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The political economy of water demand and supply, within and between countries, is increasingly becoming an absorbing subject matter amongst academics, policymakers, and the general public. Dr. Lee Poh Onn has undertaken an objective study of the current water negotiations between Singapore and Malaysia by providing a background paper that seeks to provide a better understanding of the issue.

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# The Water Issue Between Singapore and Malaysia: No Solution In Sight?<sup>1</sup>

## 1.0 Introduction and Outline

Singapore has been depending on Malaysia for nearly forty percent or more of its water supply. The importance of water to the Republic, economically and otherwise, cannot be questioned, and the historical and present role of Malaysia in assuaging this aspect of Singapore's vulnerability has been nothing less than crucial until recent years.

The issue of supplying water to Singapore has, at times, been brought to the forefront of the Malaysian and Singapore political arena. This can be traced to as early as 1965, the year when Singapore was separated from Malaysia. Since then, Singapore has sometimes been the target of resentment, or a political “whipping boy” from segments of the Malaysian polity (ruling and opposition members) and some of its constituents, especially when bilateral relations between these countries have become strained. This was sometimes brought about due to a perception of Singapore’s inadequate consideration of ethnic and religious sensitivities in Malaysia, sentiments arising from the widening disparity of affluence due to Singapore’s “uncaring” economic competition, “violations” into the territorial airspace of Malaysia, and views expressed by politicians from both sides of the causeway.<sup>2</sup> The threat of cutting water supplies would often accompany such disagreements and tensions (Kog, 2001; Long, 2001; Tan, 1997, 2001). This stormy relationship is best summarised by Long (2001: 505-506):

The penchant for Malaysian leaders to periodically exploit the asymmetrically dependent relationship, by threatening to terminate the water supply, to express unhappiness over policies pursued by Singapore, to influence governmental decisions in the city-state or for domestic political purposes has generated concerns that Singapore-Malaysia relations may quickly deteriorate, with potentially violent outcomes.

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<sup>2</sup> See Long (2002) and Tan (2001) for a more detailed discussion of some of the bilateral issues that have given rise to tiffs between neighbouring Singapore and Malaysia.

Beneath the surface of cordiality and commonality, specific tensions have existed.<sup>3</sup> Hostilities have erupted over the visit of the Israeli President, Chaim Herzog, to Singapore in 1986; the prevailing dispute over the ownership of the Pedra Banca Island (*Pulau Batu Puteh*) which became especially heated from 1989 to 1995; over-the-counter trading of Malaysian shares up to 1998 on CLOB International, after Malaysian shares have been officially delisted from the then Stock Exchange of Singapore; the view held by the Malaysian authorities that interest rates were raised by the Monetary Authority of Singapore (and not by the initiative of the various private banks) to attract funds badly needed by Malaysia during the financial crisis in 1998; and the airspace infringements by Singapore aircraft into Malaysia in 2000 (Business Times, 1 June 1998; Huxley, 2000; Long, 2002; Tan, 2001). Recently, differences over the proposed construction of a bridge to replace the Causeway, and reclamation of land by Singapore in the Tebrau Straits have also been further points of dispute (The Straits Times, 12 March 2002; 3 July 2002a).

Singapore's present dependence on water, real and perceived, has, however, led to a host of studies dealing with the vulnerabilities of the Republic; the threat of military repercussions is often touted as a possible outcome (Huxley, 2000; Kog, 2001; Lim, 2002; Tan, 1997, 2001). Military repercussions cannot be ruled out in the event of a sudden disruption of water supplies from Malaysia, but this threatening situation may be overexaggerated. It is important to note that the Malaysian government has never gone to the extent of actually cutting off water supplies to Singapore, in spite of the numerous political sparring which have occurred since separation in 1965. In addition, there have been repeated assurances from the Malaysian authorities that Malaysia intends to observe the 1961 and 1962 water agreements made with Singapore up to 2011 and 2061 respectively (BBC News, 6 August 2002; The Star Online, 21 October 2002; The Straits Times, 8 September 2002b, 22 October 2002). However, the remark made by the then Indonesian President Abdurrahman Wahid (Gus Dur) in November 2000, that water supplies could be easily cut off by a "Malaysian-Indonesian alliance", also points to the possibility that Indonesia could, when it becomes a supplier of water, use it as a bargaining leverage against Singapore if relations become strained.

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<sup>3</sup> Not all but some of these incidents have resulted in the threat by segments of the Malaysian populace and its polity

Water is the factor that has tipped the scale to favour Malaysia when it comes to bilateral negotiations between the two countries. But in a dynamic world, this can and will change, as Singapore becomes less dependent on Malaysia for water. Are such dynamics changing in the near future? How formidable is Singapore's water dependency problem? Is there a solution in sight? Are the costs of providing water from domestic sources unviably high? Is there any crucial aspect that needs to be considered in the current debate over bilateral issues between Singapore and Malaysia? The outline of this paper is as follows. Section two provides some background information to the water agreements which were signed in 1961 and 1962. Section three then discusses some of the more important aspects of the political dispute between Singapore and Malaysia, highlighting how the debate on pricing, the right to revise prices, and the guarantee of supplies after 2061 have created a deadlock. The economics of water is covered in section four; notably, the water demand and supply situation in Singapore from 1960 to 2000, the contention that Johor is suffering losses by supplying water to Singapore, and the alternative sources of water supply and its attendant costs. Section five discusses policy implications for Singapore and for ASEAN. Section six concludes.

This paper supports the contention that the “water threat” is less than what it seems to be (Long, 2002). However, this paper also moves beyond Long’s work, and presents, in a systematic manner, the costs of producing water from the various proposed sources, as compared to the present purchase of raw water from Johor. Through an examination of the present costs of desalination, and also of producing recycled water (NEWater), Singapore can and has actually weaned itself from a condition of extreme water dependency to one of near self-sufficiency.<sup>4</sup>

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to cut water supplies to Singapore

<sup>4</sup> The costs of realising self-sufficiency in water through domestic sourcing may exceed the costs of importing a similar amount from Malaysia or elsewhere. In such an instance, it is essential to consider the trade-off between a strategic need to be self-sufficient domestically against the economics of importing supplies albeit at a lower cost. The premium to be paid for self-sufficiency (and national sovereignty) may therefore be justifiable for Singapore from a strategic and national interest perspective, as this would give Singapore greater leeway in its future negotiations with Malaysia (or any other country from which it will be importing water in the future).

The crucial question would be the “price” or value that the Singapore Government and its citizenry attach to self-sufficiency, national sovereignty, and being placed on a more “equal footing” in its future bilateral dealings. If the premium on self-sufficiency is “x” dollars, then the price that Singapore is willing to pay for self-sufficiency would be the current price of water (say “y”) plus this premium “x”. As such, the price for self-sufficiency in water is S\$ (y + x).

Nevertheless, it is beyond the scope of this paper to determine the value of x. This could possibly be conducted by undertaking a country-wide survey to ascertain the premium that the local citizenry and industry are willing to pay for substituting water that is imported.

Back-of-the-envelope calculations will be carried out to support the contention that Singapore should source for its water requirements domestically if the price of raw water in Malaysia be increased beyond a certain level. In this respect, one note of caution needs to be upheld as these calculations merely involve utilising data culled from published sources such as monographs, journal articles, and newspaper clippings, and have not been officially verified. From such sources, it has been estimated that the present cost of producing water from desalination is around two to three times that of buying and treating raw water imported from Malaysia, with the production of NEWater costing around half that of desalinated water. Self-sufficiency would, however, only fully materialise in 2011 as the construction of desalination and water recycling plants require time and formidable capital investments and careful planning. However, even in the eventuality that the Republic becomes self-sufficient, the Singapore government has expressed the view that it would like to continue to purchase water, under fair terms, from Malaysia or, for that matter, any other country which is willing to be its long-term supplier (Long, 2001; The Business Times, 24 July 2002).

## **2.0 Background Information**

### *2.1 Institutional Framework*

Two water agreements signed between Malaysia and Singapore in 1961 and 1962 are in force up to 2011 and 2061 respectively.<sup>5</sup> The Tebrau and Scudai Water Agreement was signed in 1961, while the Johor River Water Agreement was signed in 1962.<sup>6</sup> The 1961 agreement allows Singapore to draw up to 86 million gallons of water per day (mgd) from the Pontian and Gunung Pulai Reservoirs, as well as the Tebrau and Skudai Rivers, while the 1962 agreement allows up to 250 mgd of water to be drawn from the Johor River. In total, these agreements allow Singapore to draw up to 250.4 mgd (1.55 million m<sup>3</sup> per day).

