE ON GROUNDWATER LEVELS AND JAKARTA'S NATURAL ENVIRONMENT

As discussed above, groundwater has always been an important source of water for Jakartans, and about 70 per cent of the population continue to depend on it, while the majority of industries in the Jabotabek area⁵⁰ also rely on groundwater for their water.⁵¹ Certain government departments also encourage the use of

44 The Indonesian Consumer Foundation (YLKI) receives 70 complaints from residents about tap water each month: Agnes Winarti, 'JICA Offers Administration System to Test Water Quality', *Jakarta Post*, 22 January 2009, available at <http://www.thejakartapost.com/news/2009/01/22/jica-offers-administration-system-test-water-quality.html>.

45 See Kooy, note 1 above at 177-178. The Decree from the Ministry of Health No. 907, 2002 defines drinking water as treated or untreated water that meets health requirements and can be drunk directly. Clean water is defined as water used for daily needs, which meets health requirements and can be drunk after being boiled. See Ministry for People's Welfare, Indonesia Progress Report on the Millennium Development Goals 80 (Jakarta: Ministry for People's Welfare, 2004).

46 'Kucuran Air Hanya Bisa Dinikmati Pukul 24.00, PAM Kecewakan Warga Jakarta Utara' ('Water Flow Can Only be Enjoyed at Midnight, PAM Disappoints North Jakarta Residents'), *Harian Terbit*, 24 May 2005, available at <http://westjavawater.blogspot.com/2005/05/kucuran-air-hanya-bisa-dinikmati-mulai.html>.

47 Interview with taxi driver, 12 November 2008.

48 Acknowledgement of PAM Jaya, which is the government party to the water supply contracts, reported on TvOne in its news story *Krisis Air Tanah* (Groundwater Crisis) on Apa Kabar Indonesia (What's News Indonesia), 31 October 2008 [hereafter Groundwater Crisis].

49 'Berlebihan, Eksploitasi Air Tanah' ('Excessive, Exploitation of Groundwater'), *Suara Pembaruan*, 18 November 2008, available at <http://digilib-ampl.net/detail/detail.php?row=&tp=kliping&ktg=airminum&kode=7975>.

50 Jabotabek is the term given to the metropolitan area surrounding Jakarta. The area consists of Jakarta (as a province on its own) and the three surrounding regencies of Bekasi and Bogor in West Java and Tangerang in Banten, including the cities of Bogor, Bekasi, and Tangerang.

51 Seventy per cent of industry relies of groundwater as its water source. See Groundwater Crisis, note 48 above.

groundwater as an alternative source of water to piped water. For example, the Jakarta Mining Agency advocates deep wells as solution to the city's lack of centralised network coverage and service quality, and in 2007, it advocated that 20 new wells should be drilled so that groundwater could be taken from depths of at least 250 metres to ensure water security in the dry season. In 2007 the Agency mapped out areas in need of wells, 'prioritizing areas with little or no access to piped water'.⁵²

This excessive level of groundwater use is exacerbated by the failure to replenish groundwater at a sufficient rate. In 1995 industries, hotels and private consumers in Jakarta were drawing more than 300 million cubic metres of groundwater a year,⁵³ which was about three times the rate that the aquifers were being replenished.⁵⁴ Since these figures were measured, the problem of non-replenishment has increased as massive buildings and concrete take over natural drainage sites, green areas and open spaces, and human waste and rubbish clogs waterways.⁵⁵ Freshwater floods now surge up from the ground during the rainy season and rainwater flows straight into the sea, making no contribution to groundwater.⁵⁶

However, it is the urban poor that are often blamed for exacerbating flooding and for blocking natural drainage

sites, green areas and open spaces in the city, and for dumping rubbish into waterways. As a consequence, the city government has stepped up the pace of forced evictions of 'illegal' settlements and places of business in the name of public order and opening up green areas. Jakarta Government Regulation No.8/2007 on Public Order permits the forced eviction⁵⁷ of persons who live or construct dwellings or places of business on green areas, parks, public places, and riverbanks among other areas.⁵⁸ A recent example of this increased pace of forced eviction is in North Jakarta, where it is estimated that 24,000 families will lose their homes in the near future to make way for green areas designed to absorb rainfall and prevent chronic flooding. However, it has since been determined that the cleared area will be turned into an international sports stadium, two outdoor soccer fields, a jogging track and urban forest site.⁵⁹ No massive buildings (namely luxury hotels or apartment complexes, factories or shopping malls) built on green areas and natural drainage sites have been demolished.

With the increasing extraction of groundwater, water levels have dropped by one to three metres a year during the last ten years and are locally at 20 to 40 metres below mean sea level.⁶⁰ In some areas, this is even more severe, for example, the groundwater level in the Mega Kuningan business area in South Jakarta is dropping by five metres per year.⁶¹ The increasing extraction levels also contribute to rising levels of groundwater

52 Adianto P. Simamora, 'City Water Crisis Could See Deeper Wells Dug', *Jakarta Post*, 18 August 2007, available at <http://www.thejakartapost.com/news/2007/08/18/city-water-crisis-could-see-deeper-wells-dug.html>.

53 At this time, 3020 deep private wells were registered in Jakarta, but nearly 88 per cent of the total groundwater abstraction wells were unregistered. See Nur Endah Shofiani, *Reconstruction of Indonesia's Drinking Water Utilities: Assessment and Stakeholders' Perspectives of Private Sector Participation in the Capital Province of Jakarta 5* (Unpublished Masters thesis, Royal Institute of Technology, Stockholm, 2003).

54 See Richardson, note 10 above.

55 Jakarta is criss-crossed by thirteen rivers and flood channels that were built by the Dutch colonial government to alleviate flooding. However, the channels are ineffective when it rains as they are clogged by garbage dumped into the channels by the city's residents and there has been no proper maintenance of the channels for 25 years. See Geoff Thompson, 'Jakarta in Jeopardy', *Australian Broadcasting Corporation*, 23 September 2008, available at www.abc.net.au/foreign/content/2008/s2368261.htm.

