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# WATER RIGHTS DILEMMA IN INDONESIA: COASE THEOREM AND GAME THEORY APPROACH

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**ABSTRACT**

**Introduction/Main Objectives:** This paper aims to explain Indonesia's water rights dilemma and propose a potential solution to solve it using the Coasian and game theory approaches. **Background Problems:** Developing a mechanism that supports the citizens (and farmers) in the area surrounding water plants, maintains firm productivity, builds social cohesion, and promotes environmental improvement remains an ongoing concern. **Novelty:** This study utilizes the Coasian and game theory approaches to solve Indonesia's water rights dilemma. **Research Methods:** This research employs a game theory simulation representing the Coasian strategy in handling externalities. **Findings/Results:** The implementation of Coasian bargaining might be promising in solving the water rights dilemma in Indonesia. The necessary condition is high farmer commitment during the bargaining process, and the sufficient condition is a reduction of transaction costs. **Conclusion:** The strategies in lowering transaction costs can be accomplished by establishing an independent multidisciplinary research team, involving a government element as a mediatory body, and creating an advisory firm. This research team would aim to close the gap in institutional deficiency. The government would have a significant role in reducing the transaction cost by defining, enforcing, and transferring property rights. Lastly, the advisory firm would help to focus all business activities, operationalize agreements, and conduct monitoring.

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## INTRODUCTION

Potable water[1] scarcity has occurred around the world. WHO and UNICEF (2017) estimate that 844 million people have an insufficient potable water supply to meet their daily needs. Most developing countries still focus on increasing the coverage of clean water access (non-potable water). It has not fully adopted the agenda of rising water quality from clean to universal potable water access.

The scarcity and inefficiency due to government failure has led to water privatization. This approach is expected to create efficiency, good governance, and equality in water access. The term privatization refers to private sector involvement in public goods provision. In the 1990s, this scheme emerged in developing countries in Africa, Asia, and Latin America (Budds & McGranahan, 2003).

However, the market-based solution has drawbacks. This system might induce an efficient market, but it cannot be denied that water is not a commodity; it is one of the shared resources (Bakker, 2007). The private sector, which tends to be profit-oriented, will create other problems such as inequality of access due to rising prices, water quality degradation due to bad governance, externality due to massive exploitation, or even corruption (Johnson et al., 2016; McDonald, 2018). It has also triggered water rights conflicts in the Middle East and Africa (Barnaby, 2009). Johnson et al. (2016) state that the water privatization problem has also become a criminological issue. Therefore, privatization might not guarantee an improvement in water access, particularly for developing countries.

The water access problems also occur in Indonesia. One of them is related to the water rights conflict caused by the massive exploitation of water for business purposes. The increasing demand for high-quality potable water, and government failure to provide it, has driven enormous expansion in the bottled water industry. It has also been supported by old regulations (Water Resource Law, No 7/2004)[2]. However, this privatization might violate the new water usage priority rule (Water Resource Law, No 17/2019)[3].

Massive exploitation of water might disturb other parties or create negative externalities. For example, in the 2000s, there were massive protests by society, NGOs, and legal aid against one of the multinational bottled-water firms in several regions. The protesters feared that exploitation would lead to land subsidence, groundwater depletion, and contamination in the surrounded or upstream areas. These conditions might imply a higher cost of accessing water for residents or farmers.

Therefore, this paper aims to explain the conflict over water rights in Indonesia and propose a potential solution using the Coasian approach. Coase (1960) argued that, where ther are clear property rights, zero or low transaction costs, and no asymmetric information, the externalities or property rights conflicts could be solved by voluntary agreement among parties.

This concept is suitable for the Indonesian context because other ideas, such as the environmental tax, have not enacted yet. However, the Coasian strategy might face some constraints

[1] Potable water is water used for drinking, cooking, food preparation, and personal hygiene (Cohen & Ray, 2018)

[2] In 2015, this law was canceled by the Constitutional Court because the articles violate human rights. Then, to accommodate the vacuum of law, Water Law Number 11/1974 was re-enacted.

