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Bumpy Road to Understanding Transaction Cost and Fisheries Co-Management

Achmad Rizal, Lantun Paradhita Dewanti, Izza M. Apriliani, Heti Herawati

Socio-Economic Fisheries Studies Center, Faculty of Fishery and Marine Science,
Universitas Padjadjaran, Jl. Raya Bandung – Sumedang Km 21 Jatinangor,
45363 Sumedang, Indonesia

*E-mail address: achmad.rizal@unpad.ac.id

ABSTRACT

The traditional approach for managing the fisheries is the acquiring of property rights over the fishery through legislation by the state. The state then parcels out rights and establishes rules (regulations) of use for the fishers. The state regulates the resource. The conventional literature in resource economics provide some insights into how common property resources such as fisheries, can be managed in a sustainable manner. Common property regimes, such as collective resource management systems, develop when a group of individuals are highly dependent on a resource (s) and when the availability of the resource (s) is uncertain or limited. There is a need to empirically evaluate the nature of the transaction costs involved in fisheries co-management institutions as a basis for defending a move away from the more centralised form of fisheries management institutions. The discussion presented in this paper will serve as a basis for further operationalization of the categories of transaction costs and for empirical case study analysis.

Keyword: fisheries resources, property rights, transaction cost, co-management

1. INTRODUCTION

The search for sustainable, efficient and equitable ways for managing fisheries has been a long and difficult one. The traditional approach for managing the fisheries is the acquiring of

property rights over the fishery through legislation by the state. The state then parcels out rights and establishes rules (regulations) of use for the fishers. The state regulates the resource [1, 2].

The outcome of such an approach has been to reduce greatly the capacity of local fishing communities to manage coastal resources and provides a minimal role for the fishers to participate in the management of the resource. This has often resulted in antagonism between government and fishers. It has made it difficult for government fisheries agencies to communicate to fishers the need for and benefit of management of fisheries resources and for fishers to communicate their needs to government and to fully participate in management. The increased difficulties faced by central authorities in preventing resource depletion despite the regulations in place has caused resource managers as well as scholars, to look more closely at both the need for fisher participation and the role of institutional arrangements (rights and rules) in fisheries management [3, 4].

The current interest in co-management of fisheries as an alternative to the heavily centralised management of fisheries is an example of a worldwide change in the way fisheries management is being approached, at least in the current decade. One of the functions of co-management systems is the shifting of control, administration, and enforcement from the central authorities to the fishing community. This reduction in authority and responsibility by the central agencies is alleged to result in co-management being a more economically efficient institutional arrangement for managing the fisheries [5].

This paper will highlight some of the transaction costs that may either increase or decrease the total costs of managing fisheries under a co-management system. It is believed that co-management, as an institutional arrangement for managing fisheries resources, will effectively address some of the problems of fishery overexploitation; dissipation and redistribution of resource rents; limited fisher participation and conflicts among the different groups of resource users.

Co-management is expected to lead to improved resource use outcomes as measured by economic efficiency, equity and biological sustainability. An implied assumption here is that the transaction costs of co-management institutions are equal to or lower than centralised government-based fisheries management systems. This is a critical policy question as governments evaluate the resources provided for fisheries management and the benefits obtained.

The problem, however, is that it is rarely possible to know, a priori, whether the transaction costs of centralised government managed fisheries institutions are higher or lower than co-managed institutions. The objective in this paper is to explore the elements of transactions costs in co-managed fisheries and built an agenda for empirical research in this important area. To facilitate the exposition, it is appropriate at this juncture to establish a few fundamental definitions.

2. THEORY FOUNDATION OF FISHERIES CO-MANAGEMENT

An examination of the co-management literature clearly shows that precise definitions of co-management are hard to come by. This is partly due to the numerous functions of what constitutes fisheries management. The extent to which individual or a combination of functions of management, such as planning, control and allocation of rights, are shared by the state and fishers will reflect the extent of co-management that may exist in a given fishery [6].

The common definition of co-management is *where* government *fisheries* agencies and fishers share authority and responsibility for resource management functions. Governments may delegate *authority and responsibility* for regulating the fishery to the fishers thus formally recognizing rights and rules which *are established and enforced* by fishers themselves. A part of the regulatory authority is transferred from the government to local resource users/community or fisher's organizations. Fisher's therefore not only participate in the decision-making process, but also have the authority to make and implement regulatory decisions on their own [6-8].

Several elements are involved in fisheries co-management. There is a hierarchy of fisheries co-management arrangements ranging from those in which the fishers are consulted by the government before regulations are introduced to those in which the fishers design, implement and enforce laws and regulations with advice from the government. The amount of responsibility and/or authority that the state and various local levels have will differ and depend upon country and site-specific conditions. Determining what kind and how much responsibility and/or authority should be allocated to local levels is, however, a political decision [5-9].

In short, co-management is a middle course between state-level control in fisheries management for efficiency and equity, and local-level control for self-governance, self-regulation and active participation. Co-management can serve as a mechanism for both fisheries management and community and economic development by promoting participation of fishers and the community in actively solving problems and addressing their needs.