56 Editorial, 'Water Scarcity', *Jakarta Post*, 5 April 2008, available at <http://www.thejakartapost.com/news/2008/04/05/editorial-water-scarcity.html>.

57 Forced evictions are defined as 'the permanent or temporary removal against their will of individuals, families and/or communities from the homes and/or land which they occupy, without the provision of, and access to, appropriate forms of legal or other protection'. See United Nations Committee on Economic, Social and Cultural Rights, General Comment 7: The Right to Adequate Housing (Art. 11.1 of the Covenant): Forced Evictions, para.3, available at [http://www.unhcr.ch/tbs/doc.nsf/\(Symbol\)/482a0aced8049067c12563ed005acf9e?Opendocument](http://www.unhcr.ch/tbs/doc.nsf/(Symbol)/482a0aced8049067c12563ed005acf9e?Opendocument).

58 See Articles 6, 12(c), 13(1), 20 and 36(1) of Jakarta Government Regulation No.8/2007 on Public Order.

59 NGO Urges a Humane Eviction of 24,000 Squatters in North Jakarta', *Jakarta Post*, 19 September 2008 and Tifa Asrianti, 'BMW Park Gets Rp.4b for Design, Assessment', *Jakarta Post*, 2 January 2009, available at <http://www.thejakartapost.com/news/2009/01/02/bmw-park-gets-rp-4b-design-assessment.html>.

60 See Tirtomihardjo, note 16 above.

61 Mustaqim Adamrah, 'New Groundwater Fees Set for Jakarta', *Jakarta Post*, 28 March 2008, available at <http://www.thejakartapost.com/news/2008/03/28/new-groundwater-fees-set-jakarta.html>.

salinisation caused by seawater intrusion: where groundwater is replenished, it may instead be replenished by salt water intrusion or by polluted surface water which seeps into the soil. The seawater intrusion also damages the piped network through corrosion.

Groundwater abstraction has also been identified as the main cause of observed land subsidence in Jakarta, which has now reached critical levels.⁶² As Jakarta develops, notably involving the construction of more luxury hotels, apartments and shopping malls,⁶³ the city gets heavier, which with the combination of groundwater extraction and the creation of vacuums in the aquifer, pushes the city downwards.⁶⁴ Many of these constructions, in particular shopping malls, are reported to grossly exceed their building floor coefficients, meaning they are too big and therefore too heavy for the land space on which they are built.⁶⁵

High rise, low cost housing built by the government as alternative housing for people who are evicted from their homes has also been identified as a source of increased land subsidence. The apartment buildings are densely populated, with over 5,000 people per hectare, and

residents must use groundwater because the tap water supply is insufficient.⁶⁶

Land subsidence in Jakarta was first observed in 1926, when a Dutch surveyor conducted measurements from Jatinegara (then on the outskirts of east Jakarta) to Tanjung Priok harbour in the north.⁶⁷ No further investigations were made until 1978 when buildings and the Sarinah fly-over bridge at M.H.Thamrin Street in Central Jakarta cracked. Flooding in Jakarta in that period also covered a wider area.⁶⁸

The Jakarta Mining Agency has reported on land subsidence in Jakarta over a twelve year period from 1993 to 2005. For the 60 per cent of land in Jakarta that is above sea level, the rates of subsidence are alarming:⁶⁹

Location	Height above sea level in 1993 (in metres)	Height above sea level in 2005 (in metres)	Land Subsidence (in centimetres)
North Jakarta	2.03	1.46	57
West Jakarta	2.32	2.11	21
East Jakarta	11.62	11.45	17
South Jakarta	28.76	28.46	30
North Jakarta	3.42	2.40	102

62 See Tirtomihardjo, note 16 above.

63 For example, during the period 2000-2005, the former Governor of Jakarta Sutiyoso issued permits for the construction of shopping malls over an area of more than 3 million square metres of land. This is more than twice the area of shopping centres built in Jakarta from 1962-1997. Sri Palupi, Perda tentang Ketertiban Umum Hasil Revisi Perda 11/1988: Upaya Sistematis Mengusir Orang Miskin dengan Dalih Ketertiban Umum (Regional Government Regulation concerning Public Order the Result of a Review of Regional Government Regulation 11/1998: Systematic Efforts to Drive Out the Poor on the Basis of Public Order) (Paper presented during discussions on the controversy of the Regional Government Regulation on Public Order at the Indonesian National Human Rights Commission, Jakarta, October 2007, page 11).

64 In addition, trees on the mountains surrounding Jakarta have been removed to make way for holiday villas radically reducing the ability of mountains to absorb water. See Thompson, note 55 above.

65 Examples cited include Kuningan City, Satrio Street; Gandaria City; Ciputra World Satrio Street; and Senayan City in South Jakarta, St Moritz, Puri Indah; Central Park, Tanjung Duren; and Season City, Grogol in West Jakarta, and Kelapa Gading Square in North Jakarta. See Agnes Winarti, 'Superblocks Pose Risks, Study Says', *Jakarta Post*, 12 February 2009, <http://www.thejakartapost.com/news/2009/02/12/superblocks-pose-risks-study-says.html>.

66 'Proyek Rumah Susun Dinilai Percepat Tanah Jakarta Ambles' ('Highrise Project is Deemed to Accelerate Land Subsistence in Jakarta') *Tempointeraktif*, 3 March 2009.

67 P. Suharto, Waterpas Teliti di Indonesia' Risalah Ilmiah ('Level Instruments Precise in Indonesia' Scientific Journals) (Bandung: Geodesi ITB, Bandung, 1971), in Rochman Djaja et al., Land Subsidence of Jakarta Metropolitan Area, Indonesia (3rd FIG Regional Conference Jakarta, Indonesia, October 3-7, 2004).

