THAMMASAT REVIEW
PRINT ISSN: 0859-5747 ONLINE ISSN: 2630-0303
Volume 27 No 2 (July-December) 2024 [Page 197-224]

Sustainable Development Goals (SDGs) Through the Water Treaty Between Kedah and Perlis (1971-1999): Implications for Water Resource Management and Equitable Resource Sharing in Malaysia and Globally

Mohd Firdaus Abdullah *

Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia, Malaysia

Received 2 April 2024; Received in revised form 2 July 2024
Accepted 29 September 2024; Available online 24 November 2024

Abstract

Water scarcity poses significant challenges to sustainable development. This study investigates the historical water treaty between Kedah and Perlis, Malaysia (1971-1999), focusing on Perlis' non-payment for water intake from Kedah. The transboundary relationship involves raw water transfer from Kedah's Muda Dam to Perlis. By examining this dispute within Malaysia's sustainable development context and the UN's Sustainable Development Goals (SDGs), particularly Goals 6 (Clean Water and Sanitation), 11 (Sustainable Cities and Communities), and 16 (Peace, Justice, and Strong Institutions), the research elucidates challenges in water resource management and equitable sharing. The study assesses the treaty's impact on water accessibility, urban resilience, societal inclusivity, and peace, revealing complex dynamics influenced by political alignments and economic considerations. It finds that Perlis' ability to secure water without payment from Kedah underscores the need for clearer legal frameworks and transparent governance in managing shared resources. The findings highlight Malaysia's need to adopt new approaches to manage its water supply, addressing internal concerns and enhancing sustainable development efforts aligned with the 2030 Agenda for Sustainable Development Goals. Overall, this research contributes valuable insights to discussions on sustainable water management, emphasizing the necessity of fair resource allocation and collaborative solutions for long-term welfare and development in both regions.

Keywords

Sustainable Development Goals, Water Management, Kedah, Perlis, Malaysia

*** Corresponding author**: mfa@ukm.edu.my **DOI**: 10.14456/tureview.2024.22

Introduction

The assertion made by Serageldin (2009) that conflicts of the twenty-first century would be related to water unless proper management of it was established is relevant in the present world. When referring to wars, it is not to suggest an armed dispute over water. The truth is the severity of future conflicts might surpass past global wars if effective water management is not established. This is because water is a basic requirement for human existence. Hence, it is plausible that disputes regarding water may arise between countries, including India and Pakistan, leading to future wars. For instance, India and Pakistan's current tension is because of the construction of a dam on Ravi River. While the waters are supplied to India via an agreement, a portion of it flows into Pakistan, causing additional friction between the two countries. This exemplifies how water can be one of the underlying reasons for Asian countries such as India and Pakistan to engage in military conflict to safeguard crucial strategic interests apart from the ongoing territorial dispute concerning Kashmir (Mirza, 2008).

In regard to Malaysia's water supply management in the current century, Chan's (2009) analysis of water governance in Malaysia suggests that it is effective. Water is distributed to more than 95% of the population, and the tariffs associated with it are relatively affordable globally. The poor have access to water, which is provided continuously throughout the day (Chan, 2012). Compared to other Asian countries, Malaysia's water management is commendable, with the exception of Singapore. Singapore presents a unique case in water management, often cited as a global model of efficiency and innovation. Despite its limited natural freshwater resources, Singapore has developed a robust and sustainable water supply system through a diversified approach known as the "Four National Taps." This strategy includes water from local catchment areas, imported water, high-grade reclaimed water (NEWater), and desalinated water. Singapore’s success can be attributed to its forward-thinking policies, substantial investments in technology, and public education campaigns promoting water conservation. The government has implemented advanced water recycling and desalination technologies, which have significantly reduced dependence on imported water from Malaysia. Additionally, Singapore has established rigorous standards for water quality and a tiered pricing system to encourage efficient water use. While Malaysia's water management is praiseworthy, Singapore's approach highlights the potential benefits of integrating cutting-edge technology and diversified water sources to ensure a sustainable and resilient water supply. Malaysia could draw lessons from Singapore's experience, particularly in enhancing technological infrastructure and public engagement in water conservation efforts (Kim & Choi 2023).

However, despite its success, in Malaysia, there are still regions in the country, such as Kelantan and Kedah, that rely on natural water resources (Fazeli Shah, 2024: Mohd Makhtar, 2024). This suggests that Malaysia has not entirely solved its water problems. Many dams and other water supply stations in Malaysia span over different states, leading to controversies and disagreements about water access (Jamri, 2022: Ujang et al., 2022). Numerous state-level disputes have erupted in the past decade, including agreement violations and abandonment (Abdullah et al., 2024). Although water disputes are occurring at the state level, they must be addressed. Malaysia's focus appears to be on resolving water arrangements with Singapore, whereas internal issues remain unresolved (N. Ganesan, 1998). As a result, Malaysia must adopt new approaches to manage its water supply, including addressing internal concerns.

Water resource management plays a critical role in achieving sustainable development goals, especially in regions where water scarcity and disputes over resource allocation persist. This is particularly evident in the case of the water treaty between Kedah and Perlis, a bilateral agreement that was in effect from 1971 to 1999. The treaty aimed to establish a framework for the fair and equitable sharing of raw water from Kedah to Perlis, ensuring access to a vital resource for both regions. However, recent events have highlighted a concerning development. Perlis has become non-compliant with the agreement, leading to unpaid dues for the raw water intake from Kedah (Abdullah & Zakarya, 2022). In light of the issues and cases discussed, this study aims to address several key research questions. First, it seeks to understand the key factors that influenced the formation and subsequent renegotiations of the water supply agreements between Kedah and Perlis from 1971 to 1999. Second, it examines how the implementation of these water treaties from 2000 to the present has impacted water revenue distribution and regional development, particularly regarding issues related to revenue collection, allocation, and economic growth in both states. Additionally, the study explores the main challenges faced by Kedah and Perlis in managing the Muda Dam's water resources and how these challenges affect inter-state relations. It evaluates how the water supply issues align with or hinder the achievement of the United Nations' Sustainable Development Goals (SDGs), particularly Goal 6 (Clean Water and Sanitation), Goal 11 (Sustainable Cities and Communities) and Goal 16 (Peace, Justice, and Strong Institutions), focusing on access to clean water and the promotion of peaceful and just institutions (United Nations, 2015). By addressing these questions, the study provides a comprehensive understanding of the historical, financial, and political dynamics of the water supply agreements between Kedah and Perlis, as well as their implications for sustainable development and inter-state relations in Malaysia and globally.

Water is not only an essential resource for life but also a catalyst for economic development, environmental sustainability, and social well-being (Mohd Daud et al., 2024: Wan Abdul Malik, 2024). The significance of equitable resource sharing cannot be understated, especially in a time when global water scarcity is projected to worsen with increasing population growth and climate change impacts. Addressing challenges in water resource management and conflict resolution is crucial to ensure sustainable development and foster long-term welfare and development for communities (Abdullah et al., 2023). Through this study, we aim to contribute to the broader discussion on equitable and sustainable water resource management, shedding light on the complexities and implications of the water treaty between Kedah and Perlis. By examining the non-compliance issue through a sustainable development lens, we hope to provide insights that can inform policy decisions and foster greater dialogue, knowledge sharing, and progressive approaches to ensure the achievement of sustainable development goals, both in Malaysia and around the world.