The conventional literature in resource economics provide some insights into how common property resources *such as fisheries*, can be managed in a sustainable manner. Common property regimes, such as collective resource management systems, develop when a group of individuals are highly dependent on a resource (s) and when the availability of the resource (s) is uncertain or limited [10, 11]. If the resource problem is repeatedly experienced, such as low or no catch, and if it exists within a single community of users, the fishers are likely to develop a collective institutional arrangement to deal with the problem.

Institutional arrangements are sets of property rights that fishers possess in relation to their fishing grounds, and the rules that define what actions they can take in utilizing their fishing grounds. In the face of uncertainty in resource availability, group members are willing to trade-off some benefit from individual use of the resource, for the collective assurance that the resource will be used in a more equitable and sustainable manner [10-13].

Institutions, through rules, provide incentives for the group members to take certain actions to achieve the desired outcome. The development of institutional arrangements require an investment of time by the members of the community. Coordination and information activities are initial aspects of building institutions [14].

The transaction process of developing institutions will have costs. These include the transaction costs of: (1) gaining information about the resource and what users are doing with it; (2) reaching agreements with others in the group with respect to its use; and (3) enforcing agreements that have been reached. For common property regimes, these costs are part of the collective decision-making process. In the case of fisheries resources the institutional arrangements for common property management is often a heavily centralised command and control type of government-based management system. Such a system often fails to *recognize* traditional community resource management regimes [15-17].

By and large, all fisheries management functions and purposes worldwide can be broadly classified into seven categories [15, 18-20].

They are:

- 1) data gathering and analysis - for understanding the state of the resource as the basis for sound decisions;
- 2) logistical harvesting decisions, such as licensing, timing, location, and vessels or gear restrictions - to prevent over-exploitation, allow sustainable yield, and so prevent undue interception of shared stocks;
- 3) harvest allocation decisions among individuals within local groups, among several local groups or gear types, and among local and non-local groups - to allow equitable access;
- 4) protection from habitat or water quality damage by other water resource users - to preserve the health of resources;
- 5) enforcement of regulation or practices guiding harvesting logistics, allocation, and resource protection;
- 6) enhancement and long-term planning; and
- 7) broad policy decision-making. In essence all these functions aim to allocate fisheries resources among users and resources over time.

To perform these functions, the agency concerned with fishery management will undoubtedly incur substantial costs. These costs of creating and maintaining such arrangements could easily sum to millions of dollars in taxpayers' money.

While some of these activities tend to be seasonal in nature or periodically carried out, others are performed almost on a daily basis. It therefore requires a huge amount of resources (money, people, equipment) to perform these activities systematically and on a sustained basis. To reduce dependencies on federal funds to carry out these functions, alternatives must be found.

Cost-sharing strategies between both the state and the resource users appear to be both economically viable and politically palatable. One such strategy to reduce the ever-increasing government expenditure on resource management is through the fishery co-management option. A rather comprehensive fisheries co-management system seeks to perform some of the functions or activities outlined above to achieve its benefits through a more appropriate, more efficient and a more equitable fisheries resource management. An important factor that has not, however, been explored in the *fisheries* co-management literature is the integral involvement of transaction costs *in institutional and organizational arrangements*. In essence, institutions, which are a set of rights and rules of behaviour for the use of resources [14, 15, 21-23] arise out of the need to internalize externalities.

In fisheries the externalities arise out of the common property and depletable nature of the resource. Societies choose the best structure available for accommodating the externality given their historical development. Both market and non-market institutions develop to handle the externalities, but all forms of institutions incur transaction costs to some degree. In theory, markets for accommodating externality problems will naturally arise if transaction costs are sufficiently low [12, 13, 24].

The theoretical framework of the fisheries co-management model looks very attractive to resource managers and this idea is now a popular agenda in many fisheries meetings and conferences.

However, besides the fear of losing authority or part of it on the part of fisheries administrators, a question which arises is why is co-management not a very common institutional arrangement for fisheries resource management? We argue that co-management is

more difficult to implement in the fisheries because of the complexity of fisheries and aquatic resource systems, the social and cultural structures of fishing communities, and the independent nature of the fishers.

The informational complexity and informational uncertainty [15-17], “bounded rationality”) in fisheries co-management are exactly what Oliver Williamson [16, 17] defines as transaction costs. It is the transaction costs involved in this resource management regime that slows down the implementation of co-management in fisheries worldwide.

Understanding the components of transaction costs in a fisheries co-management regime is therefore imperative for at least two reasons. First, there is a paucity of literature on the transaction cost in the fisheries co-management system; and second, there is a need to assess outcomes and the costs of achieving the outcomes from the new system. In fisheries co-management, there is a shift of costs from society to collective groups and individuals and also a shift in the magnitude of transaction costs of operating a different management system. By identifying the major components of transaction costs in this management system, fisheries managers can have a clearer idea of the total costs involved in implementing the management option. In doing so, the net benefits of the management option can then be accurately evaluated and compared with the existing management system.

