An institutional analysis of the trans-national marine waste: a case study of sludge oil in Bintan seawater, Kepulauan Riau, Indonesia

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Abstract. Sludge oil has contaminated Kepulauan Riau seawater for a long time ago, but there is no apparent policy by the government to address the problem. The sludge oil has become a critical issue when the government seeks to prevent the effects of climate change. This paper aims to fill the gap in the recent literature of environmental policy by analyzing the issue in an institutional lens. By applying case study research, this paper sheds light on the institutional arrangement of sludge oil problem in Bintan seawater, in particular, organizational design, policy, and norms. Data were gathered by interviewing a dozen of related stakeholders, observing in the three villages, and collecting secondary sources. The results argue that sludge oil is affected by the obscurity of the authority among the governments, the absence of specific policy, and the lack of soft diplomacy with Singapore’s government. This paper contributes to not only the body of knowledge but also the practical point of view by providing several policy recommendations for policymakers to address the issue.

1. Introduction
Sludge oil is the classical problem faced by the Bintan population because it has happened since the 1960s. Sludge oil refers to depositing fuel oil waste come from a ship conveying fuel in the Malaka strait. Sludge oil in Bintan is suspected by the tank-cleaning process of the foreign ships intentionally throwing the sludge before entering Singapore seawater. They prefer to release their pollution in international seawater because the tank-cleaning process provided by most of company in Singapore is costly. Because of its directly contiguous, every north wind season, it flows to Bintan, Kepulauan Riau, seawater.

Sludge oil conceives B3 (Bahan Berbahaya dan Beracun), a dangerous and poisonous waste in both its quantities and contents. According to Government Regulation No. 101 of 2014, about the management of hazardous and toxic material waste, it can bother human health in the long term. It can...
also damage the ecosystem of the sea, both direct and indirectly [1]. Sludge oil in several Bintan coastal area disturbs the activities of the people [2]. In the climate change perspective, it can potentially induce the surface of seawater in a long period. In sum, the social and economic life of the Bintan’s society is also indebted to the circumstance. Nevertheless, there is a lack of government action to address the issue. There is no significant policy released and implemented by the government to handle the case.

In this article, we attempt to seek on the institutional context of the problem of sludge oil in Bintan seawater. In this point of view, institutions are related to formal and informal rules and the process to strengthen the structure of governance [3]. This study uses the institutional analysis and development (IAD) framework developed by Ostrom [4]. In the context of policy studies, it can help us to understand the making process of collective policy formulated by considering the policy as the results of human interactions affected by a variety of contextual variables [5].

There is a limited number of studies on social and political perspectives explaining marine waste because it is still dominated by science and technology perspective. However, several scholars have put a fruitful to understand the issue from the socio-political viewpoint. For instance, Rajamanikam et al. [6] discussed the properties and efficiency of stable waste management mediated by NGOs and evaluated both the strengths and weaknesses and the possibilities and threats of this scheme in Puducherry town. Hamblin aimed to describe attention to the details of a specific environmental system, showing how current ocean dumping strategies survived almost unchanged despite an exceptional increase in environmental awareness, political intervention, and diplomatic negotiation [7].

Unfortunately, much of the study on marine waste has paid limited attention to the issue of institutional arrangement, especially using the IAD framework. To fill the gap, in this study, we utilize institutional analysis by employing the IAD framework to answer the question of why the problem of sludge oil in Bintan still exists. We propose the research question as follows: (1) what is the impact of sludge oil on Bintan society and how the government response? (2) What are the institutional features affecting sludge oil? The purpose of this research is to describe the effect of sludge oil and government response. In addition, it is also to analyze the institutional factors of sludge oil.