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For studies focussing on Singapore-Malaysia relations from a strategic and national perspective, see Lim (2002), Nathan (2002), and Tan (2001).

<sup>5</sup> Collectively known the Johore Water Agreements. The first was the “Agreement made on 1<sup>st</sup> September 1961 between the Government of the State of Johore and the City Council of the State of Singapore relating to the use of water from the Tebrau River and the Scudai (Skudai) River. The second was the “Agreement made on 29<sup>th</sup> September 1962 between the Government of the State of Johore and the City Council of the State of Singapore relating to the use of water from the Johore River.

<sup>6</sup> Both Agreements were confirmed and guaranteed by the governments of Singapore and Malaysia as part of the 1965 Separation Agreement, and lodged with the United Nations.

Both agreements are honoured under the 1965 Separation Act between Singapore and Malaysia, and lodged with the United Nations. Singapore pays Malaysia (the Johor Government) 3 cents (RM 0.03) for every 1000 gallons (4,546 m<sup>3</sup>) drawn from these rivers.<sup>7</sup> In turn, the Johor Government pays Singapore 50 cents (RM 0.50) for every 1000 gallons of treated water.<sup>8</sup> Both also contain a provision that allows for a review of water prices in 25 years time,<sup>9</sup> and arbitration in the event of a disagreement.<sup>10</sup> Prices can be revised in line with the purchasing power of money, labour costs, and cost of power and materials used to supply water.<sup>11</sup> Malaysia did not revise water rates in 1986 and 1987 because of financial considerations. If the Johor government raises the price of raw water, it would concurrently have to pay dearer prices for the treated water it buys from Singapore (The Straits Times, 11 April 1987).<sup>12</sup>

In June 1988, a Memorandum of Understanding on water and gas was signed between the then prime minister, Mr Lee Kuan Yew, and the Malaysian prime minister, Dr Mahathir Mohamad, which gave Singapore the right to construct more reservoirs and to draw more than what has been presently set for an additional one hundred years (The Business Times, 28 June 1988; The Straits Times, 28 Jun 1988; 29 June 1988).

### **3.0 *The Political Debate Between Singapore and Malaysia***

As noted above, the water issue is often seen as a “thorn in the flesh” in Singapore’s dealings with Malaysia. It has often been alleged that water is used as political leverage by Malaysia whenever Singapore is seen to have impinged on its interests and rights (Tan, 1997). However, whether water has or has not been used as leverage is not the focus of this section. Rather, the

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<sup>7</sup> Section 16 (i) of the 1961 and Section 13 (1) of the 1962 Agreement.

<sup>8</sup> Section 16 (ii) of the 1961 and Section 13 (2) of the 1962 Agreement.

<sup>9</sup> Section 17 of the 1961, and Section 14 of the 1962 Agreement.

<sup>10</sup> Section 17 of the 1961, and Section 17 (iii) of the 1962 Agreement.

<sup>11</sup> Section 17 of the 1961 and Section 14 of the 1962 Agreement.

<sup>12</sup> This view was expressed again by Dr Mahathir in October 2002. Dr Mahathir said that Malaysia did not revise (increase) prices 15 years ago because it was believed that Singapore would respond by increasing the price of treated water sold to Malaysia (The New Straits Times, 12 October 2002). However, there could also be other possible explanations why prices were not revised in 1986 and 1987. Recall that there were domestic issues plaguing the country in the mid 1980s like the short but severe recession, and also *Operasi Lalang* in 1987 which diverted the attention of the Federal Government towards consolidating its rule rather than focussing on an issue like the revision of water prices. See Loh (2002: 38-45) for a discussion of such issues.

main purpose here is to examine recent political developments, with the aim of drawing attention to the fundamental issues involved in the recent water negotiations throughout the whole of 2002.

Several issues are tied together with water.<sup>13</sup> They are:

- the use of Malaysian airspace by Singapore's air force,
- the withdrawal of Central Provident Funds (CPF) by West Malaysians,
- the location of Malaysia's customs, immigration and quarantine facilities,
- the development of the Malayan Railway land in Singapore,
- construction of a bridge to replace the present causeway,

In September 2001, talks between Senior Minister Lee Kuan Yew and Prime Minister Mahathir Mohamad (The Straits Times 15 September 2001, 16 September 2001), resulted in a broad agreement to resolve the above issues as a package.<sup>14</sup> The only point of disagreement during this meeting was a consensus on the pricing of raw water. Malaysia offered an increase to RM 0.60 sen/4.546m<sup>3</sup> (RM 0.60/1000 gallons), Singapore counter-offered an amount of RM 0.45/4.546 m<sup>3</sup> (RM 0.45/1000 gallons) for the same (The Far Eastern Economic Review, 20 September 2001).<sup>15</sup> This offer of RM 0.45 pricing was made in the context of the concessions that Singapore was making on the various issues included in the package.

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<sup>13</sup> See The Straits Times, 15 September 2001. Such issues have more or less been reiterated again recently in The Straits Times, 2 Nov 2002a.

<sup>14</sup> In principle, Singapore has agreed to allow Malaysia to site their customs and immigration checkpoint at Kranji, although this runs counter to international law and practice. Malaysia was also given an extra twelve plots of land in Bukit Timah in compensation for the present Malayan Railway land. Singapore has also agreed to allow West Malaysians to withdraw their CPF after they have ceased working in the Republic. Singapore acceded to Malaysia's request to build a tunnel to link a newly electrified rail service to the Kranji station in Singapore, and to construct a new bridge to replace the current causeway (The Straits Times, 15 September 2002). The tunnel proposal has however been discontinued.

<sup>15</sup> With Malaysia recently not wanting to settle the various issues as a package, Singapore has withdrawn all of the above concessions tied with water and will deal with each issue separately (ChannelNewsAsia.com, 15 October 2002; The Straits Times, 15 October 2002; 16 October 2002).

- *Recent Developments in the Political Landscape of Water Discussions between Singapore and Malaysia*

**Table 1: Chronology of Major Developments in the Water Issue between Singapore and Malaysia in 2002**

Month	Subject Matter
January	<ul style="list-style-type: none"> <li>• Dr Mahathir speaks out publicly stating that not much progress has been achieved with regards to the water issue since the September talks in 2001 (The Straits Times, 16 February 2002).</li> <li>• Malaysia would like to secure a fairer price for raw water from Singapore (The Straits Times, 28 January 2002; 1 February 2002; 2002a)</li> </ul>
February	<ul style="list-style-type: none"> <li>• The Mentri Besar of Johor, Datuk Abdul Ghani Othman, also expresses the view that a new water deal with Malaysia must be concluded as soon as possible. Johor is losing money from the current arrangement, and negotiations must be hastened (The Star Online, 2 February 2002). The Johor State Government will not participate in the new round of negotiations, but will instead leave it to the Federal Government (The New Straits Times, 2 February 2002).</li> <li>• A Singapore foreign ministry spokesperson rebuts by stating that Singapore has been waiting for Malaysia to clarify certain points in order to set the framework for talks from both sides. The Singapore government had in fact written to Malaysia on 10 December 2001, but has yet to receive any response. (The Star Online, 3 February 2002, The Straits Times, 28 January 2002).</li> <li>• Singapore reiterates the September 2001 pricing structure of RM 0.45 per 1000 gallons of water, although it is legally not obliged to revise prices now (The Straits Times, 2 February 2002; 3 February 2002). Malaysia has however set an asking price of RM 0.60 per m<sup>3</sup>, subject to review every five years (The Star Online, 3 February 2002, The Straits Times, 8 July 2002).</li> <li>• The RM 0.45 offer should not be seen in isolation; it must take into account the overall package being negotiated. All in all, the actual value of such a deal exceeds RM 1.5 billion for Malaysia. The Singapore Government agrees to RM 0.60 price on two conditions. One that this price will only be charged after the expiry of the two water pacts, in 2011 and 2061 respectively; and that the five-year reviews would only be for adjustments in inflation (The Straits Times, 3 February 2002).</li> </ul>
March	<ul style="list-style-type: none"> <li>• Malaysia proposes a new water pricing formula and a higher price, although much of the details remain under wraps (The Straits Times, 12 March 2002). Singapore indicates that it will be “studying the implications and the meaning of the new formula for the price of water.” (Business Times, 12 March 2002).</li> <li>• Johor Works and Public Utilities Committee Chairman Adam Abdul Hamid alleges that Singapore is selling a “huge amount” of water to tankers or ocean liners docking at its ports, instead of using it for its domestic and industrial consumption (The New Straits Times, 21 March 2002).</li> </ul>
April	<ul style="list-style-type: none"> <li>• PM Goh rebuts the Malaysian accusation that it has been profiteering from the sale of water to ship calling at its ports. Singapore’s gross revenue was only RM 40 million instead of the RM 600 million asserted in the Malaysian press. Water sold to ships accounts for less than 1 percent of Singapore’s total demand for water (The Straits Times, 6 April 2002).</li> <li>• PM Goh also states that the 1961 and 1962 Water Agreements are confirmed and guaranteed by both Governments as part of the 1965 Separation Agreement (also known as the Independence of Singapore Agreement). It must be honoured and cannot be varied except where stated in these Agreements, or by mutual consent by both countries. Any breach of these water pacts would call into question the Separation Agreement and the existence of Singapore (The Straits Times, 6 April 2002).</li> <li>• The water issue has strained bilateral relations between Singapore and Malaysia. The longer term interests of both countries might be better enhanced if this constant thorn is removed from bilateral relations (The Straits Times, 6 April 2002a).</li> <li>• NEWater (recycled water) and desalination are seen as alternatives that would lessen Singapore’s present reliance on Malaysia (The Straits Times, 6 April 2002).</li> </ul>