68 LM Husoit et al., Pengaruh Alami Geologi dan Berat Bangunan terhadap Penurunan Muka Tanah dan Terjadinya Genangan Air (The Natural Influence of Geology and Weight of Buildings on Land Subsistence and the Occurrence of Pools of Water) (One Day Seminar on Mining Geology, Jakarta Mining Agency, Jakarta, Indonesia, 1997).

69 See Indonesia: Environment, Science & Technology, and Health Highlights February-March 2005, US Embassy, Jakarta, available at http://www.usembassyjakarta.org/econ/ESTH_highlight_feb-march05.html.

As Jakarta slowly sinks, the repercussions are potentially disastrous. Flooding is becoming worse, with February 2008 marking the worst floods for three centuries. Fifty four people were killed and the floods caused nearly USD 1 billion in damages.⁷⁰ Perhaps even more catastrophic is the estimation that in less than 20 years time, the sea will permanently flood the first two to four kilometres of the coastal area of Jakarta, rendering almost one third of Jakarta uninhabitable and causing the displacement of millions of people.⁷¹ The date that this will happen has even been predicted: 6 December 2025. The impending disaster has been attributed to a combination of Jakarta's overdevelopment which is compressing the land it is built on, the peak of an 18.6-year astronomical tide cycle and the depletion of groundwater caused by factories, hotels and wealthy residents drilling deep water bores to bypass the piped water network.⁷²

The Jakarta administration is beginning to acknowledge the problems caused by excessive groundwater depletion and to take action.⁷³ However, stopping the overuse of groundwater is not easy, as aquifer systems are large, groundwater pumping is difficult to monitor, users unorganised, there are hundreds of thousands of consumers, and their numbers increase quickly.⁷⁴ The

following section outlines the steps the government has actually taken to address the problems and asks whether these steps are sufficient.

5 REFORM AND ACTION BY THE GOVERNMENT: IS IT ENOUGH?

If the government is to take sufficient steps to address the excessive and unlicensed use of groundwater, it must take a multi-dimensional approach to reform. Not only does the government need to address the current regulation of, and attitude towards, groundwater, it also needs to provide a reliable, commercially viable alternative water source to groundwater to the big extractors. The best way to do this is to improve the piped water supply network, both in regard to the raw water supplied to the network⁷⁵ and the capacity of the network to treat and distribute the water efficiently and effectively.

The government has drafted new regulations on water management generally and groundwater particularly, and has started a public awareness campaign on the importance of groundwater. It has also embarked on an ambitious plan with the Asian Development Bank to improve the quality and quantity of raw water supplied to the piped network. However, reform in regard to the network itself remains limited to short term improvements and ancillary measures such as increasing groundwater fees, addressing compliance issues and closing wells and bores. These initiatives are discussed in detail below.

5.1 Regulatory reform

As discussed above, historically the legal framework for the development of water resources management specifically excluded groundwater.⁷⁶ However, in 2004

70 See Thompson, note 55 above.

71 By 2025 the population of Jakarta may reach 24.9 million, not counting millions more in surrounding areas: Pepe Escobar 'Book Review. The accumulation of the wretched. *Planet of Slums* by Mike Davis', *Asia Times*, 20 May 2009 available at http://www.atimes.com/atimes/Front_Page/HE20Aa01.html.

72 Climate change is not a major reason for this permanent flooding. By 2025, estimates from the Intergovernmental Panel on Climate Change (IPCC) show sea levels will have risen by only about five centimetres. See Anonymous, 'Indonesia's Thirsty Capital is a Sinking City', *AFP*, 15 April 2008, available at <http://www.abc.net.au/news/stories/2008/04/15/2217414.htm>. The findings outlined are the result of a study by the World Bank and Delft Hydrolics.

73 States should ensure that everyone has a sufficient amount of safe water by combating the depletion of water resources from unsustainable extraction by industry. See United Nations Sub-Commission on the Promotion and Protection of Human Rights, Res. 2006/10, Promotion of the Realization of the Right to Drinking Water and Sanitation, UN Doc.A/HRC/Sub.1/58/L.11 (2006), adopting the Draft Guidelines for the Realization of the Right to Drinking Water and Sanitation, UN Doc.E/CN.4/Sub.2/2005/25 (2005), Section 4.1.

74 O. Braadbaart and F. Braadbaart, 'Policing the Urban Pumping Race: Industrial Groundwater Overexploitation in Indonesia', 25(2) *World Development* 199, 200 (1997).

75 PAM Jaya, for example, is reportedly reluctant to increase the number of connections because access to raw water is limited (KRuHA interview, 11 November 2008).

76 See generally Law No.11/1974.

the government passed its framework piece of legislation on water resources management, namely Law No.7/2004 on Water Resources. Law No.7/2004 now takes a holistic approach to water management, extending to both surface and groundwater.⁷⁷ It also emphasises the need for efficient water use, which is a new concept in Indonesian water management.⁷⁸

Prior to 2004, the responsibility for groundwater management lay with the Department of Energy and Mineral Resources as groundwater was seen mainly as a mining resource and not as a renewable resource. Regulation of groundwater consisted of guidelines with an emphasis on the technical aspects of groundwater extraction. The historical emphasis of groundwater regulation was therefore on exploitation rather than sustainable use, which has contributed to a low awareness of the real value of groundwater in Jakarta. Factory managers for example do not think beyond the fact that unless they sink new and deeper boreholes every two or three years their neighbours will draw away all the water.⁷⁹ The low awareness of the value of groundwater can also be seen by the common practice of removing and discarding groundwater when land is excavated for foundations or basements of luxury apartments, hotels, shopping malls and business complexes.⁸⁰ In order to encourage users and administrators to place a value on groundwater, and to ensure its sustainable use, it is important that the economic, environmental, social and cultural value of water is recognised. The new Law No.7/2004 recognises this in a very general sense, stating that water has a social, cultural, environmental and economic function.⁸¹ For example, Law No.7/2004 clearly states the need for efficient water use⁸² and acknowledges the need to recognise indigenous peoples' rights when exercising

control over water resources, although this recognition is heavily qualified.⁸³ The Law also guarantees everyone's right to obtain water for their minimum daily basic needs, and outlines the government's obligation to ensure that access to water for such purposes is free and is the first priority for water use.⁸⁴ However the ability of the State to fulfil this latter obligation is seriously challenged by the combination of the declining water table and salinisation and pollution of groundwater. These factors mean that getting water from shallow wells is becoming more difficult for households that rely on groundwater as their primary source of water.⁸⁵ Each year, households must dig deeper wells to access water for household uses⁸⁶ or they will not have access to groundwater for basic daily needs.