The case of the water treaty between Kedah and Perlis holds significant importance in the larger discourse on water management in developing countries and international contexts. This case study provides insights into the challenges faced by developing nations in effectively managing their water resources while striving for sustainable development. It sheds light on resource sharing complexities, offers lessons applicable to similar cases worldwide, and addresses the essential components of sustainable development goals. Additionally, it highlights the need for collaborative and equitable solutions, informing international water governance and cooperation efforts. One example that aligns with the study's focus on water management challenges in developing countries is the dispute over the Nile River among Egypt, Ethiopia, and Sudan. This ongoing conflict revolves around the construction of the Grand Ethiopian Renaissance Dam (GERD), which Ethiopia is building on the Blue Nile, a major tributary of the Nile. Egypt and Sudan are concerned about the potential impacts on their water supply and have been engaged in negotiations with Ethiopia to reach a mutually beneficial agreement (M. Aljefri et al., 2019). Another example that aligns with the study's focus is the Indus Water Treaty between India and Pakistan. This treaty, signed in 1960, governs the water sharing arrangements for the Indus River system, which flows through both countries. It was formulated to address the challenge of managing water resources in a region prone to conflicts and disputes (Biswas, 1992).

Both the case study of the water treaty between Kedah and Perlis and the real-life examples of the Nile River dispute and The Indus Water Treaty support the findings of this study on water management in developing countries. These examples highlight the challenges faced in allocating and sharing water resources in a fair and sustainable manner. They emphasize the complexities of managing water in regions prone to conflicts and

disputes, where multiple countries have competing interests. The Kedah-Perlis water treaty case study shows the importance of collaborative and equitable solutions in effectively managing water resources. Similarly, the Nile River dispute and The Indus Water Treaty demonstrate how international agreements can play a crucial role in resolving conflicts over shared water resources. These examples underline the significance of transparent negotiations, sustainable development goals, and international water governance principles in promoting cooperation and ensuring equitable access to water.

Literature Review

Studies related to SDGs and their implications for water resource management and equitable resource sharing have extensively demonstrated how water availability affects cooperation globally. Hussein et al. (2018) suggest improving the monitoring of transboundary water cooperation in SDG 6.5.2 by addressing inequitable water agreements and recognizing the role of civil society and informal cooperation. Krzymowski (2021) highlights the significance of water diplomacy for achieving SDGs and global security, emphasizing that freshwater disputes increasingly drive conflicts in the 21st century. Orme et al. (2015) argue that effective transboundary water governance requires a holistic interpretation of the SDGs, considering both Goal 6, which focuses on water, and Goal 16, which emphasizes international cooperation. Saruchera and Lautze (2015) stress the need for flexibility in interpreting cooperation indicators for transboundary waters, based on their study in Botswana, South Africa, and Zimbabwe. They argue that cooperation forms should vary based on local conditions. Fraser et al. (2020) uncovered 38 new transboundary aquifer units shared with neighboring countries during a national assessment in Malawi, emphasizing the need to address limitations in institutional mechanisms, data sharing, and groundwater monitoring to achieve SDG 6.5.2. Feng et al. (2019) identify challenges in achieving SDG water targets between China and India, such as the narrow scope of transboundary water cooperation and the lack of motivation for fair benefit-sharing. Mujica et al. (2021) found that the Global Water Partnership (GWP) and its regional branch GWP-South America have been effective in promoting Integrated Water Resources Management (IWRM) to achieve SDG 6.5 in South American countries, emphasizing participatory processes and capacity building. In Malaysia, transboundary water issues involve states like Kedah and Penang sharing the same raw water resources (Abdullah et al., 2024). Penang claims to only extract raw water from its own territory, highlighting the water scarcity challenges faced by developing states in Malaysia, which could impede sustainable development if not addressed promptly (Wan Ibrahim, 2012).

Despite the wealth of existing research on transboundary water management and SDGs, there is a lack of specific case studies examining the historical water treaty between Kedah and Perlis from 1971 to 1999. This case provides unique insights into the political,

economic, and social dimensions of water resource management within a national context, which has not been sufficiently explored. Much of the existing literature focuses on contemporary issues and recent data. There is a gap in understanding how historical agreements and their evolution over time have impacted current water management practices and SDG implementation. This study fills the time gap by analyzing the long-term implications of historical treaties. While theoretical frameworks for water diplomacy and transboundary water cooperation are well-developed, there is a need for integrating these theories with practical case studies from diverse geographical regions. This study bridges the theoretical gap by applying water diplomacy concepts to the Kedah-Perlis case, offering a nuanced understanding of the interplay between theory and practice. Many studies rely on qualitative approaches or focus on single aspects of water management. There is a gap in comprehensive, mixed method approaches that combine qualitative and quantitative data to provide a holistic view of water resource management. Despite extensive research on SDGs and water resource management, the specific examination of the water treaty between Kedah and Perlis from 1971 to 1999 has not been adequately addressed. This research fills these academic gaps by providing a detailed case study, analyzing historical data, integrating theoretical frameworks with practical insights, and employing a mixed-method approach. By doing so, it offers a new dimension to the discourse on SDGs and sustainable water management, contributing to both academic knowledge and practical policymaking.

Research Methodology

This study employs a historiographical approach, drawing upon primary historical sources and employing qualitative research methods typical of the discipline. Various scholarly procedures, including critique, analysis, heuristic exploration, and historiographical evaluation, were undertaken to ensure objectivity and rigor in the examination of historical events. Like many historical inquiries, extensive library research was conducted to gather primary and secondary materials, encompassing official documents, newspapers, journals, and books rich with pertinent information. Additionally, fieldwork involved visits to esteemed repositories such as the National Archives of Malaysia, the National Library of Malaysia, governmental institutions in Kedah and Perlis, the *Lembaga Sumber Air Negeri Kedah*, and academic libraries across Malaysia to compile a comprehensive array of sources relevant to the study.

The research commenced with a heuristic investigation of the collected sources, meticulously examining the narratives, perspectives, and concepts surrounding the subject matter. Subsequently, a rigorous process of source critique ensued, comparing and corroborating obtained sources with other scholarly works to ascertain their accuracy and reliability, thus ensuring the integrity of the research findings. The analytical phase involved synthesizing insights from primary and secondary sources, culminating in the production of

substantive conclusions. The culmination of this methodological journey was the crafting of historical narrative, a process commonly referred to as historiography, wherein the research findings were woven into a coherent historical account. Furthermore, the study incorporated oral history methodologies, involving the identification and engagement of relevant interviewees, informed consent procedures, and the systematic collection of oral testimonies through recorded interviews. Each interview was conducted with meticulous attention to ethical considerations, with participants providing consent for the use of their recorded narratives for scholarly purposes.

Results and Discussion

Issues of Muda Dam in Kedah

Sungai Muda is a primary river that flows through Kedah State and serves as an excellent source of raw water. The British had originally planned to create the *Sungai Muda* Water Supply Plan in 1955 to address the water demand in Alor Setar, the capital of Kedah, and southern Kedah. Mr C. Gjertsen, the State Engineer of Kedah at that time, developed the plan, which identified Jeniang and Kalar as suitable sites to process raw water resources from *Sungai Muda*. The plan was designed to produce 12 million gallons of water, meet the water demands of the state until 1981, and prevent the spread of dysentery, which had claimed two lives in 1955. However, the $37,400,000 required for the water supply plan was deemed unaffordable, thus rendering the plan unfeasible (S. K. 449-1375: Messrs. Steen Sehested & Partners, Vattenbyggnadsbran (VBB), 1962). Nevertheless, the post-independence Kedah government in Malaysia recognized the advantages of using *Sungai Muda* and conducted extensive research to identify the shortcomings of the British water supply model. The government strengthened the model with its own methods.