	<ul style="list-style-type: none"> <li>Malaysia's Deputy Prime Minister, Datuk Abdullah Ahmad Badawi, replies by stating that Malaysia's bilateral ties with Singapore will not be affected if Singapore became less reliant on Malaysia for water (The Straits Times, 7 April 2002).</li> </ul>
May	<ul style="list-style-type: none"> <li>By 2011, Singapore will have four sources to draw water from: Reservoir Water, Johor Water, Desalination, and NEWater (The Straits Times, 24 May 2002)</li> </ul>
July	<ul style="list-style-type: none"> <li>Foreign ministers of Malaysia and Singapore (Datuk Syed Hamid Albar and Professor S Jayakumar respectively) meet in early July 2002 for a two-day meeting to discuss the package of outstanding bilateral issues including the continuation of water supply after 2061, and an consensus on pricing (The New Straits Times, 1 July 2002; The Star Online 30 June 2002; The Straits Times, 1 July 2002).</li> <li>Both ministers initially express cautious optimism that an agreement on issues could be reached in this two-day meeting (The Straits Times, 11 June 2002; 14 June 2002; 1 July 2002).</li> <li>On the second day, the Malaysian Foreign Minister, Datuk Syed Hamid Albar, requests that the issues from now on be separately discussed and resolved (The Straits Times, 3 July 2002). This representing a departure from what has been agreed by prime ministers, Dr Mahathir and Mr Goh in December 1998 (The Business Times, 18 December 1998; The Straits Times, 19 December 1998).</li> <li>Subsequently, an agreement is neither reached on the pricing of water, nor is confirmation received on a proposed deal which would allow Singapore to draw water from Malaysia for another one hundred years after the expiry of the 1962 water agreement in 2061 (The New Straits Times, 3 July 2002).</li> <li>Malaysia publicly reveals asking price of raw water. RM 0.60 per 1000 gallons to 2007, RM 3.00 from 2007 to 2011. Malaysia also signalled that it wants this revised price to be backdated to 1986 and 1987 (The Straits Times, 8 July 2002). After 2011, a possible benchmark would be the price that Hong Kong pays Guangdong for its price of water (Channel News Asia at news.yahoo.com, 24 July 2002). KL plans to give this revised schedule to Singapore when they meet in September.</li> <li>The Singapore authorities have, however, repudiated the price charged by Guangdong because Hong Kong, unlike Singapore, has not borne any of the infrastructural expenditure incurred by China. Singapore, on the other hand, has absorbed all the costs of building the infrastructure in Johor for water supply. In addition, Singapore also bears the costs of operating the dams, pipelines, plant, and equipment.</li> <li>NEWater receives wide press coverage (ChannelNewsAsia.Com, 11 July 2002; 16 July 2002; The Business Times, 26 July 2002; 2002a; The Straits Times, 12 July 2002; 13 July 2002; 17 July 2002; 23 July 2002; 30 July 2002).</li> <li>Singapore wants Malaysia to price water at a rate which is competitive to that of the production costs of NEWater (The Straits Times, 13 July 2002). More specifically, to price Malaysia's treated water sold to Singapore as a percentage of the production costs of NEWater after the expiry of the two water agreements (The Straits Times, 24 July 2002).</li> </ul>
August	<ul style="list-style-type: none"> <li>NEWater continues to receive press coverage (The New Straits Times, 15 August 2002; The Straits Times, 2 August 2002; 3 August 2002; 4 August 2002; 2002a; 12 August 2002)</li> <li>Subsequently, Singapore announces that it might allow the 2011 Water Agreement to lapse, as it is now capable of replacing water from the 1961 Agreement (The Straits Times, 4 August 2002a).</li> <li>The press then reports on the Malaysian Prime Minister's comments that Singapore need not wait for the 2011 pact to lapse, but it could end immediately (The New Straits Times, 6 August 2002; The Straits Times, 6 August 2002; 7 August 2002).</li> <li>With the focus on NEWater since July, some Malaysian politicians and segments of the Malaysian public allege that Singapore is using this as a ploy to make Malaysia accede to its demands for a lower price of raw water (The Straits Times, 11 August 2002, The New Straits Times, 15 August 2002).</li> </ul>
September	<ul style="list-style-type: none"> <li>The second round of Singapore-Malaysia talks between the Foreign Ministers of Malaysia and Singapore was from 2 to 3 September 2002.</li> <li>Malaysia formally tables its July stance, maintaining that water should be separately discussed. The Foreign Minister of Malaysia, Mr Syed Albar, feels that it has been taking too long a time to</li> </ul>

	<p>concurrently resolve several issues tied in one package (The Star Online, 3 September 2002). Furthermore, it is felt that the water pricing stalemate has been impeding a discussion of other bilateral issues (ChannelNewsAsia.Com, 3 September 2002).</p> <ul style="list-style-type: none"> <li>• Singapore, on the other hand, feels that would be very difficult to de-link the water from other issues, as each has a bearing on the other (ChannelNewsAsia.Com, 3 September 2002a).</li> <li>• A few days later, the Malaysian Prime Minister, Dr Mahathir supports Mr Syed Albar's stance that cross-linking issues has made it difficult to resolve the price of water (The New Straits Times, 6 September 2002).</li> <li>• In this round of talks, Malaysia also formally puts up the new formula for revising the price of water reported in July. Singapore states that Malaysia does not have a legal basis for reviewing prices after 1986 and 1987, but it is willing to discuss price revisions as part of the bilateral package (Ministry of Foreign Affairs Singapore, 23 July 2002; The Straits Times, 9 October 2002).</li> </ul>
October	<ul style="list-style-type: none"> <li>• In October 2002, the saga continues with Malaysia wanting to deal with water on a separate basis, and also introducing the proposal of backdating its price to 1986 and 1987 (the year when it was legally allowed to revise the prices).</li> <li>• The issue of backdating is expressed by the Malaysian Prime Minister, Dr Mahathir, a few days before the forthcoming October meeting. Dr Mahathir states that Malaysia did not revise the price of raw water upwards fifteen years ago because it believed that Singapore would counteract by increasing the price of treated water that it sold to Malaysia (The New Straits Times, 11 October 2002; 12 October 2002).</li> <li>• Singapore reiterates that it will only consider price reviews as part of a total package (The Star Online, 13 October 2002).</li> <li>• Dr Mahathir writes to Mr Goh on 7 October 2002, stating that Malaysia has decided to discontinue with the "package approach". However, when Mr Goh meets Dr Mahathir in person on 8 October during the East Asian Economic Summit, this matter is not brought up between the leaders. Mr Goh receives this letter on 10 October 2002 (The Star Online, 13 October 2002).</li> <li>• Singapore subsequently withdraws all concessions discussed in 2001 (ChannelNewsAsia.Com, 15 October 2002; The Straits Times, 15 October 2002a; 16 October 2002).</li> <li>• Arbitration, which was toyed around in September (The New Straits Times, 8 September 2002; The Straits Times, 8 September 2002a), is brought to the forefront as a means to resolving the current deadlock prior to the meeting in Johor Baru. (The Star Online, 14 October 2002, 15 October 2002; The Sunday Times, 13 October 2002; The Straits Times, 11 October, 14 October 2002, 15 October 2002).</li> <li>• Agenda drawn by Malaysian officials two days before the meeting in Johor Baru on 16 and 17 October 2002 focuses only on the issue of pricing raw water. Singapore wants two issues to be discussed: the current price of raw and treated water, and the supply of water to Singapore after the expiry of the second water pact in 2061. The Malaysian officials agree to this revised agenda during the first day of the meeting proper (ChannelNewsAsia.Com, 16 October 2002).</li> <li>• Malaysia brings up the issue that it has the legal right to review water prices after 1986 and 1987 in this October meeting. However it is not able to offer adequate validation as to how such a right could be supported from the two water agreements previously signed between the countries (Straits Times, 17 October 2002). Singapore maintains that under the 1961 and 1962 bilateral water pacts, Malaysia only has the right to review prices in 1986 and 1987. Failing to do so, this legal right could no longer be summoned in 2002.</li> <li>• In relation to the supply of water to Singapore after 2061, Malaysia states that such an agreement need not be discussed in the meeting now but two years before the lapse of the water pact in 2061. Singapore in turn states that while it is not legally bound to review the price of water now, it is willing to do so only if Malaysia is willing to reach an agreement to supply water after 2061.</li> <li>• Singapore also states that it is unrealistic for Malaysia to only seriously want to discuss the details of a new water pact two years before the second water pact expires in 2061. This is because it takes around 20 to 30 years to plan for a country's water needs (ChannelNewsAsia.Com, 18 October 2002).</li> <li>• The October meeting ends with no real progress except with each side noting the other's respective positions and paving the way for future meetings on a ministerial level.</li> </ul>