In this regard, in 2005 Indonesia ratified the International Covenant on Economic, Social and Cultural Rights. Article 11 requires the government to recognise the right of everyone to an adequate standard of living, which includes the right to water. This means that water supply must be sufficient, clean, accessible, affordable and enjoyed without discrimination.⁸⁷ The right to water is also guaranteed by Article 28H of the Indonesian Constitution, which was amended in 2000 to include a chapter on human rights. Article 28H states that every person has the right to live in spiritual and physical welfare, has the right to housing, and the right to a good and healthy environment as well as the right

77 Article 1(5) of Law No.7/2004 where the definition of water resource includes both surface and groundwater.

78 Article 26(6) of Law No.7/2004.

79 See Braadbaart and Braadbaart, note 74 above at 209.

80 'Pidana Bagi Penyedot Berlebihan' ('Criminal Sanctions for Excessive Extractors'), *Kompas*, 17 April 2008, available at <http://asosiasi.org/tbk/2008/10/pidana-bagi-penyedot-berlebihan/>.

81 See Article 4 of Law No.7/2004.

82 Law No.7/2004 clearly states that every person has the responsibility to use water in a conservative manner as possible (Article 26(6)), although it does not state what this means exactly or how it will be enforced.

83 Article 6(2) and (3) of Law No.7/2004. The qualifications are that the indigenous peoples' rights must not be contrary to the national interest and laws, and the indigenous peoples' rights must still exist and have been consolidated by local government regulation.

84 See Articles 5, 29(3) and 80 of Law No.7/2004 on Water Resources.

85 See Djaja et al., note 67 above.

86 Interview with Jakarta resident, 13 November 2008.

87 Sufficient means that water must be sufficient and continuous for personal and domestic uses; clean means safe water that in particular is free from hazardous substances that could endanger human health, and whose colour, odour and taste are acceptable to users; accessible means that water services and facilities are accessible within, or in the immediate vicinity, of each household, educational institution and workplace; affordable means that water can be secured without reducing a person's capacity to acquire other essential goods and services, including food, housing, health services and education... See United Nations Committee on Economic, Social and Cultural Rights, note 35 above, Paras. 2 and 12.

to obtain health care.⁸⁸ The Indonesian Constitutional Court has determined that Law No.7/2004 is in accordance with the right to water as set out in the Constitution.⁸⁹

The principles in Law No.7/2004 are quite general as this Law is a framework law, the details of which are set out in implementing regulations. The implementing regulation on groundwater, Government Regulation No.43/2008 on Groundwater, was passed in May 2008. The Regulation elaborates on the framework provided in Law No.7/2004 and is an important step towards strategic groundwater management. As set out in the framework Law No.7/2004, its emphasis is no longer just on exploitation, but also on conservation and the sustainable use of groundwater.⁹⁰ The Regulation favours the basin approach to groundwater management,⁹¹ whereas in the past, the focus was on the management of boreholes. The management of groundwater as a hydro-geological unit is now central.⁹² It appears that the Department of Energy and Mineral Resources is still primarily responsible for groundwater management, although this is not clearly stated.⁹³

Importantly, Government Regulation No.43/2008 recognises the connection between groundwater management and surface water management and that the two should be managed in an integrated manner.⁹⁴ However, it does not express the need for administrative coordination between the different government agencies responsible for surface water and groundwater management.⁹⁵ The recognition is also limited in very general terms to conservation, efficient utilisation and

control of the potential damage to groundwater.⁹⁶ This means that plans for groundwater management must prioritise the use of surface water in the relevant river basin;⁹⁷ the conservation of groundwater must involve using groundwater as the last alternative;⁹⁸ and plans for provision of groundwater must be compiled bearing in mind plans for the provision of surface water.⁹⁹

The general manner in which the connection between groundwater and surface water management is recognised in the Regulation makes this aspect of the Regulation difficult to apply in practice, and the supervision of its implementation even harder. The Regulation does not take into account situations where surface water is inadequate, for example, where the surface water is not an improved water source,¹⁰⁰ is not affordable, the supply is not continuous or where it takes too long to collect the water.¹⁰¹ It also does not recognise in detail the physical connection between groundwater and surface water.

In regard to efficient use of groundwater, the Regulation recognises the current unsustainable levels of groundwater use. However, several of the requirements to ensure the sustainable use of groundwater are impractical. For example, to prevent the pollution of groundwater, groundwater users must close (and therefore no longer use) wells where the water is polluted.¹⁰² In Jakarta more than half of the population rely on groundwater from wells as a source of water, but more than 60 per cent of wells sampled in 2004

88 Judicial Review of the Water Resources Law (No 7/2004) No 058-059-060-063/PUU-II/2004 and 008/PUU-III/2005, at 488.

89 *Id.* at 485, 491-2.

90 *See* for example, Elucidation I. General Point 4 and 5 of Government Regulation No.43/2008 on Groundwater.

91 *See* Elucidation I. General, Point 2; Article 4 of Government Regulation No.43/2008 on Groundwater.

92 H.H.A. Teeuwen, *Groundwater Management and the New Indonesian Water Legislation 8* (Ministry for Transport, Public Works and Water Management, Rijkswaterstaat, The Netherlands, September 2005).

