



SYSTEMATIC LITERATURE REVIEW IN APPROACHING PRINCIPLES OF ENFORCEMENT OF RIVER POLLUTION CONTROL IN MALAYSIA

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ABSTRACT

Rivers have various uses including for domestic, industrial, agricultural purposes, and drinking water supply. However, unsystematic management can lead to river pollution, potentially endangering ecosystems and human habitats. In the context of Malaysia, studies on the enforcement principles of river pollution control still show a lack of understanding regarding the strategies commonly used at the local level. This study aims to fill this gap by conducting a Systematic Literature Review (SLR) on the enforcement principles of river pollution control in Malaysia. The SLR methodology follows the Reporting Standards for Systematic Evidence Syntheses (ROSES) publication standards. Three main databases, namely Scopus, Web of Science, and Google Scholar as an additional search tool are used in this research. The findings show three main themes: Compromise, collaborative relationships, and command, which are then explained into four detailed sub-themes: Negotiation, consideration, openness, and punishment. These findings suggest that the enforcement principles of river pollution control in Malaysia should allow for two main enforcement principles: The principle of conciliation enforcement and the principle of confrontation enforcement. It is important to remember that this article focuses specifically on enforcement principles within the framework of environmental law and is limited to this context.

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Introduction

A literature review is a discipline in the social sciences that plays a crucial role in advancing knowledge in science. Over the past two decades, a new field has emerged that systematically explores past studies in health and social sciences, known as the Systematic Literature Review (SLR) (Lame, 2019).

An SLR aims to identify, assess, and synthesise all empirical evidence that meets predetermined eligibility criteria to answer a given research question (Julian *et al.*, 2008). An SLR refers to a systematic literature study or a type of literature review that critically collects and analyses various research studies through a systematic process. The purpose of an SLR

is to provide a comprehensive summary of the available literature related to the research question (Juan Cruz-Benito, 2008). The primary goal of the Systematic Review (SR) approach is to mitigate bias and enhance transparency throughout the review process. This is achieved by employing explicit and systematic methods to minimise bias in the selection and inclusion of studies, assess the quality of the included studies, and provide an objective summary (Liberati *et al.*, 2009).

In the context of environmental management, research on river management is seen as crucial due to the rise of river pollution in Malaysia each year (Jabatan Alam Sekitar,

1997). However, there is still a shortage of researchers using the SLR approach to examine river control management in Malaysia. The use of three databases, namely Scopus, Web of Science, and Google Scholar is seen as aiding researchers in obtaining studies related to the enforcement principles of river pollution control. The basic search in the Scopus database allows users to enter terms into the search box and select the desired field from a dropdown list. Terms can be combined using Boolean Operators. Limits can be set for date ranges, document types, and frequency of updates. Advanced search allows for more open-ended term searches with provided examples. The Advanced Search Box should be used when combining more than two terms.

The objective of this study is to provide an SLR chart in the approach to the enforcement principles of river pollution in Malaysia. Therefore, the question arises: "What are the enforcement approaches used in river pollution control?" The findings of this study are significant in providing direction for future research in understanding the enforcement approaches in river pollution in Malaysia.

Literature Review

Environmental pollution in Malaysia has a long history. Rapid development in tin mining has led to river pollution due to wastewater. Malaysia continued its rapid industrialisation supported by foreign investment, but the result of this industrialisation is pollution due to industrial wastewater and other waste which became very apparent since the 1970s (Jabatan Alam Sekitar, 1997). The Malaysian Department of Environment issues an annual environmental quality report in compliance with Section 3 (1) (i) of the Environmental Quality Act 1974, covering water, air, noise, and pollution inventories. The water quality in Malaysia for 2006 was as follows: The main river pollutants were domestic sewage, livestock waste, run-off from farms, urban run-off, silt from land works, leachate from landfills, run-off from fields, garbage from riverside squatters, and mining waste.