[3] In 2019, the Water Resource Law was re-issued through Law Number 17/2019. The law regulates the scale of priority in water usage. It has been harmonized with the human rights enforcement. The first priority is for basic need. Then it is followed by agricultural need. Water usage for business becomes last priority. Besides that, the involvement of private sector in water resource management is very limited.

due to high transaction costs and asymmetric information in developing countries. Therefore, I will also consider the lessons learned from the real example of the successful use of the Coasian strategy in another country, such as the Vittel case in France. Besides that, the quality of institutions in developing countries is likely not as good as in developed countries. This condition might lead to rising transaction costs. Hence, this study provides a preliminary insight into whether efficient bargaining will occur when there are deficiencies in an institutional setting. To the best of the author's knowledge, this topic is rarely discussed in the literature, especially combining the Coasian approach and game theory to solve water rights conflicts in developing countries.

In doing so, this paper will be organized into four sections. The second section briefly explains the literature review and conceptual framework. The third section describes the detail of the case and the research method. Then the fourth section discusses the simulation result and how to implement the Coasian strategy more practically. Finally, the last section provides the concluding remarks.

## LITERATURE REVIEW

### 1. Literature Review

Studies that discuss the Coase Theorem in solving externalities or property rights conflicts vary from the theoretical to the experimental and practical. Many researchers doubt the feasibility of the Coase Theorem in solving externalities in the real world. For example, Dixit & Olson (2000) theoretically prove that the efficient equilibrium is not robust if transaction costs (even at a low level) exist. This condition occurs when there are many participants, such as in public goods provision. Not all people will join the voluntary agreement. Hence, the bargaining process may fail to reach efficient conditions. In public goods literature, this issue is called the free-rider problem.

Another theoretical study, Hahnel & Sheeran (2009), presents a sharply critical review of the Coase Theorem. They argue that, even if all Coase Theorem conditions are satisfied and there are only two parties, the bargaining process may fail to reach an efficient outcome when each party considers the bargaining "reputation". Besides that, in line with Dixit & Olson (2000), Hahnel & Sheeran (2009) also argue that large participants' presence, asymmetric information, and inaccurate compensation measurement will reduce the probability of a successful bargaining process. Furthermore, in their experimental study, Galiani et al. (2014) find another factor that needs to be considered in Coase Theorem implementation which is that commitment is crucial in conducting the bargaining process and reaching an efficient outcome. More commitment among parties leads to immense social benefit.

In the case study setup, Abildtrup et al. (2012) investigated the attempt to establish voluntary cultivation contracts between Danish waterworks and Danish farmers. They interviewed each party with various compensation schemes to assess whether all parties had an incentive to conduct voluntary agreements. The existence of asymmetric information, non-competitive legal right market, non-maximizing behavior, and transaction cost led to voluntary contract failure. Abildtrup et al. (2012) find that Danish farmers use their private information to gain more compensation; meanwhile, the Danish waterworks will not enter the agreement if there is a lower cost than the demanded compensation farmers.

By contrast, Perrot-Maitre (2006) and Depres et al. (2008) describe a success story about the implementation of the Coase Theorem in solving the externalities problem between

