

# PERSPECTIVE

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## **Drought, Pollution and Johor's Growing Water Needs**

*Jackson Ewing and Karissa Domondon\**

### **EXECUTIVE SUMMARY**

- Singapore has depended on water imports from neighbouring catchments in Johor, Malaysia since its founding. Despite long-standing cooperation, economic, environmental, and political forces are destabilizing cross-strait water flows.
- Johor has historically been water-abundant, but increased water consumption from economic development and population growth in combination with water stresses from drought and pollution have reduced its dry season water catchments.
- Johor has taken recent far-reaching measures including requesting additional water supply from Singapore, rationing supply to residential and commercial users, and requesting RM660 million in federal support for construction of a new dam at Sungai Ulu Sedili.
- There appears to be bilateral support for continuing the Singapore-Malaysia water trade. However, water stress in Johor risks undermining the bedrock of the relationship, and creates the need for redoubled regulatory diligence and clear-minded diplomacy by authorities in Johor, Singapore, and Kuala Lumpur.

*\*Jackson Ewing is Director of Asian Sustainability and Karissa Domondon is an Intern at the Asia Society Policy Institute, Asia Society. A more comprehensive study of the subject is included in the recent ISEAS book *The SIJORI Cross-Border Region. Transnational Politics, Economics and Culture*. Edited by Francis E. Hutchinson and Terence Chong (2016).*

## THE SINGAPORE-MALAYSIA WATER RELATIONSHIP

Since its founding, Singapore has depended on water imports from neighbouring catchments in Johor, Malaysia through agreements reached in 1961 and 1962. Over time, Singapore improved its domestic catchment management, created more efficient water use systems, and brought desalination capacity online. Johor has meanwhile transformed into a bustling hub second in many ways only to Malaysia's capital region. These developments have created a new water calculus between Singapore and Malaysia.

Since early 2015, drought, pollution, and large discharges to combat salinity depleted water levels in Johor River dams to historic lows, forcing Johor to seek additional potable water supply from Singapore on three occasions in 2015 and 2016 and impose water rations for 85,000 residents and industrial users in April 2016 ("Malaysian states ration water as dry spell persists", 2016). This shock to the system is spurring a reevaluation of cross-border water relations, and reveals Johor's vulnerability to the resource impacts of its own development and the changing climate.

This paper reviews the history of the Singapore-Malaysia water partnership, explores the nascent drivers impacting it, and concludes with thoughts on its future.

The status quo ties directly to the initial treaties. The 1961 agreement gave Singapore drawing rights of up to 391 million litres per day (mld) until 2011 from the Tebrau and Skudai Rivers in Johor. The 1962 agreement allows Singapore to draw up to 1,136 mld from the Johor River until 2060 through the Linggiu Reservoir and the Johor River Water Works (JRWW).<sup>1</sup> Singapore is to pay RM0.03 for every 1,000 gallons of water supplied under the two agreements.

The Linggiu Reservoir and the JRWW are located near Kota Tinggi in eastern Johor and are managed by Singapore's Public Utilities Board (PUB). The reservoir was created by building a dam across a tributary of the Johor River, as agreed under a supplementary agreement signed in 1990, and has been in operation since 25 January 1995 (PM Lee visits, 2012). Raw water drawn from the reservoir is channelled to the three water treatment plants that make up the JRWW. Together, these plants provide a total output of 1,136 mld of water as stipulated under the 1962 agreement, and the treated water is then supplied to Singapore via pipelines (A-Controls&i, 2011).

Despite this longstanding functional cooperation, water has been at times a major irritant in relations between the two countries, with Malaysia arguing that the treaties favour Singapore (Caballero-Anthony and Hangzo, 2012). Malaysia has made veiled threats that it might cut off the supply of water or repudiate the water agreements when relations became strained along other fronts. This rhetoric and the asymmetrically dependent relationship caused Singapore to become increasingly concerned about its water supply, and influenced the island-state's security and foreign policy strategies for decades (Long, 2001).

One response that began in earnest during the 1970s was Singapore's multipronged effort toward water diversification. The country invested significantly in technologies and systems for converting wastewater and seawater into usable forms and improving catchment storage. The results are striking: treated wastewater (NEWater) now accounts for 30 per cent of Singapore's total freshwater needs and desalinated water 10 per cent; and Singapore's water catchment area has increased to two-thirds of the country's land surface (from 11 per cent in 1970) (PUB (a), 2013). Each of these domestic sources continues to grow, and as a result Singapore has been able to reduce its reliance on Malaysian imports (PUB (a), 2013). Today, roughly 40 per cent of Singapore's water needs are met by water from Malaysia, compared to 80 per cent at the time of independence in 1965 (Neel Chowdhury, 2009). Significantly, when the 1961 agreement expired on 31 August 2011, Singapore decided against its renewal and has handed over two water treatment plants in Skudai and Gunung Pulai and two water pumps in Tebrau and Pontian to Johor (Benjamin (a), 2011).

Singapore has set a target for water self-sufficiency by 2061 (PUB (a), 2013), which is not farfetched given the current pace of technological innovations. In the intervening period, however, it will continue to depend on Johor for water.