Out of 146 monitored river basins, 80 were considered clean, 59 slightly polluted, and 7 polluted. This was a significant increase from 2005, when 80 river basins were clean, 51 slightly polluted, and 15 polluted. The seven polluted rivers were located in industrial areas, namely Sungai Pinang and Sungai Juru in Penang; Sungai Buloh in Selangor; and, Sungai Danga, Sungai Tebrau, Sungai Segget, and Pasir Gudang in Johor. Last year, domestic sewage and discharge from latex mills, agro-based industries, and manufacturing polluted 22 river basins. Domestic and livestock sewage waste polluted 41 river basins, while land works and land clearing caused 42 river basins to become turbid.

The main problems related to water were identified as marine pollution, river pollution, and overexploitation of resources. In terms of marine and river pollution, the primary sources were mainly from major populated areas, where sewage treatment plants had increased in 2006 by 3.2% to 9,060 from the previous year. Discharge of domestic sewage in the form of treated and partially treated sewage remained a major contributor to organic pollution.

Many natural waters are polluted due to the public's lack of concern, leading to indiscriminate dumping or industries not treating their waste. A lack of enforcement is another major challenge in ensuring the ongoing preservation of the aquatic environment. It plays a crucial role in ensuring that the public and industries comply with the laws, therefore it is possible to monitor these sources continuously (Rizal, 2006).

Methodology

This study uses descriptive analysis based on a Systematic Literature Review (SLR), involving a search of the past 10 years from 2013 to 2023, using three databases: Scopus, Web of Science, and Google Scholar. The search yielded 20 articles. The search regarding the study was classified into three categories: River management, the enforcement principle

of conflict, and the enforcement principle of peace within the river enforcement principles in Malaysia. This classification was based on references to the study titles and the descriptive analysis in this study also utilised common patterns found in the journals reviewed. Researchers used NVivo software for thematic analysis to identify enforcement principles. NVivo is a widely used qualitative data analysis tool that provides various features and benefits to researchers conducting thematic analysis. Here are some key reasons, along with references to support the importance of NVivo in qualitative research. (1) Data management: NVivo allows researchers to import and organise various types of qualitative data such as text, audio, video, and image, in a systematic and structured way (Richards, 1999). This organisation facilitates the management and access of data during thematic analysis. (2) Efficiency: NVivo offers tools for efficient data coding and extraction, reducing the time and effort required for the analysis process (Bazeley, 2007). (3) Data

exploration: Researchers can explore data using NVivo’s search and query functions, allowing them to identify patterns, relationships, and themes in their data (Bazeley, 2013).

The review process began in 2013 with the selection of the topic (environmental enforcement) and this keyword was used for the search process, as shown in Table 2. The 10-years research period, from 2013 to 2023, was chosen because these years are relevant to examining the principles used by authorities. The second keyword is enforcement principles, to explore the approaches used in controlling river pollution and the final keyword is river pollution, which is the focus of the study. All these keywords were expanded using more diverse searches to find a variety in keywords (advanced searching).

The Scopus database was selected because it is one of the largest abstract and reference databases with extensive global and regional coverage of science journals, conference

Table 1: Systematic literature review process

Steps	Process	Justification
1	Review protocol	This study is guided by the ROSES review protocol, also known as Reporting Standards for Systematic Evidence Syntheses, which is designed to conduct systematic reviews in the field of environmental management.
2	Formulate research questions	The formula used in formulating the research question is PICO, which are the three main concepts of population (population) or problem (problem), interest (interest), and context (context).
3	Systematic selection strategy	There are three processes in a systematic search, namely identification, screening, and qualification.

Table 2: Keywords and information search strategy

Databases	Keywords
Scopus	TITLE-ABS-KEY ((“ environmental enforcement*” OR “environmental compliance*” OR “ environmental policy*” OR “ environmental management*”) AND (“principles “) AND (“ river pollution” OR “environmental degradation*” OR “pollution of the environment*” OR “water quality*” OR “ water pollution*” OR “ water pollution control*” OR “water conservation*”))
Web of Science	Ts= ((“ environmental enforcement*” OR “environmental compliance*” OR “ environmental policy*” OR “ environmental management*”) AND (“principles “) AND (“ river pollution” OR “environmental degradation*” OR “pollution of the environment*” OR “water quality*” OR “ water pollution*” OR “ water pollution control*” OR “water conservation*”))