	<ul style="list-style-type: none"> <li>• In the October meeting, Singapore comes up with a price of RM 0.12/4.546 m<sup>3</sup>, if the Malaysian consumer price index is to be factored into the current price and with water pricing delinked from other bilateral matters (ChannelNewsAsia.Com, 23 October 2002a). Singapore makes it clear that this is not an offer price <i>per se</i> but rather a matter-of-fact price based on inflation. The RM 0.12/4.546 m<sup>3</sup> calculation is subsequently interpreted by Malaysia to be the new offer price from Singapore. As a reaction, Malaysia now wants a higher price, ranging from greater than RM 0.60 to RM 7.40/4.546 m<sup>3</sup> of raw water (The Straits Times, 24 October 2002).</li> <li>• The option of creating a new Act to render both water pacts null and void is considered after the October Meeting (The Straits Times, 25 October 2002; The Star Online, 25 October 2002). However, as a Straits Times columnist points out, this would violate the Vienna Convention of the Law of Treaties which states that no country can invoke internal law to justify its failure to observe a treaty – Article 27 of the Vienna Convention of the Law of Treaties (The Straits Times, 26 October 2002a).</li> </ul>
November	<ul style="list-style-type: none"> <li>• The idea of bringing up the dispute for arbitration is again brought up in early November (BBC News, 2 November 2002; Business Times 1 November 2002; 2 November 2002) with Malaysia maintaining that it still has the right to review the price of water while Singapore maintains otherwise (The Straits Times, 2 November 2002). Singapore reiterates that the price negotiations so far are not based on a legal entitlement but was rather part of the package deal negotiated between the countries (Business Times, 2 November 2002).</li> <li>• In mid-November, signs are positive in that both Singapore and Malaysia seem to making conciliatory measures and were planning to meet again in January 2003 for another round of negotiations (The New Straits Times, 17 November 2002; 2002a). There is also mention by the Foreign Minister Syed Hamid Albar that negotiations will continue until both sides reach an understanding of the issue (The Straits Times, 16 November 2002).</li> <li>• KL also wants Singapore to put aside the matter of legal rights and to discuss the water issue from a perspective of neighbourliness (The Straits Times, 18 November 2002).</li> <li>• However, this positive turn has been slightly dampened when it is reported a few days later that KL would only discuss the price of water and not a new pact to supply water after 2061 (The Straits Times, 20 November 2002; 2002a).</li> <li>• KL then states that there will be no further water talks unless Singapore agrees to a price review (ChannelNewsAsia.Com, 29 November 2002). KL is also seeking other options (The Straits Times, 30 November 2002).</li> </ul>
December	<ul style="list-style-type: none"> <li>• Malaysia decides to call off negotiations (The Straits Times, 1 December 2002).</li> <li>• However, it still remains unclear if Malaysia will be actually seeking arbitration on the water issue (The Straits Times, 3 December 2002).</li> <li>• Malaysia continues to insist that Singapore must accept its right to a review of the price of raw water before negotiations can take place in January 2003 (The Straits Times, 11 December 2002).</li> <li>• Dr Mahathir states that Malaysia will not cut the supply of water to Singapore but would only supply water to the Republic for drinking and bathing. Dr Mahathir again accuses Singapore of profiteering from the sale of water to ships (The Straits Times, 27 December 2002).</li> <li>• In addition, Dr Mahathir also states that Singapore must accept Malaysia's right for a price review. He cites the instance of SM Lee's offer of RM 0.45 in September 2001 as support for the right of price revision (The Straits Times, 27 December 2002; The Straits Times, 28 December 2002).</li> <li>• Malaysia is looking to arbitration as a means to resolve the current deadlock in water discussions (The Straits Times, 27 December 2002) as Singapore could not agree on the Malaysian price formula for water (The Straits Times, 28 December 2002). Dr Mahathir states that Malaysia would need Singapore's agreement before arbitration can take place (The Straits Times, 28 December 2002).</li> <li>• Singapore's Foreign Minister Professor S Jayakumar expresses the view that Singapore will have no option but to agree if Malaysia wants to settle the current water talks through arbitration in the Permanent Court of Arbitration at The Hague. Singapore would nevertheless prefer bilateral negotiations rather than arbitration (ChannelNewsAsia.Com, 28 December 2002a; Ministry of Foreign Affairs, 28 December 2002a; The Straits Times, 29 December 2002).</li> </ul>

	<ul style="list-style-type: none"> <li>• Professor Jayakumar also says that arbitration may help both countries to ‘clear the impasse’ over water and move on to other problems (The Straits Times, 29 December 2002).</li> <li>• On the price offer made by SM Lee in September 2001, Professor Jayakumar remarks that this was made in the context of a package deal. It does not give Malaysia the right to price revision now that the package has been called off (ChannelNewsAsia.Com, 28 December 2002a; Ministry of Foreign Affairs, 28 December 2002; The Straits Times, 29 December 2002).</li> <li>• Dr Mahathir states that Malaysia still has the right for a price review; after 25 years, not on reaching 25 years. The strain in bilateral ties is blamed on Singapore (The Straits Times, 30 December 2002; 31 December 2002).</li> <li>• Malaysia’s Foreign Minister, Mr Syed Hamid Albar informs the Malaysian media that the water issue may not be resolved through arbitration but in accordance to Malaysian laws (ChannelNewsAsia.Com, 30 December 2002; The Straits Times, 31 December 2002).</li> </ul>
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Note: See bibliography for complete details of citations in Table 1.

Tied to the early price haggling is the view by the Malaysian Government that Singapore has been paying too low a price for water. Malaysia therefore wants to revise the price of water upwards. Singapore is cognisant and accepts the Malaysian view that prices should be revised upwards. However, both countries have not been able to reach an agreement on the pricing of raw water. Malaysia would like to eventually benchmark price at the rate that Hong Kong pays Guangdong (RM 6.8 to RM 8) plus inflation, whereas Singapore would like the rate to be pegged to the cost of producing NEWater (Ministry of Foreign Affairs Singapore, 23 July 2002; The Straits Times, 24 July 2002). A change in the landscape by the introduction of NEWater has also not altered the Malaysian original stance of pegging the price to the Hong Kong-Guangdong water rates (The News Straits Times, 17 August 2002, The Straits Times, 18 August 2002). Understandably, it is not easy to set a formula to ascertain the price to be paid for raw water by Singapore, especially when it is normally considered a “free good” within a country.

Datuk Musa Hitam, former Malaysian Deputy Prime Minister, has stated that the present motivation in trying to raise the price of raw water is commercial rather than nationalistic (The Straits Times, 26 July 2002). That nationalistic, divergent political visions, and ethnic elements have prevailed in the past cannot be casually dismissed and have been discussed at length;<sup>16</sup> however, the economic basis of this statement holds at this point as the price of raw water has not increased since the onset of the original water agreement (The New Straits Times, 18 March 2002). Hence, there is a combination of economic and non-economic elements involved in the current negotiations over the price of water. Whether economic reasoning will prevail over non-

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<sup>16</sup> See Huxley, 2000; Nathan, 2002; and Sopiee, 1974 (Chap V) for a detailed discussion of such issues.

economic factors remains an important factor that will determine if the current deadlock can be resolved amiably and speedily.