In 1969, the Kedah Government developed the Muda Irrigation Plan aiming to increase paddy production and expand water supply in Kedah State. To finance part of the construction costs of the Muda Dam, the Kedah Government applied for a loan from the World Bank and was approved for a $45 million loan. Additionally, the Kedah Government covered the remaining costs of construction (Ibrahim & Siwar 2012). However, the Muda Agricultural Development Authority (MADA) report did not provide an accurate representation of the Kedah Government's total expenditure in constructing the dam, leading to the government monopolizing water supply and incurring significant debt. In an interview with Razak (2017), Senior Manager of SADA Central Region, it was revealed that failure to repay the debt would result in the state's assets being mortgaged to the federal government. Fortunately for Kedah and Perlis, which also incurred water supply debt, after the 14th General Election, the Federal Government under the leadership of Mahathir Mohamad converted the loan debt into a grant, thereby relieving the Kedah state government from the

debt (The Coordination Meeting on the Proposed Imposition of Raw Water Charges on the States of Perlis and Penang, January 28th, 2020).

Figure 1 *Sungai Muda*, Kedah, Malaysia

Source: Sim L. L. (2021, May 1). *Sg Muda* a shared resource. *The Star*. https://www.thestar.com.my/news/nation/2021/05/01/sg-muda-a-shared-resource

In 1974, the Muda Dam was built along with the hydroelectric powerhouse and able to irrigate and provide a good source of water to paddy crops in the state. The Muda Irrigation Plan spans across an area of 126,155 hectares, encompassing 105,851 hectares in Kedah and 20,304 hectares in Perlis (Ali et al., 2012). The dam's location, full of wildlife and vegetation, has unfortunately been subject to illegal logging activities, which threatens the water catchment areas in *Sungai Muda* and worries the state governments. However, the Kedah JKR Water Division has built a raw water reservoir centre in Nami, a village next to *Sungai Muda*, to measure and develop the catchment area and secure a great raw water source. The increase in raw water supply through the Muda Dam has benefitted the state by easing the water production process (Abdullah, 2019). Raw water sources used from the dam are more secure and contain better water quality than other rivers in Kedah; therefore, water can be preserved and improved before processing and distribution to the population. The Muda Dam's construction has also led to the neighbouring state of Perlis signing a series of water supply agreements with Kedah (Abdullah & Mohd Noor, 2018).

Figure 2 Google map of The Muda Dam, Kedah

The Water Supply Agreements Between Kedah and Perlis, 1971-1999

First Agreement, 1971-1976

Perlis in the past relied heavily on natural supply sources for their survival. In an interview with Nasir (2020), a 61-year-old resident of Kangar, Perlis, it was found that his family relied on wells in the mosque for domestic use in the early 1960s. For other purposes, they used water from nearby canals and rivers. According to historical sources, the main water system that sustained local residents in Perlis included wells, canals, and artificial rivers built in many locations (Abdullah et al., 2023). Residents' expertise in constructing different types of water supply led to the creation of additional canals. For instance, Sultan Dhaiuddin of Perlis oversaw the construction of a 70 km-long canal, with a width of approximately 20 feet and a depth of 8 feet, connecting Kota Almarhum Kayang to Kampung Sanglang in Perlis and extending to villages along the Kedah River from Kampung Ayer Itam to Bukit Pinang (Mohd Noor & Abdullah, 2020). Thousands of residents were involved in its construction, using traditional tools such as hoes and wooden digging tools called *Kedan* (Ismail, 1996: Rejab, 2013). This earlier water system was in use during the period when Perlis and Kedah belonged to the British Unfederated Malay States (Abd Manaf & Ahmad,

2014: Wan Mohamad Khairuddin Azaki & Hussain, 2024). Its success served as inspiration for the development of a broader water supply system in other British-controlled states in Malaya, namely the Straits Settlements and Federated Malay States.

Following independence, each state faced serious water supply issues. Terengganu, for instance, struggled with severe water shortages due to the absence of a dam to provide a reliable supply of drinking water, support agricultural irrigation, and supply water for industrial uses. It was only in 1972 that the Kenyir Dam was constructed, leaving a significant impact on the surrounding community (Chan, 2002: Shamsul Bahri, 2021). The Perlis Government recognized that state safety and stability hinged on their ability to develop and expand water resources. As a paddy-producing state, efficient irrigation systems were necessary to increase paddy cultivation (Ismail, 2002). However, the limitation of irrigation resources presented a challenge. Since paddy production was vital for state revenue, the government had to address this issue (Ismail, 2015). In 1965, the Perlis Public Works Department (PWD) was strengthened. However, due to its limited authority as a department and headquarters located in Alor Setar, Kedah, it failed to develop water supply projects (Norhudi'in Danu @ Danoo, 2014). At the same time, efforts by the Perlis Government to find raw water sources yielded no success (Khalid, 1965). As a result, the government turned to neighboring states, particularly Kedah, to seek water sources (Abdullah & Mohd Noor, 2018).

Kedah's success in developing the Muda Dam was particularly attractive to Perlis, since part of the dam is in their state's territory (Abdullah & Mohd Noor, 2020). The good relations between the two states led the Perlis Government to seek Kedah's help to solve their water problems. A meeting was held on 24 September 1969, involving high-ranking officials from both states and other government bodies, to discuss the challenges faced by Perlis in developing its water supply system. The meeting highlighted that Perlis lagged behind other states due to a lack of raw water resources, hindering the state's progress. The meeting demonstrated that water-related issues had national implications as the water supply system's development was crucial to Malaysia's nation-building agenda. Perlis is not subjected to the Water Act of 1920, allowing the state to determine the best course of action in meeting its water needs. In the meeting, Perlis proposed that Kedah provide it with up to two million gallons of water per day via the Muda Dam. Kedah agreed since the Dam also used part of Perlis' territory, as previously mentioned. The cooperation between the two states demonstrates how inter-state partnerships can enhance national development agendas (PSU (K) 690/1399). On 1971, October 28, the first water agreement between the Kedah Government and the Perlis Government was officially signed, with the following conditions:

I. Kedah's Department of Irrigation and Drainage supplies to Perlis up to two million gallons of water per day from the main water line, depending on World Bank's agreement for this action to be carried out.

II. PWD must provide a storage location for the treated and untreated water supplies before distribution to Perlis.

III. PWD bears all the expenses for the implementation of the Perlis water supply project.

IV. PWD is responsible for and seeks appropriate efforts in the event of water resource disruption during the project's implementation.

V. In the event of water shortages or disruption, Perlis should use the waters of Sungai Arau immediately.

VI. Perlis must pay an annual amount of $16, 000 to the Kedah Government for the intake of two million gallons of water per day from the Muda Dam (PSU (K) 690/1399).

Initially, the Perlis Government agreed to all the conditions set by the Kedah Government in the first agreement. However, their elation was short-lived. On 1973, October 13, a Federal Government report recommended increasing the cost of sourcing water from the Muda Dam based on the country's developing needs under the New Economic Policy (NEP). The Perlis Government feared that Kedah might disagree with their request and cut their raw water supply if they deemed the cost insufficient. Despite these challenges, the Perlis Government persisted in their efforts to secure a stable water supply. They reached out to the Muda Agricultural Development Authority (MUDA) to increase their intake of raw water up to 8.5 million gallons per day. Fortunately, Kedah did not object to their request, and through MUDA, it was approved without issue (PKR. W. 37/164). This successful negotiation highlights the importance of perseverance and communication in inter-state partnerships, especially when it comes to vital infrastructure like water supply systems.