proceedings, and books. It ensures that only the highest quality data is indexed through strict content selection and reassessment by a board of content selection and independent advisers (Baas *et al.*, 2020). Subsequently, the research question was designed and formed to guide the research process. Then, a comprehensive survey of existing literature was conducted. Establishing inclusion and exclusion criteria is an important step in this process. First, this review exclusively focused on journal articles. Second, the search was limited to publications in English. Lastly, this review only covered studies conducted in Malaysia, in line with the research objective of exploring enforcement principles in controlling river pollution in Malaysia. Detailed inclusion and exclusion criteria are provided

in Table 3, forming the basis for the screening process and identification of relevant journals.

The researchers assessed and scrutinised articles carefully. Data extraction begins with reviewing abstracts, followed by a thorough examination of the full articles to determine the research methodology and the specific subject areas covered in each article.

Research Findings

A total of 147 articles were obtained from two data search databases, namely Scopus and Web of Science, using the keywords stated in Table 2. However, only 20 articles were selected using the acceptance and rejection criteria as shown in Table 3.

Table 3: Acceptance and rejection criteria

Criteria	Inclusion	Exclusion
Access	Only open access	Gold, Hybrid Gold, Bronze, Green
Type of document	Articles only	Conference papers, book chapters, reviews, books, proceedings
Country	Malaysia	Others country
Publication level	Last	Article in the newspaper
Resource type	Journal only	Conference papers, books
Language	English	Other than English
Availability	Online	Not availability
Subject	Related to environmental enforcement	Not related to environmental enforcement

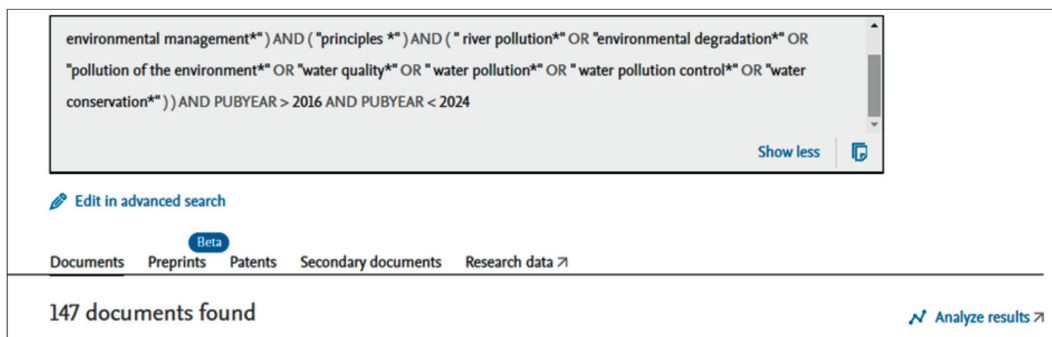


Figure 1: Website Scopus uses a variety of keywords

Background of Article Selection

From the 20 articles selected, two main themes emerged: The principle of peace and the principle of conflict. Both principles are used in resolving river pollution issues and other environmental problems. Of the 20 identified

articles, 5 were studies conducted in the United States, 4 in China, 2 in India, 2 in Australia, and 1 each in Malaysia, Indonesia, Mexico, Israel, Switzerland, the Netherlands, and the United Kingdom.