What also began as a haggling exercise over the price of water as part of a bilateral package between two countries, has since October 2002 developed into a different ball game altogether, as Malaysia has unilaterally decided to decouple water negotiations from other bilateral issues. As a result, whatever in-principle benefits previously tied to the bilateral package negotiated in September 2001 is no longer considered valid by Singapore.

Instead of solely negotiating on a price agreeable to both countries, Singapore and Malaysia are now also disputing over the right to revise the price of water, given that the package approach has been unilaterally disbanded by Malaysia. In addition, Malaysia not only wants to revise the price of water in 2002, but to backdate this price to 1986 and 1987. Singapore, in turn, will only allow Malaysia to revise prices now if it agrees to continue supplying water to the Republic after 2061. Any future negotiation on the water issue has currently ended on a rather bleak note, with Malaysia now stating that it may be resorting to national laws rather than arbitration to resolve the current impasse, something which was mooted in October.

Several issues now stand out and may need to be resolved in a sequential manner:

- that of coming to an agreement by Singapore that the current price of water can be reviewed and backdated, given Malaysia's changed stance that future water negotiations are to be decoupled from other bilateral issues;
- if such an agreement cannot be reached, both countries have to start negotiations afresh by setting new terms and conditions for a another round of water negotiations, or resort to the Permanent Court of Arbitration for a resolution of the current deadlock on the right to revise the price of water and also to set a new price that is agreeable to both Malaysia and Singapore.

If fresh negotiations take place, then the following conditions should be incorporated:

- the terms and conditions for the round of new negotiations must be clearly set out right at the beginning and strictly adhered to by both countries. In particular, terms and conditions which allow for a revision of the current price of raw and treated water up to 2061 (including backdating if agreeable by both countries), and benchmarking to a yardstick that is clearly quantifiable and acceptable by both Malaysia and Singapore;
- such terms and conditions must be in full compliance to what has already been set in the Water Agreement of 1961 and 1962. Any deviation from these water pacts must be clearly set out and agreed by both countries;
- from these negotiations, a binding agreement guaranteeing future water supplies from Malaysia after 2061 should also be put in place if possible, and conditions for future renegotiations of price and supplies after 2061 must be clearly stated and enforceable;
- appointment of an international arbitrator (the Permanent Court of Arbitration at The Hague) to resolve any disagreements that may arise from this fresh round of negotiations and future negotiations.

In spite of a change in the rules of the game, the crucial issue still remains as one of agreeing on a price for water if negotiations proceed in 2003. This debate on a price acceptable to both countries which has not reached any point of consensus in 2002, would be difficult to resolve when it comes to the forefront again. Whether the whole dispute will escalate again because of a disagreement on price, or come to a close, depends more or less on political give-and-take by both sides, the political will to resolve the issue in a manner that is seen to be just and fair for both countries, and the need to see eye-to-eye on the issues being discussed in terms of structuring future negotiations and deciding on the manner in which any future disagreement is to be resolved. Given that resolving the water issue may not be one of the most important priorities of the Malaysian Government at the moment, due to the fact that Dr Mahathir will be stepping down in October 2003 and has other more pressing domestic political issues to resolve (The Straits Times, 30 October 2002), it appears that a firm resolution and agreement will only occur after the latter part of 2003, possibly in 2004 or beyond.

- *Supply of Water from Indonesia*

Due to the current stall in water negotiations, it is not surprising that Singapore has attempted to strengthen its position by looking for alternative sources of water. Indonesia has presented itself as a very viable option due to the proximity of the country to Singapore.

The idea of tapping water from Indonesia originated from the then Prime Minister Lee Kuan Yew in 1987. Subsequently, an agreement was signed between the Singapore and Indonesian governments on 28 August 1990 to facilitate cooperation on the sourcing, supply, and distribution of water to Singapore (Kog, 2001: 17).

In 1991, a more concrete Water Agreement was signed with the Indonesian government to supply 1,000 million gallons (4.546 million m<sup>3</sup> or 3.75 times the present level of Singapore's consumption) of water a day from the Province of Riau to Singapore for a hundred years. There were also plans to tap water resources from the Sungei Kampar catchment from West Sumatra (Kog, 2001: 17).

The overall costs have been estimated in the vicinity of S \$1.5 billion (Long, 2001: 515). Understandably, the pace of implementing these projects has been slow. These projects have virtually come to a standstill since the financial crisis and the attendant political instability and uncertainty in Indonesia in 1998 (Kog, 2001: 17; Long, 2001: 515).

The idea of buying water from Indonesia was again discussed in January 1999, when a gas supply agreement was sealed between SembCorp and Pertamina. This time, the chairman of the Economic Development Board, Philip Yeo was quoted as saying that Singapore is a long-term customer, and would accept deals that provide commercially attractive and stable prices for water, should Indonesia now decide to act as a supplier to the Republic (The Straits Times, 16 January 1999). It has been reported that that water supply could possibly come from Indonesia in as early as 2005 through undersea pipelines from Riau (cited in Long, 2001: 515).

With Singapore-Jakarta ties on a firmer ground under the Megawati administration, it looks

likely that water negotiations between the countries will become firmer as Singapore increasingly seeks to diversify its water sources to include supplies from Indonesia in the near future (The Jakarta Post, 21 August 2002, The Straits Times, 21 August 2002).

#### 4.0 *Economics of Water Supply*

##### 4.1 *Water Supply and Demand in Singapore*

In spite of being the country with the highest GDP per capita (column 7 of Table 2), Singapore is a country that is considered “water-stressed”, as less than 1,000 m<sup>3</sup> per person of water can be obtained from within the country (column 4 of Table 2 below). In fact, the ratio of annual per capita of internal renewable water resources in Malaysia is one hundred and twenty four times that of Singapore’s (column 4). Nevertheless, as Kog (2000: p. 11) points out, this figure does not imply a future shortage of available water, since this is affected by actual water usage and the efficiency with which water is used and reused. From table 2, the potential for Indonesia, Singapore’s other closest neighbour, to meet Singapore’s water needs is favourable as its per capita of internal renewable water resources is around seventy one times that of Singapore’s.

**Table 2: Water Resources of ASEAN Countries, GNP Per Capita, and Population**

Country	Annual Internal Renewable Resources (km <sup>3</sup> )	Annual Withdrawals (km <sup>3</sup> )	Annual Per Capita Internal Renewable Water Resources (m <sup>3</sup> )	Annual Withdrawals as Percentage of Water Resources (%)	Annual Per Capita Ground-water Withdrawals (m <sup>3</sup> )	2000 GDP Per Capita (US\$)	Population 2000 (millions)
Cambodia	88.10	0.52	8,195	1	-	274	12.2
Indonesia	2,530.00	16.59	12,251	1	-	750	203.5
Laos PDR	270.00	0.99	50,392	0	-	328	5.2
Malaysia	456.00	9.42	21,259	2	-	3,870	23.2
Myanmar	1,082.00	3.96	22,719	0	-	142	49.0
Philippines	323.00	29.50	4,479	9	82.8	981	76.3
Singapore	0.60	0.19	172	32	-	23,071	4.0
Thailand	110.00	31.90	1,845	29	15.0	1,963	62.4
Vietnam	376.00	28.90	4,827	8	-	403	77.7

Source: Kog (2000); ASEAN Statistics <<http://www.aseansec.org/13100.htm>>; ASEAN Statistical Yearbook 2001 <<http://www.aseansec.org/macroeconomic/yearbook.htm>>.

Presently, the major consumers of water in Singapore are the “domestic” and “commerce/industry sectors” (Table 3 below). Fifty three percent of total water supply was used up by the domestic sector, and forty three percent by the commerce and industrial sector. As an interesting aside, shipping only constitutes a 0.004 percent of water consumption in the Republic; thus refuting the claim by Malaysia that Singapore is profiteering by selling excessive amounts of treated water (at high prices) to vessels docking at its port. In fact, according to official sources, the reason for charging such a high price is to dissuade ships from obtaining their water supplies from Singapore. Water shortages and price hikes are therefore likely to have greater impacts on the economy and the well being of Singapore’s population.