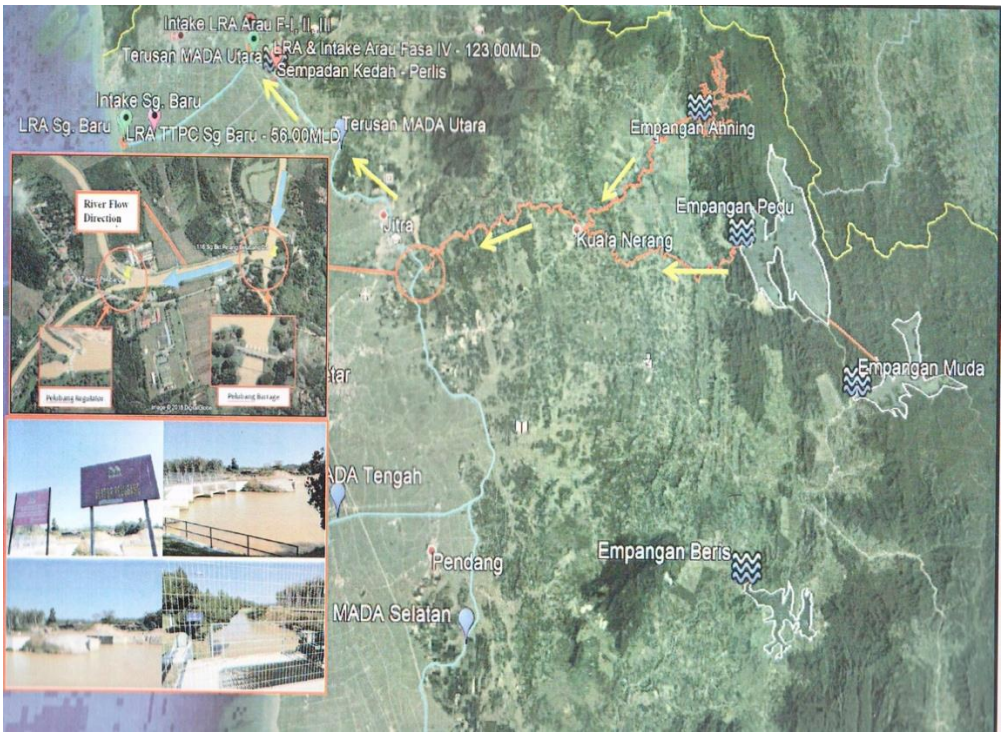

Figure 3 The Flow Direction of Raw Water From Kedah to Perlis

Source: Ilham Jurutera Sdn. Bhd. (2018). *Progress Report 3 - Program Pembangunan Water Balance bagi Pengurusan Sumber Air Negara (Fasa 1), National Water Balance Management System (NAWABS) bagi Lembangan Sungai Kedah*. Kedah: Lembaga Sumber Air Negeri Kedah.

Second Agreement, 1988-1993

The utilization of the Muda Dam as a source of raw water had a significant impact on the state of Perlis. With the establishment of a water supply system through its initial agreement with Kedah, Perlis experienced a positive shift in its economic development, with water becoming a primary focus. This was exemplified by the implementation of the Perlis Integrated Agriculture Project from 1982 to 2000, which further emphasized the importance of water in the state's development (Haji Hashim, 2014). As a result of this project, Perlis recognized the necessity of entering into a new water supply agreement with Kedah. Maintaining a good relationship with Kedah was crucial for Perlis, given its heavy reliance on the Muda Dam for its water needs. In addition to supplying raw water to Perlis, Kedah also catered to the water requirements of Penang and Perak. Consequently, there was concern that Kedah's water demands might become too burdensome or its resources insufficient to meet its own domestic and economic needs, potentially jeopardizing Perlis' access to the

Muda Dam as a water source. To address these concerns and with the influence of the Perlis Integrated Agriculture Project, the Perlis Government sought a second water agreement with the Kedah Government. Extensive discussions involving both governments, as well as Malaysia's federal- and state-level JKR (Public Works Department), led to the signing of the second Raw Water Supply Agreement between Kedah and Perlis on 14 August 1986. This agreement solidified the bond between Perlis and Kedah based on the allocation of raw water resources (PKR. W. 37/165). However, certain technical modifications were made by both parties, including a revised official agreement date of 1988, February 27. Several terms of the agreement made between the First Party (Kedah Government) and the Second Party (Perlis Government) include the following:

I. The First Party supplies raw water to the Second Party from the Muda Dam in Arau for five years.

II. The raw water source to be supplied to the Second Party does not exceed 5.5 million gallons of water per day.

III. The Second Party installs a device called “Discharge Flowmeter cum recorder” at their own expense so that the water supplied does not exceed the agreed amount.

IV. MADA staff are allowed to independently maintain the day-to-day running of the Muda Dam without interference from both First and Second Parties.

V. The Second Party is responsible for extracting raw water from the Muda Arau Dam and will bear all expenses for the stated purpose.

VI. A fee of MYR55, 000.00 per year is charged to the Second Party for the extraction of raw water resources from the Muda Dam, effective from 1 January 1986, the date Perlis began extracting water from the Muda Dam in Arau.

In the agreement, the First Party also reserved the right to decide on the Second Party’s application for renewal of the agreement after the expiration of five years (PKR. W. 37). The Second Agreement between Kedah and Perlis, covering the period from 1988 to 1993, offers a significant case study in inter-state water resource management, highlighting both the benefits and challenges associated with such agreements. On the positive side, the agreement facilitated Perlis' economic growth by ensuring a steady supply of raw water from the Muda Dam. This availability of water was crucial for projects such as the Perlis Integrated Agriculture Project (1982-2000), which boosted the state's agricultural productivity and overall economic development (Haji Hashim, 2014). Additionally, the agreement helped solidify the cooperative relationship between Kedah and Perlis. By formalizing the terms of water sharing, both states were able to work collaboratively towards their mutual benefit, ensuring that Perlis had the necessary resources to support its development needs. The installation of the “Discharge Flowmeter cum recorder” by Perlis at their own expense represents an investment in infrastructure that not only ensured compliance with the agreed water limits but

also improved water management capabilities within the state. Furthermore, allowing MADA staff to maintain the Muda Dam independently without interference from either party ensured that technical operations could be managed efficiently and professionally, reducing the risk of political or administrative disruptions.

However, there were also significant pitfalls associated with the agreement. Perlis' heavy reliance on Kedah for its water supply posed a significant risk. Any issues within Kedah's water management or changes in Kedah's water needs could potentially jeopardize Perlis' access to water, highlighting the vulnerability inherent in such dependence. Additionally, the agreement stipulated a fixed maximum daily water supply (5.5 million gallons), which may not have been sufficient to meet Perlis' growing needs over time. With Kedah also supplying water to Penang and Perak, there was a legitimate concern about whether Kedah could sustainably meet all these demands without compromising its own needs (Abdullah, 2019). Financially, Perlis was responsible for all expenses related to extracting and managing the raw water from the Muda Dam, including the annual fee of MYR55,000. While this fee was relatively modest, the cumulative costs of infrastructure, maintenance, and potential future increases in water demand could impose a significant financial burden on Perlis. Lastly, the provision allowing Kedah to decide on the renewal of the agreement after five years introduced a degree of uncertainty for Perlis. This uncertainty could hinder long-term planning and investment in water-dependent projects, as future access to water was not guaranteed beyond the initial agreement period.

Third Agreement, 1994-1999

During the late 20th century, the Perlis Government took initiatives to establish its own water supply system, indicating its recognition of the importance of independent water resources for the state's development, separate from Kedah. To fulfil its domestic and economic needs, the Perlis Government constructed the Timah Tasoh Dam in 1987, as part of its water development strategy and the Malaysian Integrated Agricultural Development Project (IADP) (Kerajaan Negeri Perlis, 1990; Haji Hashim, 2014). However, upon completion, it was discovered that the dam could only provide 40 percent of Perlis' required water for domestic and economic purposes, rendering it insufficient (Bernama, 2014). Despite the successful construction of the dam, the Perlis Government still relied on raw water supplied by Kedah. While building additional dams in Perlis, similar to Kedah's Muda Dam, Ahning Dam, and Pedu Dam, seemed like a potential solution, it proved challenging due to Perlis' limited state revenue, ranking second lowest after Kelantan (Abdullah & Zakarya, 2022). Furthermore, the scarcity of viable locations suitable for dam construction further hindered Perlis' efforts, aside from the Timah Tasoh Dam.