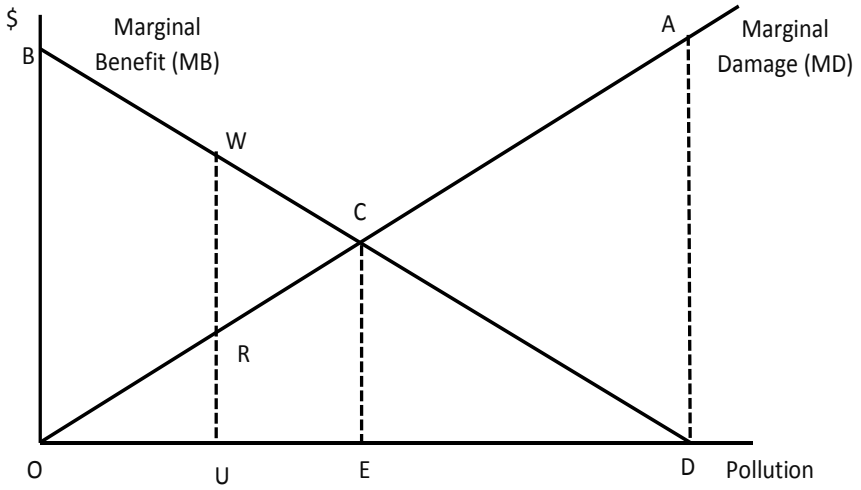
Vittel as bottled water firms and farmers in France. The Coase Theorem constraints such as asymmetric information, transaction costs, free riders, and irrational behavior were successfully treated by establishing a multidisciplinary action research team. This team independently examined all needed information for bargaining, calculated the compensation scheme, and conducted an in-depth discussion with each party.

## 2. Conceptual Framework

Pigou (1932) argue that government needs to intervene in the market by imposing subsidy or tax if there is too little "good" product (subsidy policy) or too much "bad" product (tax). Meanwhile, Coase (1960) argued that this Pigouvian concept is not satisfactory. In the world of low or zero transaction costs, each rational party will lead to voluntary agreement and conduct a bargaining process to reach an efficient economic outcome. Hence, the government's intervention may not be needed in such a situation.

In Figure 1, the horizontal axis measures the intensity of the externality level that the firm produces. For simplicity, pollution is used as a sample of externality. The vertical axis measures the polluter's marginal benefit (MB) and pollutee's marginal damage (MD) in dollars. The BCD line is the polluter's marginal benefit curve that is assumed to be downward sloping, while the OCA line is the pollutee's marginal damage curve that is supposed to be upward sloping. If polluters have the right to pollute, the pollutee has an incentive to pay the polluter to reduce the emission. When the polluter increases production to point D, the marginal benefit will be zero. Hence, the polluter also has an incentive to reduce emissions and receive the payment from the pollutee. This transaction will continue up to the optimal condition (OE) that provides mutual benefit for both. If the pollutee has the right to live without pollution, the polluter has an incentive to pay the pollutee, for example, as much as ORU to produce OU and benefit OBWR. As long as the MD lies below MB, the polluter has the incentive to increase the production until its optimal level in point C or OE. A socially efficient level of emissions calls the emission level at OE.

**Figure 1.** Standard Representation of the Coase Theorem




*Source: Hahnel & Sheeran (2009) with some adjustments*

This illustration is applied in situations where there is no asymmetric information[4]. The property rights also have to be clearly defined: whether the property belongs to the firm or the farmers. Lastly, zero or low transaction costs are necessary to incentivize both parties in the bargaining process. As long as the transaction costs of bargaining is lower than the cost of other alternative solutions, the incentive to undertake the bargaining process remains. A condition where there are clear property rights might be feasible by identifying related regulations. However, the situation of asymmetric information and zero transaction cost may be relatively difficult to achieve. Besides that, the graphical illustration above is also simplified and depicts only two parties.

Dixit & Olson (2000) provided a critical argument to counter this problem. They argue that a sizeable number of participants will lead to higher transaction costs. It will be more challenging to coordinate many participants. To present this, Dixit & Olson (2000) argued that the Coase Theorem requires two-stage games: the first stage is a non-cooperative game to identify whether all participants will participate, and the second game is a cooperative game involving the Coasian bargaining process among the parties that choose to participate. Assuming the cooperative game (as proposed by Coasian) in the first stage is too strong, Dixit & Olson (2000) found that repeated two-stage game mechanisms will not create an efficient outcome. In terms of public-good provision, zero or low waiting costs incentivize participants to become free riders at every stage.