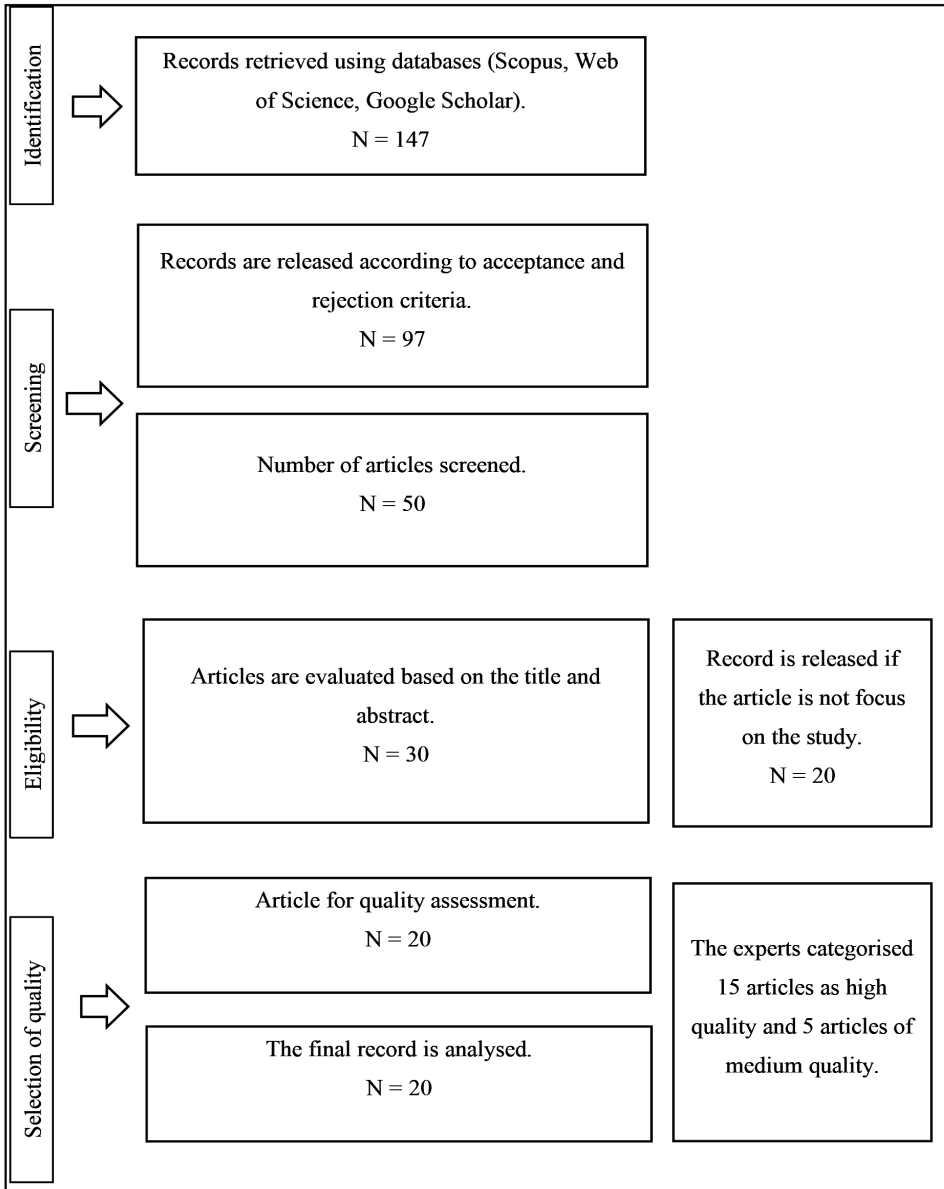


Figure 2: Formulation of research questions
 Source: Azril *et al.* (2019)

Themes and Sub-themes

This study found that the enforcement principles used by foreign countries are increasingly gaining recognition, but in Malaysia, existing legislation continues to be the main approach. For example, the study by Isabel Valenzuela Rendón (2017) expounded on the principle of peace in resolving environmental issues. Reconciliation is a proceeding where parties attempt to reach an agreement to resolve a conflict guided by one or more unbiased third parties. There are two themes formed through the principles of peace enforcement and conflict enforcement. The theme for peace includes compromise and collaborative relationships with sub-themes of negotiation, consideration, and openness. The principle of conflict enforcement also encompasses one theme and one sub-theme, which is punishment.

The principle of peace with the theme of collaborative relationships and the sub-theme of openness can be seen in the statement of the article below, where this principle is used to facilitate the resolution of environmental conflicts and can also save costs.