Realizing its dependence on Kedah, which held the authority to reject Perlis' application for the water agreement's renewal in 1993, the Perlis Government had no alternative but to continue relying on raw water resources from the Muda Dam. Consequently, the Third Water Supply Agreement between Kedah and Perlis was signed on 24 May 1994 (PKR. W. 37). The main terms of the third agreement are:

I. Starting from the implementation date of the agreement for five years, the First Party supplies raw water resources of not more than 9.6 million gallons per day to the Second Party from the Muda Dam in Arau.

II. The raw water intake is guided by the water level in the main canal of the Muda Dam in Arau (intake in Guar Sanji), which must not be less than 3.81 meters (12.50 feet) to avoid the problem of raw water suction from the canal.

III. The Second Party is responsible for extracting raw water from the Muda Dam in Arau and will also be responsible for the preparation of an appropriate water supply emergency plan if the raw water supply from the Muda Dam is cut off unexpectedly.

IV. The Second Party bears all expenses for the work to extract raw water from the Muda Dam in Arau, including its storage, cleaning, and supply works thereafter.

V. The Second Party shall pay MYR210,240.00 per year to the First Party (based on MYR0.06 per 1,000 gallons for 9.6 million gallons per day) and the amount shall be paid four times per year, amounting to MYR52,260.00.

VI. For any amount not paid by the Second Party, interest shall be paid at 8% per annum calculated from the date the amount is due to be paid until the date the actual payment is made (PKR. W. 37, 1994).

The Third Water Supply Agreement between Kedah and Perlis brought both benefits and challenges. One major benefit was the guaranteed provision of up to 9.6 million gallons of raw water per day from the Muda Dam, ensuring a steady supply for Perlis' domestic and economic needs despite its limited resources. Financially, the agreement was relatively manageable, with Perlis paying MYR0.06 per 1,000 gallons, totalling MYR210,240.00 annually. Additionally, the requirement for Perlis to prepare an emergency plan for water supply interruptions promoted proactive measures, enhancing the state's resilience. However, the agreement also had significant drawbacks. It perpetuated Perlis' dependency on Kedah, as Kedah could renegotiate or reject future agreements, creating vulnerability for Perlis. The 9.6 million gallons supplied daily were insufficient to meet Perlis' full water needs, highlighting ongoing resource struggles. Financially, the total annual payment was a substantial expense for Perlis, the second-lowest revenue-generating state, limiting its ability to invest in other development areas. Operational responsibilities for extracting, storing, cleaning, and supplying the water added further pressure. Additionally, the

8 percent per annum interest on unpaid amounts posed a high risk, potentially worsening financial challenges in case of delayed payments. While the Third Water Supply Agreement provided necessary water resources and some level of security, it also exposed Perlis to dependency, financial strain, and operational pressures. This analysis highlights the complexities of inter-state agreements and their long-term implications for state development and resource management.

Water Revenues and Issues, 2000-Now

Beginning from 2000, the third water agreement between Perlis and Kedah was terminated. In an interview with Mohammed Ali (2021), Director of the *Lembaga Sumber Air Negeri Kedah*, it was found that the Perlis Government, then under Chief Minister Shahidan Kassim, contended that the water obtained from Kedah did not need to be paid for, as it was a 'natural resource of God's grace'. In fact, starting from the stated period, the Kedah Government allowed the state of Perlis to use its raw water resources for free. Not only did Kedah fail to manipulate to its advantage a good source of raw water in northern Malaysia, but the state also lost revenue as it also had to maintain water catchment areas for the use of domestic water supply to Penang, Perlis, and its own people (Abdullah et al., 2024). A rich state with 370 rivers that total up to 2,900 kilometres and a rain catchment area of 9,000 square metres, Kedah should have healthy state revenues just from the sale of its raw water to the neighbouring states of Penang and Perlis (Ilham Jurutera Sdn. Bhd, 2018). By failing to leverage their water advantages, Kedah is currently one of the least successful states in water management in Malaysia. To date, its water supply problems continue to be unresolved.

Figure 4 Arau Water Treatment Plant I-III

Source: Ilham Jurutera Sdn. Bhd. (2018). *Progress Report 3 - Program Pembangunan Water Balance bagi Pengurusan Sumber Air Negara (Fasa 1), National Water Balance Management System (NAWABS) bagi Lembangan Sungai Kedah*. Kedah: Lembaga Sumber Air Negeri Kedah.

Figure 5 Arau Water Treatment Plant I-III

Source: Ilham Jurutera Sdn. Bhd. (2018). *Progress Report 3 - Program Pembangunan Water Balance bagi Pengurusan Sumber Air Negara (Fasa 1), National Water Balance Management System (NAWABS) bagi Lembangan Sungai Kedah*. Kedah: Lembaga Sumber Air Negeri Kedah.

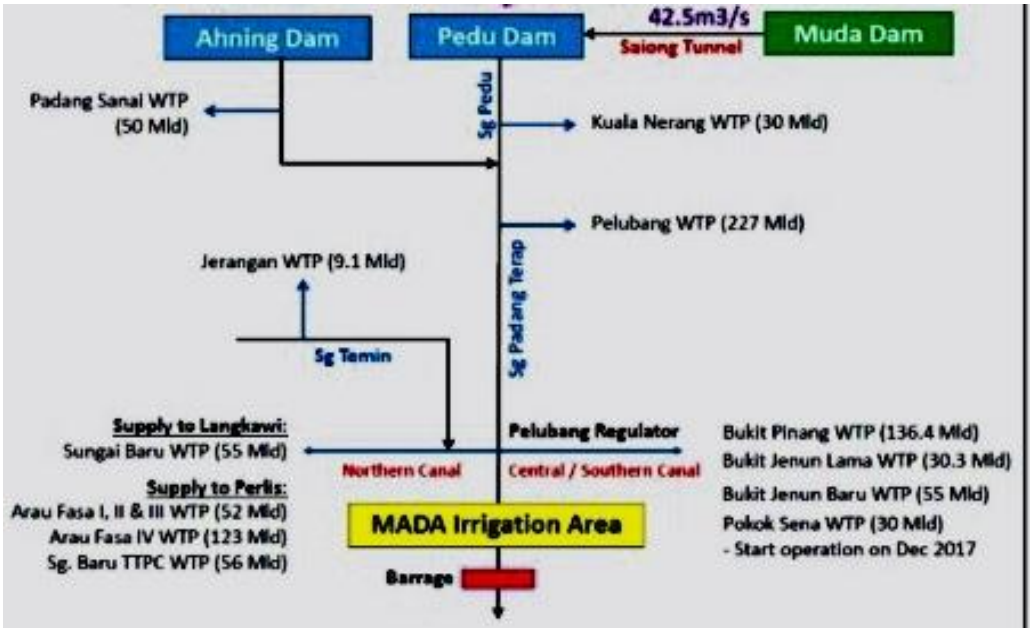

Figure 6 Schematic diagram of existing water resources for Perlis and Kedah.
Source: Ilham Jurutera Sdn. Bhd. (2018). *Progress Report 3 - Program Pembangunan Water Balance bagi Pengurusan Sumber Air Negara (Fasa 1), National Water Balance Management System (NAWABS) bagi Lembangan Sungai Kedah*. Kedah: Lembaga Sumber Air Negeri Kedah.