93 The Department of Energy and Mineral Resources was responsible for drafting the Regulation.

94 *See* Article 3(1) of Government Regulation No.43/2008 on Groundwater.

95 *See* Elucidation I. General, Point 1 of Government Regulation No.43/2008 on Groundwater.

96 Elucidation of Article 3 of Government Regulation No.43/2008 on Groundwater.

97 Article 25(2)(a) of Government Regulation No.43/2008 on Groundwater. This reflects Article 26(6) of the framework law.

98 Article 42(1)(d) of Government Regulation No.43/2008 on Groundwater.

99 Article 51(1) of Government Regulation No.43/2008 on Groundwater.

100 An improved water source is one that is likely to be safe, and includes household connections, public standpipes, boreholes, protected dug wells, protected springs and rainwater collection. *See* WHO and UNICEF, *Joint Monitoring Program for Water Supply and Sanitation: Definitions*, available at http://www.wssinfo.org/en/122_definitions.html.

101 These are elements of the right to water, as set out in General Comment No.15. *See* United Nations Committee on Economic, Social and Cultural Rights, note 35 above.

102 Article 46 of Government Regulation No.43/2008 on Groundwater.

showed e-coli contamination in excess of the regulated drinking water level, despite the majority of these being classified as protected wells. In 2006, the Jakarta Environmental Monitoring Agency (BPHLD Jakarta) estimated that 80 per cent of deep wells were contaminated with e-coli,¹⁰³ and in September 2008 concluded that in some areas (West Jakarta and Central Jakarta) contamination was as high as 93 per cent.¹⁰⁴ It is also unclear how this requirement to close polluted wells can be applied consistently with the requirement that the supply of groundwater for daily needs must be prioritised above all other needs,¹⁰⁵ and that the State must 'guarantee everyone's right to obtain water for their minimum daily basic needs'.¹⁰⁶

The Regulation also notes the occurrence of sea water intrusion into groundwater and land subsidence, stating that the way to avoid this is by prohibiting the extraction of groundwater in coastal areas,¹⁰⁷ and stopping the extraction of groundwater in critical zones and damaged zones.¹⁰⁸ How this will be achieved in practice is unclear, and it will not lead to the desired results without similar commitment to reducing Jakarta's overdevelopment on natural drainage sites, green areas and open spaces. Preventing land subsidence can also be through the creation of artificial recharge areas.¹⁰⁹ All three methods will be further regulated by Ministerial Regulation.¹¹⁰

As mentioned above, the Regulation prioritises the use of groundwater for domestic use (basic daily needs), for small-scale farming in an irrigation system, and as a source of drinking water.¹¹¹ The use of groundwater

for commercial purposes requires a permit and a fee may be charged.¹¹² Where licences are required, the Regulation does not set out a clear procedure in relation to licensing and this may discourage users from applying for a licence, and therefore unintentionally encourage unlicensed groundwater use. For example, the Regulation does not stipulate when a decision must be made regarding the application, and has no information about the nature of permit conditions to be set, about amendment to and revocation of the permit, or about the handling of any appeals to be lodged against the permit decision.¹¹³ It merely states that licensing will be further regulated by Ministerial Regulation.¹¹⁴

It is questionable whether the financing structure in the Regulation offers sufficient incentives for reducing groundwater usage. A fee instrument is likely to be inappropriate for such a purpose given that the way the fee is determined allocates no value to the groundwater itself.¹¹⁵ If as stated in the Regulation one of the goals is limiting groundwater use, the Regulation should focus more on the strict application of the permit instrument.¹¹⁶ In this regard, clear policy frameworks should set out a strategic plan for achieving the reduction of groundwater, especially by industry, luxury hotels and apartments and shopping malls.

The government has also prepared a draft regulation on water usage rights.¹¹⁷ This draft regulation also contains provisions on licensing. However, it appears that the licensing systems in the Regulation on Groundwater and in the draft regulation on water usage rights differ, although both may cover groundwater. For example, in the Regulation on Groundwater, water usage rights to utilise groundwater for basic daily needs requires a permit if the diameter of the bore is more than five centimetres, the water is not extracted by hand or the water used is more than 100 m³ per month for each family and is a central distribution point.¹¹⁸ On the other hand, the draft regulation on water usage rights states that a licence is required for basic daily needs if

103 World Bank, *Economic Impacts of Sanitation in Indonesia: A Five-country Study Conducted in Cambodia, Indonesia, Lao PDR, the Philippines, and Vietnam under the Economics of Sanitation Initiative (ESI) 32* (Jakarta: World Bank, Research Report, 2008).

104 'Air Tanah Jakarta Semakin Tercemar Bakteri E-coli' (Jakarta Groundwater Increasingly Contaminated by the E-coli Bacteria), *Tempointeraktif*, 27 February 2009, available at http://www.tempointeraktif.com/hg/layanan_publik/2009/02/27/brk,20090227-162362,id.html.

105 Article 50(3) of Government Regulation No.43/2008 on Groundwater.

106 Article 5 of Law No.7/2004.

107 Article 62(2) of Government Regulation No.43/2008 on Groundwater.

108 *Id.* Article 63(2).

109 *Id.* Article 63(3).

110 *Id.* Article 64.

111 *Id.* Article 47(1).

112 *Id.* Article 58.

113 *See* Teeuwen, note 92 above at 20.

114 Article 69 of Government Regulation No.43/2008 on Groundwater.

115 *Id.* Articles 83-84.

116 *See* Teeuwen, note 92 above at 15.

117 *See* Draft Regulation on Water Usage Rights, 10 June 2008.