[4] Asymmetric information is when one party engaged in an economic transaction has better information about the good or service traded than the other party (Rosen & Gayer, 2008)

## METHOD, DATA (SIMULATION), AND ANALYSIS

This paper uses a two-stage game in analyzing the feasibility of the Coasian strategy to examine water rights conflict in Indonesia. However, the details of the analysis may differ from Dixit & Olson (2000) due to the different contexts. The possibility of a cooperation game in the first stage may be higher in the Indonesian context due to the identical historical and cultural background. Furthermore, this paper also examines whether the equilibrium in Coasian bargaining sustains over time. The details of the case, simulation, and result will be explained in the next section.

### 1. The Case: Water Right Conflict in Indonesia

In Indonesia, the water provided by PDAM (municipally-owned water companies) is non-potable. Water supplied by private or communal wells in urban areas might also be polluted and not meet the drinking water standard. The effort to get more drinkable water by drilling the aquifer may not be financially and economically feasible for all individuals. High-quality groundwater may also not be found in all regions. These conditions have led to growth in the bottled water industry from local firms to a multinational firms. However, this paper only focuses on the exploitation of water conducted by global firms due to its enormous effect on economic activities.

The water commercialization issue emerged in the 2000s. It started from the massive protest from society, activists, NGOs, and legal aid that asked for the termination of one of Indonesia's multinational bottled-water firms. Sukabumi (West Java) and Klaten (Central Java) are the two regions that experienced the negative effect of water exploitation (Ananda, 2019). The massive exploitation led to land subsidence,

groundwater depletion, and contamination in surrounding or upstream areas. This condition implied higher costs for accessing water and cultivating the land, especially for farmers. This phenomenon encouraged other regions to reject the expansion of the firm's plant, such as in Padarincang (Banten), Karangasem (Bali), Jombang (East Java), and Bandar Lampung (Ananda, 2019; BERITASATU, 2010; Hapsari, 2013; Lestari, 2017; Tempo.co, 2013).

Many companies exploit water for business purposes in Indonesia. The bottled-water industry has emerged due to the high demand for high-quality potable water. At the industrial scale, the case of bottled water might be more complicated. To simplify the analysis without eliminating the substance, I will simulate a water rights conflict between one multinational firm and farmers. The farmers are assumed to be large in number, but an association coordinates them. The following section will present details about context, assumptions, and the scheme.

## 2. Simulation Scheme and Result Analysis

It assumed that there is one firm and many "identical farmers" joined in one association. The simulation will be conducted in two scenarios: a zero or low transaction cost scenario and an intermediate or high transaction cost scenario. The compensation scheme is based on farmers' opportunity loss in farming activities or the loss of income due to water exploitation.

The firm payoff is based on the production level simplified by plant profitability. No plant implies zero profit (strategy A), one plant creates a yield of 200 (strategy B), and two plants generate 350 (strategy C). Meanwhile, the farmer's payoff is based on farming activities simplified by the amount of land. No land implies zero income (strategy X), one unit of land creates a gain of 50 (strategy Y), and two units of land generate 80 (strategy Z). This payoff scheme simplifies the decreasing marginal profit concept that the production cost (input) might not drive the profit linearly. This example also adopts the analysis of Ruffin & Anderson (1996).

### *First Scenario: Zero or Low Transaction Cost*

In this scenario, farmers have the right to farm without the disturbance of water exploitation. It is also assumed that there is no asymmetric information and the property rights is clearly defined. The value of the compensation scheme in this scenario can be easily measured. Furthermore, it is assumed that one plant addition will damage the farmer's income by 20 per unit of land. The simulation of the Coasian approach is conducted in a two-stage game. The first stage identifies the farmer's decision to participate (IN) or not (OUT). The second stage is the Coasian bargaining game between the firm and the participants that choose IN.