Figure 6 shows the quantity of raw water in Kedah and how it has been channelled to the state of Perlis. Starting from the Muda Dam, the raw water is channelled to the Pedu Dam (in Kedah), and then through *Sungai Pedu* and *Sungai Padang Terap*. This raw water source will reach the MADA Irrigation Area (Northern Canal) before arriving in the state of Perlis. Several plants in Perlis that process raw water resources have been identified, such as Arau Water Treatment Plant I-IV and Sungai Baru Water Treatment. Perlis uses a total of 231 million litres per day (MLD). Based on the current water rate imposed by the Kedah Government, the use of 1 cubic meter (m3) is charged at MYR 0.10 (LSANK 600-7/2/1). Based on the daily consumption, Perlis must pay MYR963.00 to Kedah per day. Subsequently, for one-year usage, the total water charges to be paid by Perlis is MYR351,495.00. The Kedah Government has therefore suffered immense revenue losses as it has continued to allow Perlis to use their raw water resources for free every year. In fact, the above calculation is only the calculation of the current losses without involving the losses suffered by the Kedah Government starting from 2000 (at this time, a charge of MYR0.06 is imposed on the consumption of 1,000 gallons of water). With this income, Kedah could have

enjoyed strong water revenues that could help with its future domestic and economic developments.

Sustainable Development Goals through the Water Treaty between Kedah and Perlis

The case study of the water treaty between Perlis and Kedah offers several lessons that are relevant to SDG 6, which aims to ensure access to water and sanitation for all, specifically focusing on target 6.5: "By 2030, implement integrated water-resources management at all levels, including through transboundary cooperation as appropriate" (United Nations, 2015). The issue of Perlis having to pay for raw water intake from Kedah highlights the importance of equitable and sustainable water management practices. Firstly, it emphasizes the need for collaboration and cooperation between regions or countries in managing shared water resources. By negotiating and implementing water treaties or agreements, as in the case of Perlis and Kedah, countries can ensure fair allocation and access to water resources, thus contributing to SDG 6. Secondly, it highlights the significance of inclusive water management practices. Ensuring access to water and sanitation for all requires considering the needs and perspectives of all communities, including marginalized and vulnerable populations. In the case of Perlis and Kedah, the issue of payment for raw intake must be addressed in a manner that ensures affordability and accessibility for all residents, aligning with the principles of SDG 6. The contemporary relevance of this issue extends beyond Perlis and Kedah to water management practices globally. Many regions around the world face similar challenges of sharing water resources and implementing equitable water management practices. By learning from the Perlis-Kedah case study, countries can adopt collaborative and inclusive approaches to water management that align with the principles of SDG 6. Furthermore, the treaty between Kedah and Perlis demonstrates how integrated water-resources management (IWRM) can be effectively implemented at a regional level, addressing target 6.5 of the SDGs. The agreement's provisions for equitable water sharing, conflict resolution mechanisms, and financial arrangements for water extraction are all components of successful IWRM. These elements ensure that water resources are managed sustainably, disputes are minimized, and the benefits of water resources are shared fairly among all stakeholders. By applying the principles of the SDGs to this case study, it becomes evident that the water treaty between Perlis and Kedah is not just a historical and descriptive narrative but also a practical example of how integrated and equitable water management can be achieved. This analysis provides valuable insights for policymakers and water resource managers globally, demonstrating the importance of transboundary cooperation and inclusive water governance in achieving sustainable development goals.

Additionally, the case study of Perlis paying for raw intake from Kedah offers lessons that are relevant to SDG 11, which focuses on sustainable cities and communities (United Nations, 2015). The lesson from this study is that water management issues, such as payment for raw intake, have direct implications for the sustainability and resilience of cities and communities. By addressing these issues through collaboration, cooperation, and inclusive decision-making processes, countries can work towards achieving SDG 11. This involves considering affordability and accessibility in water management practices to ensure the well-being and sustainable development of urban areas. The relevance of this lesson extends beyond the case of Perlis and Kedah to contemporary water management practices worldwide, especially in urban areas. As cities face increasing challenges related to water scarcity, quality, and distribution, it becomes crucial to adopt sustainable approaches that align with SDG 11. By addressing payment issues and adopting inclusive practices, countries can promote sustainable water management in urban areas, contributing to the overall objective of SDG 11. Similarly, in South Africa, water scarcity and unequal distribution of water resources have been significant challenges, particularly in urban areas. The city of Cape Town experienced a severe water crisis in 2018 due to a prolonged drought, leading to the implementation of strict water restrictions, including daily water usage limits per household (Rodina, 2019). This crisis highlighted the importance of sustainable water management and the need to ensure access to water for all residents, aligning with SDG 11. To address the issue, the South African government implemented various measures, including public awareness campaigns, infrastructure investment, and water conservation programs. These efforts aimed to ensure the availability of water resources, promote equitable water distribution, and build more resilient urban communities. By addressing the water management challenges and working towards sustainable and inclusive solutions, South Africa is striving to achieve SDG 11's objectives of sustainable cities and communities (Croese et al., 2020).

The case study also offers lesson to SDG 16, which aims to promoting peaceful and inclusive societies, justice for all, and effective governance (United Nations, 2015). The lesson from the study of Perlis paying for raw intake from Kedah is that effective water management requires transparent and cooperative governance structures. By addressing issues related to payment and resource allocation through fair and inclusive decision-making processes, countries can contribute to SDG 16's objective of promoting peaceful and inclusive societies. This involves establishing water governance frameworks that involve all stakeholders, ensure transparency, and uphold principles of justice and fairness. This lesson is relevant to contemporary water management practices in countries around the world. Effective water governance, where shared water resources are managed with collaboration and cooperation, is essential for the sustainable and equitable allocation of water. By

incorporating principles of SDG 16 into water management practices, countries can work towards creating inclusive societies, promoting peaceful cooperation, and ensuring effective governance of water resources. One example of a country where a payment system for water resources is in place is Israel and its water agreement with the Palestinian Authority. Under the Oslo II Accord, Israel supplies water to the Palestinian territories in the West Bank (Selby, 2003: Hussein & Al-Ajarma, 2023). The Palestinian Authority pays for this water supply based on agreed-upon rates. This arrangement is relevant to the issue of payment for water resources and aligns with SDG 16's focus on effective governance. It highlights the importance of establishing fair and transparent mechanisms for water allocation and financial transactions. By implementing a payment system, Israel and the Palestinian Authority demonstrate cooperation and governance in the management of shared water resources, contributing to SDG 16's goal of promoting peaceful and inclusive societies (Nassar et al., 2023: Raheb, 2023). This example showcases how the establishment of payment systems for water resources can facilitate cooperation, equitable distribution, and effective governance, which are key aspects of SDG 16. It serves as a precedent for other countries facing similar water management challenges, emphasizing the significance of fair and transparent financial arrangements in the sustainable management of shared water resources.

Conclusion

Based on the findings of this study on the water treaty between Kedah and Perlis from 1971-1999, it is evident that managing shared water resources entails complex challenges, deeply influenced by political alignments and economic considerations. The decision by Kedah not to charge Perlis for raw water usage reflects both goodwill and strategic political alliances, yet it raises questions about equity and sustainability in water resource management across neighboring states. This scenario contrasts starkly with Kedah's approach to other neighboring regions, such as Penang, where different financial terms apply for water usage. The asymmetry in financial arrangements underscores the need for clear legal frameworks guided by transparent decision-making processes in managing shared resources. Establishing equitable payment mechanisms and defining mutual responsibilities can mitigate potential conflicts and foster sustainable development. To address these complexities and improve water supply management in Kedah, several recommendations emerge from this study. First, there is a pressing need for a renewed water agreement between Kedah and Perlis that explicitly outlines payment terms and responsibilities for water resource maintenance. Historical precedents should inform contemporary policies to ensure consistency and fairness across agreements. Second, political considerations must be tempered with professional governance practices to avoid selective enforcement of water policies, which can undermine regional stability.