118 Article 55 of Government Regulation No.43/2008 on Groundwater.

the manner water is used changes the natural condition of water sources, if the water is used in large amounts (it is unclear what this means), or if it is used for community farming outside the existing irrigation system.¹¹⁹

Where no licence is required under the draft regulation on water usage rights, such rights are realised through a water allocation certificate, published on the basis of an inventory of population number, estimated water needs to fulfil basic daily needs and estimates of water needs for community farming in pre-existing systems.¹²⁰ The certificate is intended to guarantee the right of the certificate holder to manage the water resource.¹²¹ It is doubtful that households considered to be illegally occupying the land will be issued with such a certificate and therefore they will have no guarantee of free groundwater for personal daily use under the draft regulation. The Regulation on Groundwater makes no provision for such certification.

Another area in which the two regulations differ although both can apply to groundwater, is in relation to the priority of water use. While the draft regulation on water use rights prioritises water use to fulfil daily basic needs, prioritisation between other uses of water is absent. The Regulation on Groundwater clearly sets out the priority of water use.

Finally, an important point of difference between the two regulations is the need for efficient groundwater use. While the Regulation on Groundwater clearly recognises the need for efficient use of groundwater (both shallow and deep),¹²² the draft regulation on water usage rights does not contain any such obligations where groundwater is used for fulfilling daily basic needs or for community based agriculture. Obligations regarding water use are only imposed on those holding a licence, which neither of the users of groundwater for daily basic needs or for community agriculture are required to have. However, Law No.7/2004, on which this draft regulation is based, has an overarching requirement for efficient groundwater use.

Under the draft regulation, holders of water usage rights are obliged to give the local community access to the water resources over which they hold rights, for the purpose of fulfilling the community's basic daily needs.¹²³ In this respect it is important the local community is obliged to use the water efficiently so as to avoid any conflict over water usage.

5.2 Public awareness campaigns

In addition to the regulatory reform outlined above, the Jakarta administration has begun a public awareness campaign regarding the importance of groundwater in the form of television advertising addressing groundwater conservation.¹²⁴ The slogan of the campaign is 'selamatkan air tanah untuk tanah air' (save groundwater for the sake of our nation).¹²⁵ The Jakarta Mining Agency is also promoting the 5R Programme (reduce, reuse, recycle, recharge and recover) to industries and companies, which is aimed at conserving groundwater.¹²⁶

In this regard, the government has also introduced a requirement that homeowners and commercial building owners build facilities to store rainwater and to channel it underground. This may be either in the form of rainwater run-off pools, catchment basins or biopore cylinders.¹²⁷

119 Article 8(1) and (2) of the Draft Regulation on Water Usage Rights.

120 *Id.* Article 20 (1) and (2).

121 *Id.* Article 20(6).

122 *See* Articles 41 and 42 of Government Regulation No.43/2008 on Groundwater.

123 *See* Article 35 of the Draft Regulation on Water Usage Rights.

124 The advertisements observed were shown on TvOne in October 2008.

125 The Sub-Commission Guidelines state that 'States should adopt measures to prevent over-consumption and promote efficient water use, such as public education, dissemination of appropriate conservation technologies, and, as necessary, restrictions on water use beyond an acceptable consumption threshold, including through the imposition of charges'. *See* United Nations Sub-Commission on the Promotion and Protection of Human Rights, note 73 above, Section 4.2.

126 Anonymous, '1,000 Firms Fined for Overusing Groundwater', *Jakarta Post*, 12 December 2008, available at <http://www.thejakartapost.com/news/2008/12/12/1000-firms-fined-overusing-groundwater.html>.

127 'Biopores are tunnels bored into the soil that enable organisms to become more active and plants to take root more easily. Such processes create hollow spaces inside the soil that are filled with air, and these air-filled spaces function as channels to absorb water more readily'. Biopores allow the soil to absorb water and minimise the possibility of water inundating soil's surface. This in turn reduces flooding since the water is directly absorbed into the soil. *See* Anonymous, 'Biopore Infiltration Holes: A Flood Prevention Method', *Jakarta Post*, 26 June 2008, available at <http://www.nowpublic.com/environment/biopore-infiltration-holes-flood-prevention-method-0>.

It is intended that the facilities will prevent repeat flooding, water scarcity and will recharge groundwater in the event of drought.¹²⁸ The target in regard to biopore cylinders for 2009 is to create five million in five municipalities across Jakarta.¹²⁹ However, it is unclear how this will be implemented in practice given the high population density of Jakarta. It is also unclear how its implementation will be supervised given Jakarta's official population is around 8.5 million residents¹³⁰ and a biopore cylinder unit can be as small as ten centimetres in diameter for a house on land measuring up to 21 square metres. The cost may also be prohibitive for many low income residents, with a house on land this size requiring at least three cylinders at a cost of over half a month's official minimum wage.

5.3 The need for adequate surface water

While regulatory reform and public awareness campaigns are important steps in addressing excessive groundwater depletion, as mentioned above, the strategy must also include providing a reliable, commercially viable alternative water source to groundwater to the big extractors. The best way to do this is to improve the piped water supply network, both in regard to the raw water supplied to the network and the capacity of the network to treat and distribute the water efficiently and effectively.

5.3.1 Quality of raw water supplied to the network

In regard to the first factor, namely the quality of raw water supplied to the network, 80 per cent of Jakarta's water supply comes from the Citarum River Basin in West Java and flows through the West Tarum Canal, a

68 kilometre long canal that was opened in 1968. The Citarum River was named one of the most highly polluted rivers in Indonesia in a 2007 study by the Indonesian Department for the Environment. It has a biochemical oxygen demand (BOD) of 155.¹³¹ The Asian Development Bank has even called the Citarum River the world's dirtiest river.¹³² It is polluted by industrial waste, household waste and garbage from the settlements along its banks, agricultural waste and silt from increasing erosion and landslides in the river basin area. As a result, the quality of the raw water treated by the private piped water companies is poor and requires extensive treatment, the subsequent effect of which is that piped water often has a strong smell of chlorine and other chemicals and does not run clear. Many households and businesses do not want to use the piped water as it smells and is discoloured.¹³³

In an effort to address this problem, in December 2008, the Indonesian government and the Asian Development Bank signed a USD 500 million loan for the Integrated Citarum Water Resources Management Investment Program (ICWRMIP). Through the ICWRMIP, the Bank will support the rehabilitation of the West Tarum Canal. The main objective of the rehabilitation work is to improve the flow and quality of water that supplies Jakarta,¹³⁴

128 Adiando P. Simamora, 'Households May Have to Store Rainwater', *Jakarta Post*, 9 February 2009, available at <http://www.thejakartapost.com/news/2009/02/09/households-may-have-store-rainwater.html>.