This two-stage game will be solved by backward induction. Hence, the second stage will be analyzed first. Before the bargaining process, we will first check whether there is any Nash Equilibrium in a non-cooperative game at the second stage. This step is crucial to know why the bargaining process in the Coase Theorem will be voluntarily undertaken.

According to Figure 2, when a firm uses one plant while the farmer uses one land, the firm has to pay the farmer 20 due to the damage from plant production; when the firm operates two plants, the payment is 40. In this case, a farmer's income does not change, and they will always play Z as the dominant strategy. The Nash Equilibrium is $\{C, Z\}$, but this Nash is not socially efficient (Pareto-Efficient) because the total payoff is less than is $\{C, Y\}$. Then, how to make it socially efficient? The firm has to bargain with the farmers by offering 31 (for example), and then the farmer might have an

incentive to reduce their cultivation from two units of lands to only one. With this setup, both parties will experience Pareto improvement if the equilibrium is $\{C, Y\}$. The firm's profit remains increasing from 270 to 279 (310-31), and farmers' income increases from 80 to 81.

This bargaining equilibrium is then backwardly inducted to the first stage. In the first stage, there are two choices: participate (IN) or not participate (OUT). In this case, rational farmers (whether in association or not) choose IN because they will get a more significant income. Staying OUT implies that the firm utilizes two plants and the farmer uses two units of land. There is no additional compensation for a farmer because there is no bargaining process. The payoff will remain (80, 270) (see Figure 3). This simulation result aligns with Coase's argumentation about an efficient outcome that might remain even in many participants.

This game context is different from Dixit & Olson (2000) who employed public goods provision in simulating the Coase Theorem implementation. There is a free-rider problem with the public goods issue due to the non-excludable characteristic. Hence, the free-rider player is incentivized to keep OUT of the agreement because they will receive the same benefit as other players. In contrast, the farmer in this water-rights case has no incentive to choose the OUT of the bargaining process. If he takes the OUT strategy, his payoff will be lower.

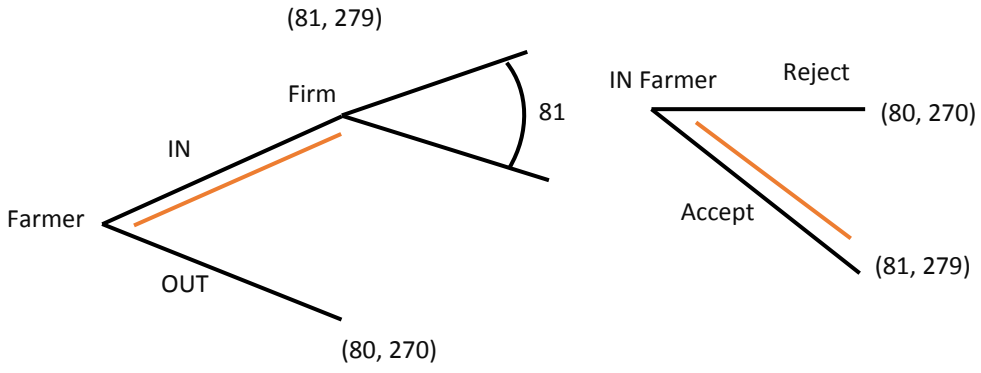
Nevertheless, another game needs to be considered if we assume that the farmers did not agree from the start. This game reflects how people build an agreement (a social contract issue) known as a stag-hunt game. This game is inspired by a story from Rousseau in *A Discourse on Inequality*. The game scheme is as follows.