2. Methods

This study is a qualitative case study research, in particular, a single case study. A case studied in this research was sludge oil in Bintan. It was performed not only for understanding the research problem but also for extending the theory. In doing so, the process of the research followed the stages of case study research as recommended by Eisenhardt as follows: getting started, selecting a case, proposing instruments and guidance, entering the field, analyzing the data, enfolding literature, and reaching a new theory [8]. The data was obtained through in-depth interviews, observation, and secondary sources. An in-depth interview was conducted to the participants of this research related to the issue. To strengthen and triangulate interview data, we also observed at the three villages in Bintan, Pengudang, Trikora, and Tanjung Berakit. The informants of this research came from various backgrounds, including government officials (Environmental Office at the Kepulauan Riau Province and Bintan Regency), military and semi-military institution (Indonesian Coast Guard, Indonesian Navy), business sector (owners of the resort in Bintan), and society (communities in the village of Pengudang, Trikora, and Tanjung Berakit). Before analyzing the data, we coded the data by grouping them in a category. The data analyzed through qualitative analysis by comparing the data with theory and concept and explaining with the institutional analysis and development (IAD) framework.

3. Results and discussion

3.1. The impact of sludge oil and the government response

Sludge oil has a variety of implications for Bintan society. Because of Bintan regency relies on the tourism sector, it has destroyed Bintan’s tourism. Bintan becomes an alternative vacation for local tourists and international tourists, in particular, Singaporean tourists as well. Based on the information from several resort owners, the number of tourists decreases, especially in the north season, even though
they have reserved a hotel. The cancellation occurs because of the condition of the beach, dirty for swimming, playing, and sunburning. It has led to a disadvantage to the resorts in the Bintan area and reduces their income. Furthermore, they have paid an obligation as the tax for their business. Yet, means revenue and expenditure are not balance.

![Figure 1. Crab and stingray trapped by sludge oil in Bintan Beach](image)

This circumstance not only influences tourism but also the social existence of the society lived in Bintan coastal area. Many of them work as fishermen significantly affected by sludge oil. Sludge oil also indebts fishermen relying on the result of fishing catches. Basically, sludge oil has destroyed the ecosystem of the sea and plays a key role in killing much of the fish (see Figure 1). In some villages surrounding Berakit, the seagrass and mangrove garden, home for many fish in the water, have died because of sludge oil. Their fishnet and other equipment are also damaged by sludge oil.

Interestingly, the government still lacks the policy to address the problem. The efforts conducted by the government have not able to solve the issue so far. The central governments develop a task force to respond to the matter led by the Ministry of Environment and Forestry. It includes provincial and regency as a member of the team. The regional governments also fail in responding to the condition because they argue it is the responsibility of the central government. They refer to law about regional autonomy limiting the authority of local government to manage marine affairs. Otherwise, the central government has a large power to handle it. Moreover, it is a problem of trans-national involving between Indonesia and Singapore. The fact is supported by the statement of Bintan regent as follow:

“We have attempted an effort. We have coordinated with the Ministry of Environment and Forestry. We have submitted a piece of evidence, and so on. Yet, we need hard work from various stakeholders of this country. We are a part of this country, and accidentally Bintan perceived a sludge oil. The point is that we have done, and we solely wait for the real action from the central government” (Tribunnews.com, 04/16/2018).

Although the governments have created a task force to manage the situation, the sludge oil almost challenging to tackle. As a consequence, the hopeless society attempt to collect the sludge oil carried by streams to the beach itself. The resorts in Bintan aim to gather itself in a large number. As an illustration, a resort can collect more than ten drums per year (see Table 1). It has consequently added the burden of the resort.

| Company Name     | Amount (Oil Drum) |
|------------------|-------------------|
| PT BRC           | 12                |
| PT Banyan Tri    | 2                 |
| PT Nirwana Resort| 5                 |
| PT Lagon         | 11                |

Source: The results of data processing (2019)
3.2. The institutional context of the issue

The primary problem answered by this research is why the sludge oil in Bintan still exists? What are the institutional properties affecting this problem? By using the IAD framework, we attempt to analyze the matter. It can be illustrated in Figure 2. By using the institutional analysis, we find that it is related to such policy, regulation, norms, and tradition in the process of managing the situation. It is categorized as institutional antecedents. At the same time, it has also yielded institutional consequences for handling the condition, which is the status quo and institutional void.