129 Triwik Kurniasari, 'City Aims to Build 5m Biopores this Year', *Jakarta Post*, 1 April 2009, available at <http://www.thejakartapost.com/news/2009/04/01/city-aims-build-5m-biopores-year.html>. Jakarta currently has only 335,590 biopores, far below the recommended 76 million.

130 Dinas Kependudukan dan Catatan Sipil (Population and Civil Registry Office), December 2008, available at http://www.kependudukancapil.go.id/index.php?Itemid=63&id=4&option=com_content&view=article.

131 BOD is the total oxygen required by micro-organisms to decompose organic substances in sewerage. See Adiando P. Simamora, 'Most Rivers Face Severe Pollution, Study Finds', *Jakarta Post*, 2 December 2008, available at <http://www.thejakartapost.com/news/2008/12/02/most-rivers-face-severe-pollution-study-finds.html>. Moderately polluted rivers may have a BOD value in the range of two to eight mg/L.

132 Anonymous, 'ADB Lends \$500 mln to Clean Up Dirtiest River', *Jakarta Post*, 5 December 2008, available at <http://www.thejakartapost.com/news/2008/12/05/adb-lends-500-mln-clean-dirtiest-river.html>.

133 In an interview with a taxi driver in October 2008, the driver commented that his wife did not want to use piped water as it had been treated with chemicals which 'could not be good for you'. It could also be seen in a comment by a resident of the Semanan subdistrict in West Jakarta that '[groundwater] is much better than the pricey tap water which has been mixed with chemical substances'. See Bambang Nurbianto, 'Poor People Pay More for Water', *Jakarta Post*, 11 July 2005, available at <http://westjavawater.blogspot.com/2005/07/poor-people-pay-more-for-water.html>.

134 The project is to supply water to 200,000 more households in Jakarta, as it will ultimately increase Jakarta's water supply by 2.5 per cent annually. See Anonymous, note 132 above.

in addition to supplying the water requirements of industrial establishments and about 52,800 hectares of farmland.¹³⁵ At present the Canal operates at 70 per cent capacity only and leakage from the Canal is more than ten cubic metres per second.¹³⁶ However, the ICWRMIP is not without controversy. It is feared that the rehabilitation of the Canal will result in at least 872 households being evicted from the Citarum River Basin without an appropriate resettlement plan.¹³⁷ The families will not be compensated for lost land as the land is considered 'State land'.¹³⁸ The rehabilitation project may also cause temporary problems for Jakarta's piped water supply as canal dredging will disperse bottom sediments.

5.3.2 Capacity of the network to treat and distribute water

In regard to the second factor, namely the capacity of the network to treat and distribute the water efficiently and effectively, the government has only recently begun to publicly acknowledge the connection between a poor water distribution network and excessive groundwater use.¹³⁹ Limited initiatives have been introduced in this respect, all of which are short term and not directed at sustainable improvements to the piped water network. The initiatives are directed towards increasing groundwater fees, closing wells and bores and compliance issues.

The Jakarta administration plans to increase current groundwater fees by up to sixteen times their current rate in an effort to balance the prices set by the piped

water network providers, and to reduce groundwater consumption and land subsidence.¹⁴⁰ Fees for groundwater have always been far below those for piped water, for example, piped water ranges from Rp.1,050 to Rp.12,550 per cubic metre, whereas groundwater is only Rp.525 per cubic metre for luxury homes and up to Rp.3,300 for industry.¹⁴¹ Groundwater that does not require a licence and that is used for basic daily needs is free. The proposed new fees for groundwater would be on par or higher than piped water, ranging from Rp.8,800 (luxury homes) to Rp.23,000 (industry) per cubic metre. The government has stated that the components for the proposed new fees are based on costs such as replacing the groundwater taken, with the remainder being environmental compensation costs.¹⁴² These components will ideally increase awareness of the real value of groundwater as well as the need for its efficient and sustainable use. However, there is no indication that the increased revenue from groundwater will be ring-fenced and utilised to promote the sustainable use of groundwater in practice. Rather it is likely that the additional money will be used for general purposes as part of the wider government budget.

The Jakarta government has also begun to actively implement the requirement in the contracts with the private operators that it assist in closing deep wells where piped water is available.¹⁴³ Recently, commercial jeans-laundry plants were given a deadline of early December 2008 to use tap water instead of groundwater, and if they failed to do so, they were to be either relocated or shutdown. Local residents had previously complained that the laundries caused water shortages because of their excessive use of groundwater.¹⁴⁴ In March 2009, the wells of five companies were shut off, with the

135 Directorate General of Water Resources, Indonesia: Integrated Citarum Water Resources Management Investment Program (Resettlement Plan, Document Stage: Draft for Consultation, Project Number: 37049-01-03, ii, 6-7, August 2008).

136 Directorate General of Water Resources, Public Information Booklet: Integrated Citarum Water Resources Management Investment Program, available at http://www.adb.org/Documents/Resettlement_Plans/INO/37049/37049-06-INO-RP.pdf. [hereafter Public Information Booklet].

137 Yuli Tri Suwarni, 'ADB Urged to Withdraw Investment in Citarum', *Jakarta Post*, 5 December 2008, available at <http://www.thejakartapost.com/news/2008/12/05/adb-urged-withdraw-investment-citarum.html>.