## **JOHOR'S GROWING WATER STRESS**

As with much of Malaysia, Johor has historically been water-abundant and receives an average annual rainfall of 1,778mm per year (GWP, 2008).<sup>2</sup> Water usage in the state is expanding substantially however and, when coinciding with drought, has led to serious shortages.

Johor is Malaysia's second-most populous state after Selangor with a population of 3.55 million in 2015 and is transitioning to an international industrial hub (Department of Statistics, 2016). The state has traditionally been a major producer of agricultural commodities, including palm oil – where it has the highest growth rate in Peninsular Malaysia (MPOB, 2011) – as well as rubber, pineapples, coconuts, cocoa and coffee (Hutchinson, 2012).

This agricultural base is being outstripped by growth alongside its border with Singapore. The Iskandar Development Region (now named Iskandar Malaysia) was launched in Johor in November 2006 as a special zone covering 2,217 sq km, roughly three times the size of Singapore. The zone focuses on industrial and service sectors and seeks to capitalise on its synergies with Singapore to create an integrated economic hub. Between 2006 and 2013, it registered cumulative committed investments totalling RM111.37 billion, of which 40.2 per cent has been realised (“Iskandar Malaysia hits”, 2013).

Johor's population is projected to grow to as much as 5 million in 2030, and water demand is projected to nearly double during this same period (MNRE, 2011). Meeting this growing water demand is expected to strain Johor's export commitments to Singapore (“Johor charges inconsistent”, 2009).

Pollution creates further problems. Discharge from sewage treatment plants, agro-based factories, livestock farming, estate agriculture and domestic sewage, much of which is linked to the state's primary sources of economic revenue, all impact the waters of Johor. In 2008, 14 out of 21 rivers in the Iskandar Malaysia zone had moderate pollution levels while 5 rivers (Pandan, Plentong, Sebulung, Sengkuang and Tampoi) in the Tebrau catchment exhibited more serious pollution (Mohamed, 2011). One river in the Pasir Gudang catchment experienced severe pollution caused by industrial and development activities (Mohamed, 2011). As pollution has worsened the cost of water treatment has gone up, and industrial and transportation growth in bustling southern Johor are further exacerbating these threats.

Resultant dry season water stresses are becoming progressively apparent. Malaysia receives the bulk of its rainfall between December and March, and 97 per cent of the country's needs are met by rain-fed surface water (World Bank, 2013; FAO, 2013). Johor is no exception, and in 2010 more than 500,000 people in the districts of Batu Pahat and Kluang were subjected to water supply for only 12 hours a day or 24 hours of alternating water supply (Benjamin (b), 2010). The state government also undertook cloud seeding around water catchment areas and dams in an effort to increase water levels (Benjamin (b), 2010), seemingly to little avail.

The dry conditions of 2015-2016 have revealed still greater threats to Johor's water sources. In August and September 2015 Singapore agreed to transfer over 22 mld to Johor BAKAJ (the Johor Water Regulating Body) due to low water levels at the Sungei Layang Dam and the Linggui Reservoir (PUB (b), 2015). The Linggui Reservoir, which has capacity to supply half of Singapore's daily demand, was just 31 per cent full by mid-2016, compared to 80 per cent at the start of the year (Ng Joo Hee, 2016). Singapore Minister of Environment and Water Resources Masagos Zulkifli confirmed that Singapore has asked Malaysian water authorities to top up the reservoir (Roman & Cheok, 2016).

In June and July alone, Johor BAKAJ twice requested additional supply of water from PUB Singapore, citing supply system shutdowns due to pollution in the Johor River (PUB (c), 2016). The 4 June 2016 request, involving supply of 6 million gallons per day for a month above and beyond the nearly 60 mld of treated water that is supplied by Singapore to Johor per day, was due to low water levels from dry weather at Johor's Sungai Layang dam. In July 2016, Johor BAKAJ made an urgent request for an additional supply of 22 mld of treated water, this time citing a shutdown of their supply system in Johor Bahru due to pollution in the Johor River (PUB (d), 2016).

## **POLITICS, PRICING, AND USAGE**

The lack of consumer water efficiency and conservation in Malaysia further complicates matters. Malaysia has the highest per capita water usage in Southeast Asia, with a daily water consumption of 280 litres compared to 155 litres in Singapore, 175 litres in the

Philippines and 130 litres in Indonesia (Lim Sue Goan, 2010). A key reason for this is that water in Malaysia is relatively cheap. It is typically not more than 5 per cent of disposable household income and much lower than electricity costs (“Malaysians waste”, 2010).

Johor, however, has among the highest water tariffs among Malaysian states and is unlikely to increase domestic water prices. The state may in fact go the other direction toward implementing targeted water subsidies. The ruling Barisan Nasional, for example, promised free water to those families who are registered with the MyKasih programme during the 2013 election (“GE13”, 2013). The People’s Justice Party, meanwhile, has attacked the Johor Government for the water shortages that have forced the state to seek additional supply from Singapore (“Johor PKR shocked that state needs water supply from S’pore”, 2016).