**Figure 2**. Normal Form of Non-cooperative Game in the Second Stage

| | | *Farmer* | | | | | |
|---|---|---|---|---|---|---|---|
| | | X (0 land) | | Y (1 land) | | Z (2 lands) | |
| *Firm* | A (0 plant) | 0 | 0 | 0 | 50 | 0 | 80 |
| | B (1 plant) | 200 | 0 | 180 | 50 | 160 | 80 |
| | C (2 plants) | 350 | 0 | 310 | 50 | 270 | 80 |

*Source: Author's simulation and Ruffin & Anderson (1996)*

**Figure 3**. Two-Stage Game Tree for the Bargaining Process




*Source: Author's illustration*

**Figure 4.** Water Right Conflict Game (for the Farmers)

| | IN | OUT |
|---|---|---|
| IN | 81,81 | 80,80 |
| OUT | 80,80 | 80,80 |

*Source: Author's simulation*

Strategy profile $\{IN, IN\}$ with payoff (81) is obtained from Coasian bargaining in the second stage if all the farmers commit to entering the bargaining process, while another strategy profiles $\{(IN, OUT); (OUT, IN); (OUT, OUT)\}$ is the condition when not all the farmers conduct the bargaining process. This game assumes that any deviation of $IN$ strategy (e.g. a farmer who does not participate) will fail the bargaining process. However, this assumption might be too strong. It can be relaxed by setting up the minimum number of $IN$ participants who must be satisfied to conduct successful bargaining. This condition essentially indicates that farmers' commitment is becoming crucial in building social contracts among them (Galiani et al., 2014).

Based on the various game schemes, it can be summed up that the commitment to building social contracts among farmers is also prominent. This argument is reasonable because the farmer needs to develop a solid alliance to succeed in the voluntary bargaining process. However, the next question is whether both parties also have an incentive to deviate from the agreement. Will the contract be sustained? From the farmer's perspective, there is relatively little incentive to back out because the payoff from bargaining is the largest[5]. Meanwhile, from the firm's perspective, there is an incentive to back out the contract because, if the firm no longer extends the agreement, it will get a larger profit of 350 (the firm also ignores the penalty of 20 for the farmer).

There are two alternative schemes if the firm deviates from the contract. The scheme can be formulated as follows.

**Figure 5.** Infinite Repeated Game Scenarios (Firm Deviates)

| Scheme 1: (high risk to deviate/aggressive farmer) After deviation, farmers claim the cessation of plants, so the firm's payoff is 0 in the time after deviation | | | | |
|---|---|---|---|---|
| | t | t+1 | t+2 | t+... |
| Commit | 279 | 279 | 279 | … |
| Deviate | 350 | 0 | 0 | … |
| Delta* | 0,2 | | | |

| Scheme 2: (low-intermediate risk to deviate/less aggressive) back to the agreement but with higher compensation in the time after deviation | | | | |
|---|---|---|---|---|
| | t | t+1 | t+2 | t+... |
| Commit | 279 | 279 | 279 | … |
| Deviate | 350 | 271 | 271 | … |
| Delta* | 0,9 | | | |

Note: * Delta is level of patience. It defines the level of how patient the firm to commit the contract

*Source: Author's calculation*

[5] This condition might be different when the farmers are more aggressive. They can ask for more compensation by claiming the cessation from the firm. But, when the re-bargaining process is still in the range of bargainable value (in this case between 30 to 40), the contract remains sustainable. More compensation that exceeds the range will lead to the failure of bargaining process. Hence, the deviation from the contract is likely more tends to be undertaken by firm than the farmers.

Figure 6 implies that the contract's sustainability depends on two things in the long run. First is farmers' aggressivity, which the strong alliance or commitment might represent. The second one is the firm's commitment, particularly in the case of the less aggressive farmer. Overall, the contract is more likely to be sustained over time when the farmer is belligerent. It is too risky for the firm to deviate.

Nevertheless, when the farmer is less aggressive, deviating is not too risky. Hence, it implies that the firm needs to be very patient (delta 0.9) to keep the contract sustained over time. This finding shows that the solidity of the farmer alliance might be more important for keeping the agreement sustained over time.