“In 1998, President Clinton signed into law the Environmental Policy and Conflict Resolution Act, which established the U.S. Institute for Environmental Conflict Resolution (IECR) as a programme of the Morris K. Udall Foundation (an independent federal agency created by Congress in 1992). IECR’s goals

are to resolve environmental conflicts involving federal entities and improve environmental decision-making through collaborative problem-solving, increase the capacity of other agencies to engage in ECR, and provide leadership on ECR throughout the federal government.”
(Siegel, 2007)

The approach of peace in the theme of collaborative relationships with the sub-theme of consideration can be seen in the article below, where there are several cases that do not require the use of existing laws but instead use an open approach to resolve a conflict.

“Instead of punishing the offenders, they need to be assisted. Restorative justice approach is the best solution to resolve this kind of issue. The traditional justice system as implemented in Malaysia, merely to punish the offender based on the law provided. Unlike the traditional justice system, the restorative justice gives opportunity to the accused and the victim to resolve the case out of courts based on their needs and interests. For example, the case is considered resolvable if the victim is willing to forgive the offender and accepts compensation or the offender agrees to return the stolen item to the victim. This can expedite the disposal of criminal

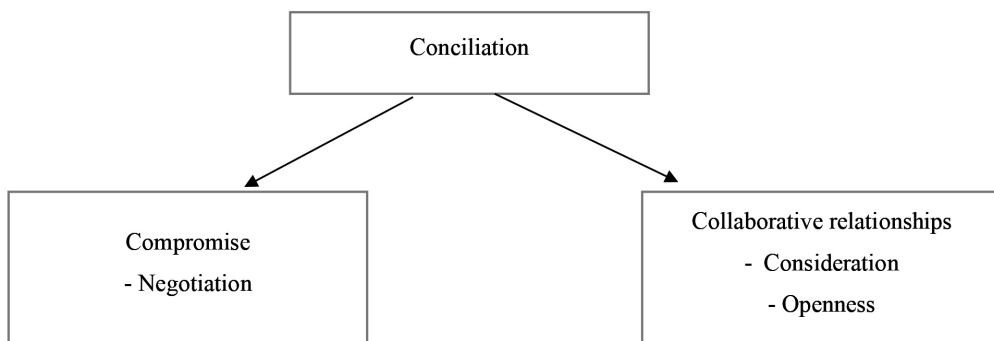


Figure 3: Themes and sub-themes of peace

cases, as well as minimise pending an appeal cases.”

(Ab Aziz et al., 2017)

The peace approach that uses the theme of compromise and the sub-theme of negotiation is clearly seen in the excerpt from the article below. Negotiation allows for the cooperation of both parties in resolving environmental issues without the formal use of law.

“Over the years, environmental enforcement in the United States has shifted from traditional, deterrence-based enforcement toward a more partnership-based, less adversarial approach that uses multiple tools to induce compliance.”

(Earnhart & Glicksman, 2015)

The theme of conflict, namely command, using the sub-theme of punishment is discussed in the article below. This statement supports the idea that imposing punishment on those who commit environmental pollution serves as a deterrent, especially when severe penalties are applied to the offenders.

“... the power of punishment can deter potential offenders, causing them to accept societal norms and refrain from breaking the law. The more severe the punishment and applied swiftly, the greater chances of its internalisation by society.”

(Seror & Portnov, 2020)

Conclusions

The primary purpose of this study was to systematically observe the enforcement principles in river control. From the findings, it was observed that most countries prefer using a peace approach over a conflict approach. This preference is due to several factors such as cost savings in trial proceedings and the ability to find quicker solutions to environmental problems. The peace approach is extensively used by the United States in resolving environmental issues, involving multiple parties, including third parties. This study is limited to examining enforcement approaches in environmental issues. Further research, emphasising various issues to observe the approaches used in those contexts is recommended.

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Conflict of Interest Statement

The researchers affirm that this study was undertaken without any personal gain, commercial incentives, or financial conflicts, and assert that they have no conflicting interests with the funding sources.

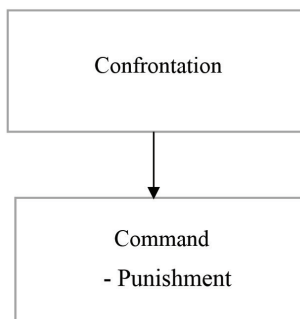


Figure 4: The conflict approach with the theme of command and the sub-theme of punishment

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