**Table 3: Water Consumption in Singapore: 1960-2000 (Thousand m<sup>3</sup>)**

Year	Domestic	Shipping	Commerce/ Industry	Government and Statutory Boards	Total Annual Consumption
1960	40,786.9	NA	21,697.6	36,997.2	99,481.7
1970	71,024.0	2,276.9	35,718.3	43,923.6	152,942.8
1980	113,478.0	3,347.0	75,991.3	23,750.0	216,566.3
1990	177,343.3	2,914.4	113,148.6	29,391.8	322,798.1
2000	241,388.0	1,841.0	181,477.0	30,742.5	455,488.5

Source: Kog (2000) and Department of Statistics (Singapore)

Since 1965, the Water Department of the Public Utilities Board (PUB) has been enlarging Singapore’s capacity to provide its population with water. Currently, around fifty percent of Singapore’s requirements are tapped from domestic water catchment areas, while the remainder is imported from the state of Johor in Malaysia.

Around 680,000 m<sup>3</sup> of Singapore's water consumption is sourced from catchment areas around the city state. Nineteen raw water reservoirs, nine treatment works, and fourteen storage or service reservoirs in Singapore capably undertake this present task (Savage, 2001: 250). The total storage capacity of PUB reservoirs in Singapore and Johor is enough for about two years at the current level of usage (Savage, 2001: 250). In September 2002, it was reported that Singapore is also now working on increasing its domestic water catchment capabilities in two-thirds of the island to supplement present supplies from traditional reservoir catchment areas.

New areas like housing estates and other built-up areas will serve as avenues to channel rainwater into present reservoirs. Only industrial areas in Jurong and parts of the southern, eastern, and northern fringes of Singapore will be excluded (The Straits Times, 6 September 2002a). If the water stored in Johor is no longer available for any reason whatsoever, Singapore has about four months time to resolve the issue (Kog, 2000: 16-17). By 2010, Singapore's desalination programme will be able to supply 400,000 m<sup>3</sup> of water daily of its water supply.<sup>17</sup> Together with the water collected from reservoirs, and recycled water (250,000 m<sup>3</sup>), a "comfortable volume of water will have been procured indigenously ..." (Long, 2001: 518).

In July 2002, Singapore has stated that it has decided to allow the 1961 agreement to lapse when it expires in 2011. It will be acquiring that amount domestically rather than importing it from Johore. This, however, begs the question: would Singapore's population increase by 2011 create undue pressures on its future production capabilities? Several authors have provided slightly different estimates of Singapore's daily consumption of water. Educated guesses have reported that Singapore consumes between 1.2 to 1.4 million m<sup>3</sup> (264.2 to 300 million gallons) of water per day (Kog, 2002: 36; Lim, 2002: 53; Long, 2002: 131). That water consumption will not increase dramatically, can be supported by data from the Public Utilities Board which indicates that water consumption per head has, in fact, fallen in recent years: from 114 m<sup>3</sup> in 1998 to 110 m<sup>3</sup> in 2001 (Public Utilities Board Annual Report 2001). Drastic population increases are also unlikely to occur. Total fertility rates have decreased from 1.7 in 1996 to 1.4 in 2001, with Singapore's population (citizens and permanent residents) projected to hover around 3.3 million in 2010 (Saw, 1999: 229). Total population will not climb above 4.3 million by 2010, assuming that the number of foreigners remain between 800,000 to 1,000,000. Compared to the present population of around 4.1 million in 2001, this projected figure suggests that any additional pressures created on water production should be manageable in 2011.

The recent proposal to use recycled water for drinking has also been highlighted by the Singapore authorities. Known as NEWater, the process involves stringent purification and intensive treatment (microfiltration, reverse osmosis, and ultra violet treatment)

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<sup>17</sup> See The Straits Times, 10 April 2002.

(Channelnewsasia.Com, 11 July 2002).<sup>18</sup> It has also been reported that by 2011, NEWater can be produced in sufficient quantities to replace all the water that Singapore is currently purchasing from Malaysia in the 1961 agreement (Straits Times, 13 July 2002). The NEWater project began in 1988 as a joint venture between the Public Utilities Board (PUB) and the Ministry of the Environment (ENV). In 2000, the PUB began operating a prototype plant for NEWater in Bedok with an initial capacity of producing 10,000 m<sup>3</sup> of recycled water. By end 2002, the PUB will complete another plant in Kranji (Long, 2002: 122). In September 2002, it was announced that NEWater will initially be pumped to Singapore's reservoirs in February 2003 before it is piped to homes, making up to less than one percent of the total volume of water consumed daily (ChannelNewsAsia.Com, 25 September 2002; The Straits Times, 26 September 2002). By 2003, plants in Bedok and Kranji will produce around 50,000 m<sup>3</sup> per day (10.8 mgd) of NEWater. By 2011, 250,000 m<sup>3</sup> of NEWater will be produced from the Bedok, Kranji, Seletar, and, possibly, Ulu Pandan plants (The Straits Times, 26 September 2002).

By 2011, together with water from its reservoirs, desalination, and recycling plant, Singapore will no longer be in the dire straits condition that has plagued the country since time immemorial (see Table 4 below).

**Table 4: Major Sources of Water**

Total Water Requirement for Singapore		1.2 to 1.3 million m <sup>3</sup>
Domestic Reservoirs and Catchments (a)	<b>0.68 million m<sup>3</sup></b>	
Desalination (b)	<b>0.40 million m<sup>3</sup></b>	
NEWater (c)	<b>0.25 million m<sup>3</sup></b>	
Total: a+b+c		<b>1.33 million m<sup>3</sup></b>

Source: Long (2002); The Straits Times, Various Issues.

<sup>18</sup> NEWater was mentioned in as early as April 2002. For more details, please refer to The Straits Times, 6 April 2002.

#### 4.2 *The Price of Raw Water: Loss or Gain for Johor?*

Singapore buys water from Johor at RM 0.03 sen/4.546 m<sup>3</sup> (RM 0.03 sen/1000 gallons). It sells treated water to Johor at RM 0.50/4.546 m<sup>3</sup> (RM 0.50/1000 gallons), although treatment costs Singapore RM 2.40/4.546 m<sup>3</sup>. Effectively, Singapore is subsidising Johor at a rate of RM 1.90/4.546 m<sup>3</sup>. Table 5 provides the volume of water sold to Johor in selected years.

Johor presently purchases around 8.14 million m<sup>3</sup> (37 million gallons) of water from Singapore daily and sells this at RM 3.95/4.546m<sup>3</sup> to its consumers (The Straits Times, 28 January 2002).

**Table 5: Volume of Water Sold to Johor (Thousand m<sup>3</sup>)**

Year	Volume
1975	<b>21,341.70</b>
1980	<b>39,841.50</b>
1985	<b>56,735.20</b>
1990	<b>51,424.50</b>
1995	<b>65,501.30</b>
2000	<b>50,600.30</b>

Source: Department of Statistics (Singapore)

Singapore, however, is only legally obliged to sell 3.74 million m<sup>3</sup> (17 million gallons) daily to Johor although it has been providing over twice this amount to the state (excess amounting to 20 million gallons per day). Hence, Singapore has been providing a subsidy of RM 29 million to Johor by selling treated water at the rate of RM 0.50/4.546 m<sup>3</sup> (Kog, 2001: 18).

Johor is, however, reportedly suffering losses to the tune of RM 3.2 million (S \$1.5 million) per year by buying treated water from Singapore (The Straits Times, 5 February 2002a). This issue was brought up again in November (The Straits Times, 13 November 2002) by the Johor Assembly which this time alleged that Singapore has raked up around S\$ 700 million by purchasing raw water from the state over a period of forty years.

However, based on the stated costs of providing treated water in Malaysia by Long (2001), Johor has stood to gain by continuing to purchase water at the subsidised rate of RM 0.50/4.546

m<sup>3</sup> from Singapore. Long (2001: 522) cites a figure of RM 6.86 per 4.546 m<sup>3</sup> as costs if the Johor government were to process water domestically.<sup>19</sup> The Johor government therefore saves RM 6.16 per 4.546 m<sup>3</sup> of water, as it only pays Singapore RM 0.50 for an equivalent amount.