The success of Perlis in securing water security despite limited local resources offers valuable insights for managing water disputes in Malaysia and beyond. This case highlights the importance of strategic planning and collaborative governance in achieving sustainable water management goals. By aligning these efforts with the Sustainable Development Goals (SDGs), particularly SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), and SDG 16 (Peace, Justice, and Strong Institutions), countries can promote inclusive and resilient urban development while ensuring universal access to clean water resources. This study applies the theoretical frameworks of water diplomacy and transboundary water cooperation, demonstrating their relevance in analyzing historical and contemporary water management issues. By integrating these theories with practical insights from the Kedah-Perlis case, the research contributes to a deeper understanding of the interplay between political, economic, and social factors in water resource management. In conclusion, the study on Perlis paying for raw water intake from Kedah contributes significantly to the broader discourse on equitable and sustainable water management. By advocating for ongoing dialogue, knowledge sharing, and progressive policy approaches, this research supports the objectives of the 2030 Agenda for Sustainable Development. These findings provide critical guidance to policymakers and stakeholders, informing the implementation of effective strategies for water governance that uphold principles of fairness, sustainability, and inclusive development.

Acknowledgements

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

Abd Manaf, A. & Ahmad, A. (2014). Peningkatan kawalan British melalui Perjanjian Perlis-British 1930 dan pengukuhan kuasa elit Melayu. *SEJARAH: Journal of the Department of History, 23*(4), 99-122.

Abdullah, M. F. (2019). *Pembangunan Bekalan Air Domestik di Negeri Kedah, 1957-1992* (Doctoral's dissertation). Universiti Malaya, Kuala Lumpur, Malaysia

Abdullah, M. F. & Mohd Noor, A. (2018). Kerjasama Kedah dan Perlis dalam pembangunan sistem bekalan air domestik di negeri Perlis, 1969-1978. *JEBAT: Malaysian Journal of History, Politics & Strategy*, *4*5(1), 56-78.

Abdullah, M. F. & Mohd Noor, A. (2020). Pembangunan Bekalan Air Domestik di Negeri Kedah, 1957-1992. *Kajian Malaysia, 38*(1), 89–113.

Abdullah, M. F. & Zakarya, Z. (2022). Politik Air di Negeri Perlis dalam Pilihan Raya Umum (PRU) ke-14. *SEJARAH: Journal of the Department of History, 31*(1), 140-162.

Abdullah, M. F., Mohd Noor, A. & Mat Enh, A. (2023). Hydrological Legacies of Colonialism: Examining water systems in Perlis, Malaya (1909–1950). *Journal of International Studies, 19*(2), 215-243.

Abdullah, M. F., Mohd Noor, A., Tan, C. S. & Wan Ibrahim, W. K. (2024). The Water War between Kedah-Penang in Malaysia: The Relation in the Management of Sungai Muda Raw Water, 1965–1985. *Geopolitics Quarterly*, *20*(2), 151-170.

Abdullah, M. F., Padzil, R., Mohd Noor, A. & Nordin, M. (2024). The Impact of Inter-Basin Water Transfer between Johor and Singapore on Johor's Water Supply System, 1927 to 1941. *MANUSYA: Journal of Humanities*, *27*(1), 1-22.

Abdullah, M. F., Wan Ibrahim, W. K., Mohd Noor, A., Mohamed Hassan, N., Ali, I. & Mohamad Yasid, A. F. (2024). Water Architecture in Malaysia: A Case Study in Penang,1957-1985. *Journal of Sustainability Science and Management*, *19*(7), 23-38.

Ali, Jamal., Kamaruddin, R. & Mohd Saad, N. (2012). Group farming and productivity in the Muda Agricultural Development Authority of Malaysia. *Journal of Business Management and Accounting, 2*(2), 19-34.

Biswas, A. K. (1992). Indus water treaty: The negotiating process. *Water International, 17*(4), 201-209.

Chan, N. W. (2002). *Pembangunan, Pembandaran dan Peningkatan Bahaya dan Bencana Air di Malaysia: Isu, Pengurusan dan Cabaran*. Pulau Pinang: Penerbit Universiti Sains Malaysia.

Chan, N. W. (2009). Issues and challenges in water governance in Malaysia. *Journal of Environmental Health Science and Engineering (IJEHSE)*, *6*(3), 143-152.

Chan, N. W. (2012). Managing urban rivers and water quality in Malaysia for sustainable water resources. *International Journal of Water Resources Development*, *28*(2), 343-354.

Croese, S., Green, C. & Morgan, G. (2020). Localizing the sustainable development goals through the lens of urban resilience: Lessons and learnings from 100 resilient cities and Cape Town. *Sustainability, 12*(2), 550.

Fazeli Shah, M. I. (2024). *Perkembangan Sistem Bekalan Air Domestik di Selangor, 1890-1925* (Degree dissertation). Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia.

Feng, Y., Wang, W. & Liu, J. (2019). Dilemmas in and pathways to transboundary water cooperation between China and India on the Yaluzangbu-Brahmaputra River. *Water, 11*(10), 2096.

Haji Hashim, K. A. (2014). Menyelusuri sejarah pelaksanaan projek pertanian bersepadu Perlis: 1982–2000. In Prosiding Seminar Institusi Raja (SIRaj II), 131–142. *Seminar Institusi Raja (SIRaj II): Seminar Raja dan Kerajaan Perlis, 12–13 Jun 2013, Pauh Putra, Universiti Malaysia Perlis. Perlis: Universiti Malaysia Perlis*.

Hussein, H., Menga, F. & Greco, F. (2018). Monitoring transboundary water cooperation in SDG 6.5.2: How a critical hydropolitics approach can spot inequitable outcomes. *Sustainability, 10*(10), 3640.

Hussein, H. & Al-Ajarma, K. (2023). Exploring the framings of water scarcity in Palestinian textbooks. *Contemporary Levant, 8*(1), 3-15.

Ibrahim, A. Z. & Siwar, C. (2012). Kawasan pengairan Muda: Merentasi masa menyangga keselamatan makanan negara. *Jurnal Pengurusan Awam, 9*(2), 69–90.

Ilham Jurutera Sdn. Bhd. (2018). *Progress Report 3 - Program Pembangunan Water Balance bagi Pengurusan Sumber Air Negara (Fasa 1), National Water Balance Management System (NAWABS) bagi Lembangan Sungai Kedah*. Kedah: Lembaga Sumber Air Negeri Kedah.

Ismail, R. (1996). Terusan tertua di Semenanjung. *Jurnal Warisan Indera Kayangan, 8*, 1–10.

Ismail, R. (2002). Peranan Alor Dalam Masyarakat Melayu di Perlis. *Jurnal Warisan Indera Kayangan, 14*, 56-58.

Ismail, A. R. (2015). The northern region of peninsular Malaysia: Historical heritage and national identity. *Kajian Malaysia, 33*(2), 1-25.

Jamri, M. B. (2022). *Perkembangan sistem bekalan air domestik di Perlis, 1965-1987*(Degree dissertation). Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia.

Khalid, M. (1965). *Penyata Tahunan Jabatan Kerja Raya Kedah & Perlis 1965*. Kedah: Jabatan Kerja Raya Kedah & Perlis.

Kim, S. & Choi, Y. (2023). A comparative study of the adoption of public-private partnerships for water services in South Korea and Singapore. *Public Administration and Policy, 26*(2), 142-155.

Krzymowski, A. (2021). Water Diplomacy and Its Strategic Significance for Sustainable Development Goals and Global Security Architecture. *Sustainability, 13*(24), 13898.

LSANK 600-7/2/1. (n.d.). *Perbincangan isu bekalan air mentah di antara Negeri Kedah dan Negeri Perlis*. Lembaga Sumber Air Negeri Kedah.

M. Aljefri, Yasir., Fang, L., W. Hipel, K. & Madani, K. (2019). Strategic analyses of the hydropolitical conflicts surrounding the grand Ethiopian renaissance dam. *Group Decision and Negotiation, 28*, 305-340.