138 See Directorate General of Water Resources, note 136 above.

139 Triwik Kurniasari, 'City to Propose Draft on New Groundwater Tariff', *Jakarta Post*, 4 March 2009, available at <http://www.thejakartapost.com/news/2009/03/04/city-propose-draft-new-groundwater-tariff.html>.

140 Fery Firmansyah, 'Tarif Air Tanah Jakarta Akan Dinaikkan' ('Groundwater Tariffs will be Raised'), *Tempointeraktif*, 27 February 2009, available at http://www.tempointeraktif.com/hg/tata_kota/2009/02/27/brk,20090227-162358,id.html.

141 Peraturan Gubernur No.4554/1999 (Regulation of the Governor No.4554/1999).

142 Fery Firmansyah, note 141 above.

143 Articles 9.2(b) and 12 of the Contracts.

144 Anonymous, 'Laundries Behind Time to Install Tap Water, Waste Disposal Systems', *Jakarta Post*, 26 November 2008, available at <http://www.thejakartapost.com/news/2008/11/26/laundries-behind-time-install-tap-water-waste-disposal-systems.html> and Anonymous, 'Most Laundries Get Tap Water Installed', *Jakarta Post*, 27 November 2008, available at <http://www.thejakartapost.com/news/2008/11/27/most-laundries-get-tap-water-installed.html>.

government intending to close the wells of 48 companies in total.¹⁴⁵

The government also plans to limit the amount of groundwater that can be extracted to 100 cubic metres a day.¹⁴⁶ Penalties for those who misuse groundwater will also be increased, with fines of up to Rp.1 billion (USD 109,000) and gaol terms of more than six years.¹⁴⁷ Previously many managers of tall buildings exceeded their quota because the fine was less than the tariff for piped water.¹⁴⁸ However, by mid December 2008, 1,000 companies in Jakarta were facing over Rp.5 billion (USD 545,000) in fines for the misuse of groundwater. Some company representatives have complained about the fines, stating that they have to use groundwater because the piped water network fails to meet their needs.¹⁴⁹

The Department of Energy and Mineral Resources has also asked the two water operators to increase their water supply. Palyja, which operates in the western side of Jakarta, has installed booster pumps to serve groundwater and tap water subscribers in the Mega Kuningan business district in South Jakarta, increasing the water supply from Palyja from 30 litres per second to 50 litres per second.¹⁵⁰ Data indicates that there are

fifteen groundwater users extracting 50,697 cubic meters per month (or 19.6 litres per second) of groundwater from 24 deep wells in the area. The groundwater users are all Palyja customers.¹⁵¹

6 CONCLUSION

Piped water supply in Jakarta is characterised by poor levels of access and quality. Reliability, limited coverage of the piped network, the low cost of groundwater, and water quality are important factors in determining consumer preference for groundwater.¹⁵² This preference for groundwater has led to excessive groundwater use and theft, which is causing significant land subsidence, pollution and salinisation of aquifers and increased levels of flooding. The impact is so severe, the World Bank is predicting much of Jakarta will be inundated by seawater in 2025, rendering at least one third of the city uninhabitable and displacing millions of people.

In its effort to address this impending disaster, the government has taken the important step of revising its water management legislation so that it now adopts a holistic approach to water management, emphasises the need for efficient water use and recognises, although in a general sense, that water has a social, cultural, environmental and economic function and value. All these are positive developments. The government has also begun a public awareness campaign regarding the importance of groundwater.

However, reduction of groundwater use is generally judged to require an increased quantity and improved quality of piped water supply from surface water.¹⁵³ As discussed above, Jakarta's piped water system suffers numerous problems, including low service coverage, high water losses, low water quality and poor reliability. The

145 'West Jakarta Closes Deep Wells to Conserve Groundwater', *Jakarta Post*, 17 March 2009, available at <http://www.thejakartapost.com/news/2009/03/17/west-jakarta-closes-deep-wells-serve-groundwater.html>.

146 *Berlembihan, Eksploitasi Air Tanah di Jakarta* (Excessive, Groundwater Exploitation in Jakarta) Suara Pembaruan, 18 November 2008.

147 'Govt Told to Monitor Groundwater Exploitation', *Jakarta Post*, 1 July 2008, available at <http://www.thejakartapost.com/news/2008/07/01/govt-told-monitor-groundwater-exploitation.html>.

148 'Pidana Bagi Penyedot Berlembihan' ('Criminal Sanctions for Excessive Extractors'), *Kompas*, 17 April 2008, available at <http://asosiasi.org/tbk/2008/10/pidana-bagi-penyedot-berlembihan/>.

149 '1,000 Firms Fined for Overusing Groundwater', *Jakarta Post*, 12 December 2008, available at <http://www.thejakartapost.com/news/2008/12/12/1000-firms-fined-overusing-groundwater.html>.

150 The head of the groundwater and mineral management sub-agency Dian Wiwekowi, quoted in Adamrah, note 22 above. Aetra is planning to install a new booster pump in Cilincing, North Jakarta and to upgrade their booster pumps in Sungai Bambu and Sumur Batu in North and Central Jakarta in early 2009. See 'Water Quality Tops Complaints in Consumer Survey', *Jakarta Post*, 22 December 2008, available at <http://www.thejakartapost.com/news/2008/12/22/water-quality-tops-complaints-consumer-survey.html>.

151 See Adamrah, note 22 above.

152 Yusman Syaukat and G.C. Fox, 'Conjunctive Surface and Ground Water Management in the Jakarta Region, Indonesia', 40(1) *Journal of the American Water Resources Association* 241 (2004).

153 *Id.* at 242.

government has embarked on an ambitious long term plan to improve the quality of raw water supplied to the piped water network, but is yet to develop long term policies for improvement of the network itself. The question therefore remains, has the government done enough and will it implement its commitment to sustainable groundwater use, or will groundwater use continue unabated making Jakarta the next lost city of Atlantis?

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