### *Second Scenario: Intermediate-High Transaction Cost*

Transaction costs in developing countries are likely higher than the developed countries. The risk of asymmetric information increases due to institutional deficiency issues. Besides that, the enforcement of property rights might be weak. These shortages lead to the higher transaction costs that induce the failure of Coasian bargaining.

This scenario assumes that intermediate or higher transaction costs will represent all disadvantageous characteristics of developing countries. To conduct the bargaining process, the firm and farmer have to spend additional costs (coordination and legal costs). These coss reduce the firm's profit and the farmer's income. The range of extra income that the firm can offer is between 30 and 40. Hence, the value "on the table" is 10 (bargainable income compensation). If both parties' transaction costs equal or exceed 10, the bargaining process might fail. However, if the cost is less than 10, the bargaining process remains. In the no transaction costs design, the bargaining process implies 279 in profit for the firm and 81 for farmers. Then, if we assume that the transaction cost is 8 for a firm and 0.5 for farmers, the benefit will be 278 for the firm and 80.5 for the farmer. By this setup, the incentive to conduct bargaining remains. However, if the total transaction cost is 10 for the firm and 2 for the farmer (> 10 in whole), the incentive for bargaining will disappear.

The existence of intermediate or high transaction costs is one constraint in implementing the Coase Theorem (Abildtrup et al., 2012; Dixit & Olson, 2000; Hahnel & Sheeran, 2009). Hence, the effort to reduce transaction costs in developing countries is crucial. These costs might be high in Indonesia due to institutional deficiency issues. However, it does not mean that it is not feasible to implement the Coase Theorem. Using the lesson learned from the Vittel case in France, controlling the transaction costs is possible. How to do it will be deeply discussed in the next section.

## 3. Dealing with Transaction Cost

With the no transaction cost assumption, Coase Theorem's feasibility in solving the conflict over water rights depends on the strength of the farmer alliance, or, as Galiani et al. (2014) stated, the level of commitment. However, where there are intermediate or high transaction costs, the feasibility of the Coasian strategy depends on how both parties reduce transactional cost from asymmetric information and unclear property rights. Depres et al. (2008) documented several lessons learned from the Vittel case, mainly related to the transaction cost issue, which can be considered a critical success of the Coasian implementation.

Vittel was a distinguished mineral water firm in France that tried to internalize the externalities of water pollution in their springs. Water pollution came from intensive and chemical-based farming activity. Hence, the firm offered

the farmers $230 per hectare per year for seven years. This compensation package induced a diversion of farming methods from intensive to more environmentally-oriented agriculture (Depres et al., 2008). The firm also provided other benefits, such as technical assistance and product innovation, to improve the farming activities.

In this case, the water-rights seems to be attached to the firm. Meanwhile, the water-rights tends to be owned by the farmer in the Indonesian context. However, according to the Coasian principle, this difference is not a problem as long as the property rights are clearly defined. Several lessons were learned that might be relevant to the Indonesian context, which are as follows.

### *The Formation of the Independent Research Team*

In 1989, Vittel undertook a collaboration with the French National Agronomic Institute (Institut National de la Recherche Agronomique – INRA) to establish a multidisciplinary research team called 'Agriculture-Environnement-Vittel' (AGREV). Essentially, this team was responsible for several things: 1) understanding the farming activities; 2) identifying and testing the practices necessary to control the quality of water; 3) identifying incentives necessary for farmers to change intensive farming to more environmentally-oriented farming; 4) engaging in close communication and collaboration with farmers (Perrot-Maitre, 2006). Besides INRA, another government element is also involved in this team. The government's involvement has a significant role in decreasing the costs of defining, enforcing, and transferring property rights.

To develop a compensation package, this team has to identify the farmers' characteristics and assess the scale of the impact in terms of the area or people. The compensation scheme might be more complicated than the simulation. Hence, this team needs to propose various compensation packages aligned with each farmer group's characteristic and financially feasible to the firm. They divide the farmers into four categories based on land ownership, demographical data, and farming methods. This identification predicts farmers' preferences and estimates the compensation packages for different groups.