Singapore likewise appears not to be on the path toward pricing in more efficient water use. Its current target to reduce per capita consumption to 147 litres by 2020 and 140 litres by 2030 has been criticised as too modest for a country dependent on significant water imports (Biswas & Tortajada, 2015). While in many swathes of the developed world water prices are increasing to promote its sustainable use, in Singapore 2015 prices were 25.5 per cent lower in real terms compared with 2000 (Biswas & Tortajada, 2015).

Malaysian leaders have long argued that the 1961 and 1962 water agreements priced water at a level that is “too low and unrealistic” (Ramlan Said, 2003). Malaysia’s National Economic Action Council (NEAC) asked in July 2003, “[c]an any person on this earth, in this day and age, truthfully say that 3 Malaysian sen – or 1.4 Singapore cents or 0.8 US cent – is a fair price to pay for 1,000 gallons of water?” (NEAC, 2003). The central issue for Malaysia therefore is attaining price that it considers fair, and various prices have been floated, from RM0.60 to RM6.25 for every 1,000 gallons of raw water (Shahanaaz Habib, 2002).

Singapore has typically countered that the prices it pays are agreed upon mutually and are legalised under the two water agreements and the Separation Agreement of 7 August 1965. It reasons that ‘international law and the sanctity of treaties voluntarily entered into by governments are the foundation of inter-state relations’ and must be adhered to (“Singapore launches”, 2003). As a small country, and most importantly, as the less water-secure party in comparison with Malaysia, Singapore suggests that the law is its ‘only protection’ (MICA, 2003), and has argued that its very existence as an independent sovereign nation ‘depends on such agreements being honoured’ (“Singapore launches”, 2003).

Singapore has not always opposed an increase in the price of water outright. During talks between Senior Minister Lee Kuan Yew and Prime Minister Mahathir Mohamad in September 2001, for instance, Singapore made a counter-offer of RM0.45 per 1,000 gallons of water to Malaysia’s proposed RM0.60 for that same amount (Onn, 2003). The key issue for the countries is how any price revision should be realised. Malaysia and Singapore could ultimately not agree on a fair price or the appropriate methodology for discovering one, and as a result the 1960-1961 prices have remained.

Recent scarcities in Johor call into question whether the water relationship can remain on an even keel into the coming years and decades. Johor State Public Works, Rural and Regional Development committee chairman Hasni Mohammad has said that Johor will honour its 1962 agreement with Singapore, although “the selling price does not make sense, given the current environment,” adding that “several quarters” have urged the state government to stop supplying water to Singapore due to the current water shortage (“Johor to continue supplying water to Singapore despite shortage”, 2016).

## **THE FUTURE OF CROSS-STRAIT WATER RELATIONS**

Despite these problems, there does appear to be bilateral support for making the Singapore-Malaysia water relationship work. Most notably, a February 2013 agreement between Prime Ministers Lee Hsien Loong and Najib Tun Abdul Razak to honour the terms of the 1962 water agreement and implement the ‘necessary measures to ensure reliable water supply from the Johor River’ (MFA, 2013) bodes well for the future of cross-strait water trade.

Both Malaysia and Singapore have also flagged large-scale capital investments into their water systems to improve efficiency and expand treatment and desalination capacity. Malaysia announced that RM13 billion worth of investment in water distribution systems is required to reduce the share of non-revenue water to 25 per cent by 2020 (Kamarul Anwar, 2016), while Johor has asked for an allocation of RM660 million under the 11th Malaysia Plan to build a new dam at Sungai Ulu Sedili. The Singapore PUB has called a tender for the construction of a fourth desalination plant anticipated to be completed by 2019 that will add 30 million gallons of water a day to Singapore’s water supply (PUB (e), 2016).

But current realities in Johor may overwhelm Singapore’s longstanding arguments based on the sanctity of treaties. Drought conditions – likely to become more pronounced with the changing climate – converged in 2015-2016 with increased water usage and pollution in Johor to challenge the foundation of the bilateral water partnership. The domestic political considerations and diplomatic underpinnings of water pricing in this cross border region were already tenuous, and growing water stresses may well make them more so.

Responding to this situation will require regulatory diligence and clear-minded diplomacy by authorities in Johor and Singapore as well as in Kuala Lumpur. Specifically, it is in Singapore’s interest to continue its collaboration with Malaysia on Johor’s catchment management given its dependence and considerable experience in the sector. Singapore diversifying imports to include sources from Riau, Indonesia is also not beyond imagination, but has been made less likely by the island’s progress in its domestic water sector. Regardless of the specific mechanisms used, it is important that such resource protection and management efforts do not fall victim to the rush for economic growth. If this occurs, such growth might undermine the very cross-border relations that it calls upon and attempts to strengthen.

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<sup>1</sup> The amounts have been converted based on 1 imperial (UK) gallon = 4.546 litres. The amount specified in the 1961 agreement is 86 million gallons per day (mgd). The 1962 agreement specifies 250 mgd.

<sup>2</sup> Johor has 10 major river basins: Sg. Kesang, Sg. Muar, Sg. Batu Pahat, Sg. Benut, Sg. Pontian, Sg. Pulai, Sg. Johor, Sg. Sedili Besar, Sg. Mersing and Sg. Endau.