In addition, back-of-the-envelope calculations reveal that Johor derives over RM 50 million from the present arrangement of buying treated water from Singapore at RM 0.50/4.546 m<sup>3</sup> (RM 0.50/1000 gallons) and reselling at RM 3.95/4.546m<sup>3</sup> (RM 3.95/1000 gallons). Based on the calculations undertaken in Table 6, it is difficult to support the contention that Johor has been losing money by buying treated water from Singapore.<sup>20</sup>

**Table 6: Net Water Revenues Accruing to Malaysia (Johor) Annually (RM) at 2002 Prices**

Raw Water Revenues from Singapore (0.03*350 million gallons/1000)*365	<b>3.83 million (+)</b>
Payment Malaysia Makes to Singapore for Treated Water (0.5*37 million gallons/1000)*365	<b>6.75 million (-)</b>
Water Revenues Malaysia gets from Sale of Treated Water to its Local Population (3.95*37 million gallons/1000)*365	<b>53.34 million (+)</b>
<b>Net Revenues Accruing to Malaysia</b>	<b>50.42 million</b>

Source: Author's calculation

Johor has announced that it would stop buying water from Singapore in 2003 when it completes the construction of its own water treatment plant in Kota Tinggi at a cost of RM 650 million (S \$302.7 million) (The Straits Times, 2 November 2002a). This has been confirmed by the Johor Chief Minister, Mr Abdul Ghani Othman on 6 January 2003, who stated that Johor will stop buying treated water from Singapore in mid-2003 (The Straits Times, 6 January 2003). Noting this, the Malaysian Foreign Minister, Mr Syed Hamid Albar said that it was “the right thing to do”, as Johor endeavoured to become self-sufficient in water (ChannelNewsAsia.Com, 7 January 2003).

<sup>19</sup> This figure was also reported in The Straits Times, 6 January 2003.

<sup>20</sup> Table 6 is based on the amount of treated water that Singapore has supplied to Johor as reported in The Straits Times, 28 January 2002.

### 4.3 *Alternative Sources of Water and Cost Options*

In 1998, it was reported that Singapore plans to build a test desalination plant in an attempt to reduce its reliance on water from Malaysia, a joint effort between Singapore Power, AquaGen, and Singapore Technologies. The PUB was also reportedly planning to build a S \$900 million plant to begin production in 2005 (The Australian, 2 June 1999). By 1998, two sites at Tuas were identified for the construction of full fledged desalination plants (Long, 2001: 514).

In 1999, this decision to build public plants was slightly modified to involve private sector participation. Conditions laid down include building a plant capable of desalinating 140,000 m<sup>3</sup> of seawater daily. Singapore is also aiming to produce 400,000 m<sup>3</sup> of water by 2011, when the first of the two water agreements with Malaysia expires (Long 2001: 514).

Tenders were called in 2001 for a desalination plant to begin operation in 2005 (Agence France-Presse, 13 January 2001). The project has subsequently attracted six bidders (Business Asia, 28 January 2000). The lowest bid, S \$14.2 million (US \$8.45 million) came from a German engineering firm, Fichtner Asia, while the highest was just under S \$27 million, from a local company, PWD Consultants. Desalinating sea water has been estimated to cost US\$ 1.80 per m<sup>3</sup> in 1997/98 and this has fallen to US\$ 0.70 or S\$ 1.23/m<sup>3</sup> in 2000 (RM 11.70/4.546 m<sup>3</sup>) (Straits Times article cited in Long, 2001: 529 and 531). In another source, a value of S\$ 0.83/m<sup>3</sup> (RM 7.87/4.546 m<sup>3</sup>) was cited. This came from the report of a Singapore delegation which visited Tampa Bay's seawater desalination plant in mid-1999 to examine the possibility of applying the process locally (PR Newswire, 1 June 1999). There, it was reported that the price of desalinated water amounted to US \$2.08 per 1000 gallons (S\$ 3.80/1000 gallons or RM 7.87/1000 gallons).

Desalination costs in 2002 in Tampa Bay have fallen to US\$ 0.39/m<sup>3</sup> or S\$ 0.68/m<sup>3</sup> (The Straits Times, 10 April 2002). In June 2002, from the tenders submitted to the PUB in Singapore, estimated costs of processing sea water ranged from US \$0.44643 or S \$0.78126 per m<sup>3</sup> (RM 7.42/4.546 m<sup>3</sup>) to US \$0.80286 or S \$1.4050 per m<sup>3</sup> (RM 13.34/4.546 m<sup>3</sup>) (Straits Times, 1 June 2002).

***Costs of Desalination Vs Costs of Buying Raw Water (Per 1000 gallons or Per 4.546 m<sup>3</sup>):***

Computing from the June 2002 tenders submitted to the PUB, the cost of desalinating water vs. buying raw water from Malaysia would be RM 7.42/4.546 m<sup>3</sup> against RM 0.03/4.546 m<sup>3</sup>, if the lowest tender is chosen:

Desalinated Water: RM 7.42 per 1000 gallons (4.546m<sup>3</sup>)

Raw Water: RM 0.03 per 1000 gallons

***Costs of Desalination Vs Costs of Buying and Processing Raw Water (Per 1000 gallons or Per 4.546 m<sup>3</sup>):***

However, comparing such costs is not reflective of the true price of water. The costs of processing and treating raw water (RM 2.40/4.546 m<sup>3</sup>) purchased from Johor would have to be included in the overall costs.

From the above, the price of desalinated water vs. the price of treated water is RM 7.42 against RM 2.43/4.546 m<sup>3</sup>.

Desalinated Water: RM 7.42 per 1000 gallons (4.546m<sup>3</sup>)

Treated Water: RM 2.43 per 1000 gallons.

The gap is narrowing over time, with the lower range of the price of desalinated water just around three times the price of treated water in 2002. In 1997/98, the price of desalinated water was around thirteen times the price of treated water.

***Costs of NEWater Vs Costs of Buying and Processing Raw Water (Per 1000 gallons or Per 4.546 m<sup>3</sup>):***

Singapore also intends to use recycling to meet fifteen percent of its water needs by 2010 (Agence France-Presse, 13 January 2001). NEWater, which undergoes more stringent processes for human consumption, would cost around fifty to sixty percent less than desalinated water (Channelnewsasia.Com, 11 July 2002; The Straits Times, 30 July 2002). That would price

NEWater at approximately RM 3.71/4.546 m<sup>3</sup>.

NEWater: RM 3.71 per 1000 gallons (4.546m<sup>3</sup>)

Treated Water: RM 2.43 per 1000 gallons.

New methods are also in the process of being developed. Recently, the PUB has found a cheaper method to pre-treat waste water more efficiently by using membrane bio-reactor technology (membranes to sieve contaminants out), which reduces the three-stage process to remove contaminants to just one (ChannelNewsAsia.Com, 19 November 2002). Besides cutting down on the stages of processing, membrane bio-reactor technology only requires one-fifth of the physical area compared to present technology for processing water.

- *Costs of Sourcing for Water Domestically*

Table 7 provides a summary of the costs of the various options available to Singapore. Based on the above estimations, it can be seen that a wider use of NEWater would incur an increase of at least 50 per cent in terms of the present cost of water that is imported from Johor (RM 3.71 as opposed to RM 2.43).

**Table 7: Alternative Cost Options**

Option	Cost (per 4.546 m <sup>3</sup> or 1000 gallons)
Costs of Buying Raw Water from Johor and Processing	@ RM 0.03 : RM 2.43 (present) @ RM 0.60 : RM 3.00 @ RM 3.00 : RM 5.40
Costs of Desalination	RM 7.42
Costs of NEWater	RM 3.71

Note: Figures on the cost of desalination and NEWater is based on the price of the lowest tender submitted to the PUB. This was obtained from the Straits Times, 1 June 2002.

Source: ChannelNewsAsia.Com; The Straits Times, various issues; Long (2002).

The following scenarios presented in Tables 8, 9, and 10 provide the likely expenditures that Singapore will incur, under different price settings. Table 8 provides the current expenditure that Singapore incurs from purchasing water at RM 0.03 together with a treatment cost of RM 2.40. Table 9 calculates expenditure based on the scenario that Singapore continues to import water from Malaysia (at the new price of RM 6.8 in 2011), supplemented by its own reservoir and catchment supplies, with minimal supplies from NEWater and desalination plants. Table 10 provides expenditure based on Singapore sourcing its entire water supplies domestically. There are other combinations which could have been discussed, but for the sake of illustration only the scenarios in Tables 9 and 10 are considered. Based on the information and calculations provided in these tables, it is difficult to justify purchasing raw water from Malaysia at RM 6.8 to RM 8 in 2011. This is because Singapore would only incur an expenditure of RM 5,547.5 million by sourcing for water domestically as compared to expending RM 6,416 million by paying RM 6.8 for raw water from Johor (see Tables 9 and 10).