In the Indonesian context, an institution like INRA can be replaced by an independent multidisciplinary research team consisting of experts such as academicians, environmental activists, and the government. This team might need to be initiated by the firm. More or less, its responsibilities are identical to INRA. By conducting professional measurements in the compensation scheme, the risk of asymmetric information and valuation disputes might decrease. The government element has an essential role in defining, enforcing, and transferring property rights between parties[6]. This effort leads to transparent allocation of property rights and transaction cost reduction.

Perrot-Maitre (2006) and Depres et al. (2008) stated that this team helps deal with technical activities and develops social binding with the farmers. This social approach leads to the conducive relationship between the firm and farmers. It is also proven that more understanding among parties will support the bargaining process.

One may state that establishing an independent team is also part of the transaction

[6] Based on Water Resource Law Number 17/2019, the priority scale of water usage is as follows: first is basic need, the second one is agriculture, and the next is other needs such as business activities. Hence, the firm may become the party that has weaker property right than farmer. The government have to properly define this property right rank among parties and the consequences of this stipulation.

cost. However, there is also a higher risk if the firm does nothing, mainly when the farmer aggressively asks for the termination of operations. This phenomenon has occurred in Indonesia. Hence, this condition provides an incentive to the firm, at least, to avoid the higher cost incurred by doing nothing or by direct bargaining. Another solution, such as taking legal action, is too risky because, based on Water Resource Law Number 17/2019, the firm has weaker property rights than the farmer.

### *Environmental Issue: Ecosystem Service Loss*

Jaffee & case (2018) highlighted that the extraction of groundwater has a hydrological and ecological impact. In some areas, it may be impossible to conduct water recycling. Therefore, this extraction causes aquifer depletion and water contamination. In France, Vittel collaborates with farmers to conduct more environmentally-oriented farming. This cooperation enhances water quality throughout the watershed, not only in the spring area. In the Indonesian context, educating the farmers to avoid harmful cultivation has been implemented. This program can complement the Coase Theorem strategy as a part of the compensation package. The research team might also need to calculate the loss in ecosystem services and propose an environment recovery program to the firm.

### *Advisory Firm*

Vittel has established Agrivair as an advisory firm to manage all business activities with the farmers. This advisory firm helps focus on the operational activities related to the execution of agreements. In Indonesia, the firm has also created an "advisory firm" through *Koperasi* (a firm's subsidiary) to facilitate its social and environmental programs in the Indonesian context. This movement becomes a good starting point to support the Coasian strategy.

## CONCLUSION AND SUGGESTION

Benjamin F Franklin stated that "when the well is dry, we know the worth of water". This statement represents the ironic condition of water allocation around the world. The privatization of the bottled water industries might benefit the demand for high-quality drinking water, but it might also raise a problem. High water exploitation in business activities leads to conflics over property rights. Hence, this externality needs to be solved with a win-win solution. The implementation of Coasian bargaining in Indonesia might be promising. The necessary condition is high farmer commitment in conducting the bargaining process.

Meanwhile, lowering the transaction costs is sufficient. Using the lesson learned from the Vittel case, the strategy to reduce the transaction costs is to establish an independent multidisciplinary research team and involve the government as a mediatory body. This team aims to close the gap in institutional deficiency. The government has a significant role in reducing the transaction cost by defining, enforcing, and transferring property rights. Lastly, the advisory firm helps to focus all business activities, operationalize the agreement, and conduct monitoring.

Finally, this paper has three limitations that need to be considered in future study. First, the payoff simulation does not consider the the firm's other benefits for the community, such as creating employment. This condition might affect the bargaining position between firms and farmers. Second, this study cannot cover the complexities of the compensation scheme and farmer characteristics. Third, the first stage game does not identify a free-rider problem.

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