M. Fraser, C., M. Kalin, R., Kanjaye, M. & Uka, Z. (2020). A national border-based assessment of Malawi's transboundary aquifer units: Towards achieving sustainable development goal 6.5.2. *Journal of Hydrology: Regional Studies, 31*, 100726.

M. Mirza, N. (2008). Water, war, and peace: Linkages and scenarios in India-Pakistan relations. Heidelberg Papers in *South Asian and Comparative Politics, working paper no. 37*.

Md Yusof, A., Ali, J. & Kamaruddin, R. (2013). Kesejahteraan hidup: Kajian petani di kawasan penanaman padi di negeri Perlis. In Prosiding PERKEM VIII, ed. Yussof, I., 1177–1187. *Persidangan Kebangsaan Ekonomi Malaysia ke VIII (PERKEM VIII), 7–9 Jun 2013, KSL Hotel & Resort, Johor Bahru, Johor, Malaysia. Bangi: Fakulti Ekonomi dan Pengurusan, Universiti Kebangsaan Malaysia.*

Messrs. Steen Sehested & Partners, Vattenbyggnadsbran (VBB). (1962). *The State Government of Kedah Federation of Malaya, Report on The Development of The Alor Star Water Supply, September 1962*. Kedah: Public Work Department.

Mohammed Ali, N. (2021, March 25). *Interview with Mohammed Ali, Noorulhuda, Director of the Lembaga Sumber Air Negeri Kedah.*

Mohd Daud, M. S. A. (2024). Livestock Production in Kedah, Malaya (1909–1940): The Key to Achieving Food Security, Economic Growth, and Responsible Consumption Under the British. *Journal of International Studies, 20*(1), 53–82.

Mohd Makhtar, M. S. H. (2024). *Imperialisme Air di Kelantan* (Degree dissertation). Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia.

Mohd Noor, A. & Abdullah, M. F. (2021). Reign of Raja Syed Alwi Ibn Syed Safi Jamalullail in Perlis (1905–1943): Modernisation and socioeconomic development. *JEBAT: Malaysian Journal of History, Politics & Strategic Studies, 48*(3), 127–152.

Mujica, A., Piaggio, C., Díaz, L. R., Bussi, J., Courret, A. P. & Saito, C. H. (2021). The global water partnership-South America and the transboundary implementation of integrated water resources management (SDG Target 6.5). In *Sustainable Development Goals for Society Vol. 1: Selected topics of global relevance (pp. 171-186).* Cham: Springer International Publishing.

N. Ganesan. (1998). Malaysia-Singapore relations: Some recent developments. *Asian Affairs: An American Review, 25*(1), 21-36.

Nassar, S., Tóth, Z, N. & Vasa, L. (2023). Economic empowerment as a result of achieving SDGs with resource access: A comparative research between Gaza Strip and Hungary. *Journal of International Studies, 16*(2), 2071-8330.

Nasir. (2020, May 23). *Interview with Nasir, a 61-year-old resident of Kangar, Perlis, Malaysia*.

Norhudi'in Danu @ Danoo. (2014). Industri gula dan implikasi sosial dan ekonomi masyarakat Perlis, satu tinjauan sejarah, 1970–1990. In *Prosiding Seminar Institusi Raja (SIRaj II), 143–156. Seminar Institusi Raja (SIRaj II): Seminar Raja dan Kerajaan Perlis, 12–13 Jun 2013, Pauh Putra, Universiti Malaysia Perlis*.

Orme, M., Cuthbert, Z., Sindico, F., Gibson, J. & Bostic, R. (2015). Good transboundary water governance in the 2015 Sustainable Development Goals: a legal perspective. *Water International, 40*(7), 969-983.

PKR. W. 37/165. (n.d.). *Perjanjian Bekalan Air Mentah Di antara Kerajaan Negeri Kedah dan Negeri Perlis*.

PKR. W. 37/164. (n.d.). *Bekalan Air Perlis Utara*. Setiausaha Negeri Perlis.

PKR. W. 37. (n.d.). *Perjanjian Bekalan Air Mentah Di Antara Kerajaan Kedah Darul Aman Dengan Kerajaan Negeri Perlis (27 Februari 1988–26 Februari 1993)*.

PKR. W. 37. (n.d.). *Perjanjian Bekalan Air Mentah Untuk Kegunaan Minuman Air Bagi Perlis Utara Diambil Dari Terusan Besar Rancangan Pengaiaran Muda di Arau, 24 Mei 1994*.

PSU (K) 690/1399. (n.d.). *Perjanjian Bekalan Air Minum Bagi Perlis Utara Diambil Dari Rancangan Perairan Muda*.

Raheb, M. (Ed.). (2023). In *the Eye of the Storm: Middle Eastern Christians in the Twenty-First Century. Wipf and Stock Publishers.*

Razak, H. (2017, October 10). *Interview with Razak, H., Senior Manager of SADA Central Region.*

Rejab, F. I. (2013). *Memoir seribu riak di pantai usia*. Kuala Lumpur: ITBM.

Rodina, L. (2019). Water resilience lessons from Cape Town's water crisis. Wiley Interdisciplinary Reviews: *Water, 6*(6), 1376.

S. K. 449-1375. (n.d.). *Medical Report (Kedah & Perlis) For the Year 1955*.

Saruchera, D. & Jonathan, L. (2015). *Measuring transboundary water cooperation: learning from the past to inform the sustainable development goals*. International Water Management Institute (IWMI).

Selby, J. (2003). Dressing up domination as 'cooperation': The case of Israeli-Palestinian water relations. *Review of international studies, 29*(1), 121-138.

Serageldin, I. (2009). Water wars? A talk with Ismail Serageldin. *World Policy Journal, 26*(4), 1-2.

Shamsul Bahri, N. A. (2021). *Bekalan Air Domestik di Terengganu, 1951-1997* (Degree dissertation). Universiti Malaya, Kuala Lumpur, Malaysia.

Sim, L. L. (2021, May 1). Sg Muda a shared resource. *The Star*. https://www.thestar.com.my/news/nation/2021/05/01/sg-muda-a-shared-resource

SUK. Ps 510 SK 3. (n.d.). *Bahagian Am Bekalan Air Minum Bagi Perlis Utara*.

SUK. Ps 510 SK 3 (35). (n.d.). *Bekalan Air Minum Bagi Perlis Utara Diambil Daripada Tali Ayer Sungai Muda, Arau*.

SUK. Ps 510 SK 3 (42). (n.d.). *Bekalan Air Perairan Muda*. Setiausaha Negeri Kedah.

Ujang, Z., Ching, K. T., Md. Noh, M. N., Ramli, R. I., Aris, A., Tukiman, K., & Hamid, H. (2022). *Air dan pembetungan di Malaysia, sejarah serta perspektif*. Kementerian Alam Sekitar dan Air, Institusi Penyelidikan Air Kebangsaan Malaysia, Jabatan Perkhidmatan Pembetungan.

United Nations. (2015). *The 17 sustainable development goals*. https://sdgs.un.org/goals.

Wan Abdul Malik, W. N. A. K. (2024). *Perkembangan Industri Telur Ayam di Kedah, 1909-1941* (Degree dissertation). Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia.

Wan Ibrahim, W. K. (2022). *Perkembangan Bekalan Air Pulau Pinang, 1975-1990.* (Degree dissertation) Universiti Sains Malaysia, Penang, Malaysia.

Wan Mohamad Khairuddin Azaki, W. N. Z. & Hussain, N. (2024). Sejarah Perkembangan Sektor Penanaman Padi di Perlis, 1930-1950: Perbandingan antara Era Penjajahan British dengan Era Pendudukan Jepun. *International Journal of the Malay World and Civilisation, 12*(1), 59 – 75