**Table 8: Current Expenditure with the Price of Raw Water at RM 0.03 per 1000 gallons (2002 Prices)**

Sources of Water	Volume (million m <sup>3</sup> )	Cost (RM million)
Water from Malaysia	<b>0.52</b>	<b>1,264 [0.52*(2.4+0.03)]</b>
Domestic Supplies (Water from Reservoirs and Catchments)	<b>0.68</b>	<b>1,632 (0.68*2.4)</b>
Total Costs		<b>2,896</b>

Note: Price of raw water plus treatment cost in the case of water from Malaysia is RM 2.43. For domestic supplies, it is assumed that water is a free product, hence the RM 2.40 which is just the treatment cost.

Source: See Table 7.

**Table 9: Year 2011 Expenditure with the Price of Raw Water at RM 6.80 per 1000 gallons (2002 Prices)**

Sources of Water	Volume (million m <sup>3</sup> )	Cost (RM million)
Water from Malaysia	<b>0.52</b>	<b>4,784 [0.52*(2.4+6.8)]</b>
Domestic Supplies (Water from Reservoirs and Catchments)	<b>0.68</b>	<b>1,632 (0.68*2.4)</b>
Total Costs		<b>6,416</b>

Note: Price of raw water plus treatment cost in the case of water from Malaysia is RM 9.2. For domestic supplies, it is assumed that water is a free product, hence the RM 2.40 which is just the treatment cost.

Source: See Table 7.

**Table 10: Year 2011 Expenditure with Water Sourced Domestically (2002 Prices)**

Sources of Water	Volume (million m <sup>3</sup> )	Cost (RM million)
Water from Reservoirs and Catchments	<b>0.68</b>	<b>1,632 (0.68*2.4)</b>
Desalination Plants	<b>0.40</b>	<b>2,968 (0.4*7.42)</b>
NEWater Plants	<b>0.25</b>	<b>927.5 (0.25*3.71)</b>
Total Costs		<b>5,547.5</b>

Note: Price of water from the various sources (Desalination and NEWater) are from Table 7.

Source: See Table 7.

## **5.0 Policy Implications**

### *- Social and Economic Impacts*

The social and economic impacts of sourcing for water by desalination and recycling (NEWater) must continue to remain in the forefront of the minds of policymakers in Singapore. It is beyond the scope of the present paper to discuss these impacts in a detailed manner. Nevertheless, the

more salient aspects will be highlighted in the hope encouraging future research and discourse.

In terms of desalination, it is important to ascertain the extent to which an average person's cost of living, and general industry costs will be affected if Singapore embarks on a desalination program which replaces the thirty percent of Singapore's water requirements in 2011. The impact on consumers and industry alike may not be significant based on the following factors. First, that the desalination program will only provide thirty percent of Singapore's total water supply. Second, that desalination costs may possibly fall to a level close to that of the present treatment costs of raw water in the near future. This may not be a far-fetched assumption given that the price of desalinated water has fallen from around thirteen times the price of treated reservoir water in 1997 to three times in 2002.

The prospect of using NEWater for drinking and also for certain industrial uses will also reduce the anticipated cost increase if Singapore decides to move towards self sufficiency. NEWater is expected to meet up to 20 percent of Singapore's water needs by 2010, and costs half as much to produce when compared to the process of desalination. Although the costs of producing NEWater is higher than that of treating raw water, new technologies may again lower this cost in the future. In fact, the PUB has said that NEWater sold to water-fabrication plants from next year will be about ten to fifteen percent cheaper than potable water which costs S\$1.52 per m<sup>3</sup>, inclusive of a 30 percent conservation tax (The Straits Times, 30 July 2002).

In terms of the impact of costs on individuals, the average per capita water consumption in 2001 was 110m<sup>3</sup> (Public Utilities Board Annual Report, 2001). This would amount to a consumption of around 9.3 m<sup>3</sup> per capita per month. Given that this would cost less than S\$15 (present tariff of S\$ 1.17 cents/m<sup>3</sup> plus the 30 percent water conservation tax), there is room for individuals in the higher income bracket to absorb cost increases when Singapore sources for water from the sea and its water recycling plants in the coming years. In turn, a blanket subsidy could be given to individuals living in one to three room Housing Development Board (HDB) flats, and also to other deserving individuals (and altruistic organisations) on a case-by-case basis to offset any economic hardship cause by a price increase in water.

Industries may also not be greatly impacted as the utilities component (electricity and water) of their operating costs averages 5.18 percent of their total operating costs (Report on the Census of Manufacturing Activities, 2000).<sup>21</sup> Nevertheless, this represents an averaging of costs of industries across-the-board. There are industries which are more intensive users of water and as such would be disproportionately affected when the cost of water increases in the future. More research needs to be undertaken to determine the exact impact of cost increases on different industries.

- *Future Implications for Singapore and ASEAN*

There are two situations that Singapore must consider.

**If Singapore decides to source for water domestically:**

This would make it imperative for the government to:

- Work out a premium that Singaporeans are willing to pay for acquiring self-sufficiency (see footnote 4).
- Continue to implement a comprehensive plan for its desalination programme.
- Continue to provide information and general progress reports of the desalination programme to the Singapore public.
- Ensure that the desalination plants to be constructed are economically and environmentally viable in the longer term, especially on a twenty-five or fifty year time scale. The National Environment Agency (NEA) should ensure that the private desalination companies adhere to standards set by the Government.
- Continue to hasten the production of NEWater plants and plan for additional plants in excess of what has been estimated to be sufficient.
- Continue with the current programme of educating the public on NEWater so that any unfounded fears can be dispelled.

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<sup>21</sup> The breakdown of costs into its water and electricity component is not available. However, it would not be too far wrong to assign a ballpark figure of around 2 percent as the component cost of water usage in most industries. Further research would be needed to ascertain a more precise water component cost.

### **If Singapore continues to source for water elsewhere:**

A matter of immediate urgency is the need for a framework that will facilitate the process of purchasing and supplying water between countries in the region, notably between Singapore and Malaysia, and Singapore and Indonesia. In its immediacy, such an agreement for cooperation should be formulated and implemented between Singapore and Malaysia first, and then between Singapore and Indonesia. This should later be expanded to serve as a framework that will allow for countries which are water-deficient to purchase water from its water-abundant ASEAN counterparts.

The framework must also allow for the setting up of working groups in member countries to study the pricing of water taking into account the expected future demand for water, a strategic action plan to deal with water crises especially during periods of drought, and establishing similar standards for the quality of raw and processed water - in short, implementing more strategic cooperative activities. The framework should also allow for a periodic review of prices and a mechanism to settle price adjustments in a fair and just manner. The devil of course is in working out the details of how such a mechanism can be set in place.

This will include setting up a pricing mechanism that is flexible and one that will adjust according to demand and supply conditions of water. Such a mechanism must also be agreed upon by all parties and must be binding. Feedback from all sections of society will be necessary in the case of countries complying to this framework, so that animosities will be minimised in times of drought and other trying conditions.

## **6.0 Conclusion**

In the past, the concern over water has always been over the threat posed by Malaysia on cutting supplies, coupled with the inability of Singapore to achieve self sufficiency in terms of sourcing for its own water domestically. There is also a widely held view that water has been used by Malaysia to coerce Singapore into complying with its wishes. This landscape has now changed

to one where the focus is not so much on questioning Singapore's capabilities; but rather on achieving a resolution on the deadlock posed by the inability of both countries to come to an agreeable mechanism for pricing water imported, and for guaranteeing future supplies from Malaysia. Also, the need to guarantee future supplies lies not so much on the resource scarcity argument alone but rather on the economic reasoning that water, where available, should be sourced in a manner that is cost-saving for Singapore.

Bilateral relations between the countries have indeed been strained by the need to resolve this disagreement. Underlying the current dispute is for the need to devise an appropriate negotiation mechanism that can help to resolve the current deadlock, and a structure of pricing that is seen to be equitable from the viewpoint of both countries. Importantly, the pricing structure must also be appropriately devised to maximise monetary benefits for both countries, to utilise and enhance the comparative advantage of their different resource endowments and strengths.

Recent developments have shown that the water issue will continue to be a critical factor in the management of bilateral relations. The leadership in both countries would have to deal with the problem in a rational and pragmatic manner in the realisation that their actions today will impact on the future course of ties between the governments and the peoples of both Malaysia and Singapore. Indeed Singapore and Malaysia have reached a level of political maturity to realise that the fate of both countries are intertwined, and that their economies are very much interdependent. Enhancing their well-being through cooperation would ultimately result in a situation that would bring rewards to both countries alike through an improved collective welfare.

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### ***Water Agreements***

Agreement made on 1<sup>st</sup> September 1961 between the Government of the State of Johore and the City Council of the State of Singapore relating to the use of water from the Tebrau River and the Scudai River, 1961.

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