![Figure 2. Institutional analysis of sludge oil in Bintan](Source: Developed from Ostrom [9] and Araral and Amri [10])

Sludge oil is affected by institutional antecedents involving international regime, polity, and disposition. Firstly, the international regime is the dimension of international law regulating international marine. After 12 miles of the seawater is an international sea in which every ship can sail without limited by national law of such country. At the moment, the vessel can prevail anything and free from regulation. As mentioned above, the ships dispose of the tailing in international seawater. As a consequence, Indonesian law cannot rope them. Secondly, the polity adjusted the process of managing the issue is extraordinarily bureaucratic and hierarchic. Lastly, the disposition of our government to solve the problem is extremely poor. It relates to the commitment and arrangement of bureaucracy to tackle the issue [11]. There is no real action and regulation to overcome the case, both central and local governments. Their attempts conducted by the government are still partially and not profoundly. The central government creates a regulation itself, and so do local government. As a consequence, the problem more complicated to be solved. Moreover, the local government still wait for central government action.

Institutional antecedents generate institutional consequences involving the status quo and institutional void. Generally, the status quo and institutional void refer to the emptiness of regulation or law to eliminate sludge oil. Status quo relates to the tendency of doing nothing or retaining the present or previous choice. Meanwhile, the institutional void is the vacuum of authority or no obvious standard
and politics in a political circumstance. The circumstances make the situation more complex and difficult to be resolved.

From the perspective of public policy, the results show that the lack of policy, in this case, is a logical consequence of institutional dimensions of the problem. The political choice of the actors significantly affected by the structure of the institution worked at the macro level. The emergence of status-quo and institutional void relates to institutional antecedents (polity, norms, and disposition). It illuminates that there is a relationship between policy and institutional design. Indeed, the actors, especially central and local governments, also utilize the absence of regulation to justify their less effort.

3.3. Theoretical and practical implications
In theoretical terms, this study confirms the IAD theory arguing that institutional features are the critical points of the social world. As assumed by institutional scholars, a policy is greatly affected by institutional features worked at the upper [12]. The findings of this study also indicate the absence of government action is induced by the institutional properties, such as norms, polity, and disposition. The results also find institutional consequences upon the problem, including the status quo and institutional void. Therefore, the results have extended the theory of neo-institutionalism and the IAD framework by offering institutional antecedents and institutional consequences. In the methodological view, the study opens the further analysis of the concept of institutional antecedents and consequences. Because the IAD framework performed in this study is a qualitative analysis, further studies can apply a quantitative approach to examine the variable and the relationships, consequence to such environmental policy performance. It is worth being completed to broaden and robust institutionalism perspective.

![Figure 3. A format of institutional transformation of Bintan's sludge oil governance](image)

This research also has several implications for the policymaker. The results of this study show the weak structural arrangements between national and subnational governments toward the case. It is affected by the bureaucratic structure among the layers of government. The relationship among the actors shows the hierarchy, top-down, and command configuration. Hence, we more non-hierarchy and flat government to respond to the issue. Theoretically, it is called as multi-level governance—a model involving many actors in an equal position to solve the common problem [13]. The relations between central and local governments should equal so they can communicate, coordinate, and share the information as a partner. In addition, because it is a trans-national waste, the central government should vigorously lead the responsibility to use soft diplomacy with the Singaporean government. As suggested by Sebayang, the government, particularly the central government, should activate policy advocacy to
the Singaporean government [2]. Our government can bring the issue in bilateral discussion between Indonesia and Singapore to obtain mutual agreement. Finally, the practical recommendations for the policymaker can be drawn, as seen in Figure 3.

4. Conclusion
Our attempt to investigate the case of sludge oil in Bintan by using the IAD framework has to entail us an inference of the influence of institutional arrangement on this issue. Sludge oil is one of the pollutions defiling seawater. Their contamination of seawater can contribute to climate change in the long term. The results indicate that institutional antecedents and consequences are the reasons why the problem still exists. The findings shape our knowledge on not only institutional perspective but also a guide for the government in transforming the governance of trans-national marine waste.

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