2. 1. Transaction costs economics

Transaction costs economics was first discussed in the economic literature by [10] in his seminal paper “*The Nature of the Firm*”. Coase proposed that the decision whether to have a transaction within a firm or in the market place will be determined by transaction costs [10]. He suggested that the form of control (the firm or the market) chosen would tend to be the one with the lowest transaction costs. This early *analysis* eventually spawned a great deal of theoretical work known as transaction cost economics.

This theory suggests, if given a choice, individuals will choose the set of institutions, contracts or transactions that will minimize the (transaction) costs of doing business. Coase went on to say that a contract that offers the lowest transaction costs will tend to be used the most to govern a set of actions. However, as [12, 13] points out, having lower transaction cost is a necessary rather than a sufficient condition for adoption. It is therefore appropriate to examine transaction costs when evaluating the potential of new institutions as alternatives to existing institutions.

Transactions costs are difficult to define precisely. A basic premise of economics is that individuals choose from options they have available to them to maximize their utility. [16] makes the point that it is this opportunistic behaviour when combined with incomplete contracts that leads to transaction costs.

Defines transaction costs to include the following [15]:

- i) the cost of obtaining information,
- ii) establishing ones bargaining position, bargaining and arriving at a group decision and
- iii) enforcing the decision made.

Separates transaction costs into [11, 17, 18]:

- i) search and information costs,
- ii) bargaining and decision costs, and
- iii) policing and enforcement costs.

According to him these costs "represent resource losses due to lack of information". However, there are other definitions provided in a number of overlapping frameworks including the literature on property-rights, the transaction-cost approach, and the new institutional economics.

Defines transaction cost as "the cost of transacting, which consists of the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights and policing and enforcing agreements" [23, 24]. Other closely related definitions of transaction costs are also proposed by [9, 11, 17].

Some of the important elements of transaction costs often discussed in the literature include [12]:

- 1) **The Cost of Negotiating a Contract.** The cost of negotiating a contract deals with the cost of collecting relevant information and negotiating the terms of an agreement.
- 2) **Opportunistic behaviour of the Agents (Moral Hazard).** When an agent is involved in the production decision the contract may create an incentive to maximize something other than the net return from production. The resulting loss in efficiency is a cost of transacting in this manner.
- 3) **Monitoring and Enforcement Costs.** If an agent is not a residual claimant it will often be in an agent's interest to break the contract. The principle has to expand some effort to determine whether the agent is adhering to the terms of the contract. Thus monitoring activity requires resources that are part of the cost of the transaction.
- 4) **Signalling Costs.** Often a principle will have contract provisions that will reward specific behaviour of the agent if this observed behaviour is correlated with the desired behaviour of the agent. Creating a positive signal may require resources in excess of the optimal resource use. The cost of providing this positive signal is referred to as Signalling cost.
- 5) **Risk Averse behaviour.** Usually a risk averse individuals without complete insurance may use input at sub-optimal level. The resulting loss in efficiency due to risk averse actions are part of transaction costs.
- 6) **Reduced Investment Due to Tenure Insecurity.** A related set of costs is the reduced incentive to invest in capital assets specific to the contract. The resulting inefficiency is a transaction cost resulting from insecure tenure.
- 7) **Restricted Economies of Size and Scope.** If in any particular contract or tenure that restrict the size and capital investment, this results in a loss in efficiency and should be included as a transaction costs. According to the transaction cost economics framework, the institutions with the lowest transaction costs will tend to displace those with higher cost. Before one evaluates the *transaction costs of a fisheries co-management system vis-a-vis the centralized management system*, one needs to identify some of the components of the transaction costs involved in instituting this new concept of co-management. This process is envisaged for future empirical work that will address the viability of the proposed fisheries co-management *system*.

2. 2. Transaction costs in fisheries co-management

When multiple individuals are involved in environments where complex activities must be coordinated across space and over time, they may attempt to reduce the substantial uncertainties they face through various forms of implicit or explicit agreements. These contracts

involve costly activities expended in the processes of achieving agreements before and continuing to coordinate activities after an initial agreement is reached in an uncertain environment.

Identifies the costs associated with contracting activities as ex ante and ex post transaction costs [17]. Using the generic of the Williamson's transaction cost economics, the transaction costs in fisheries co-management can therefore be broadly categorized into three major cost items: (1) information costs; (2) collective fisheries decision-making costs; and (3) collective operational costs. The first two categories are ex ante transaction cost while the latter is defined as the ex post transaction cost. This breakdown is largely based on anecdotal information and the schematic flow diagram of the transaction costs in fisheries co-management. The transaction costs arise from the problems of information, coordination and control that stem primarily from the fact that fisheries resource management decisions involve multiple actors with different interest in long term, interdependent and uncertain processes.

The key ingredient in the success of a public program is information. Similarly, the success of fisheries co-management programs also depends on the amount and types of information available to both decision-makers and participants or resource users. Decision-makers concerned with fisheries resource management may have different types of information available to them; likewise, resource users have a variety of information available to them.

The information available to those two groups may vary and may not be shared, and the information available to resource users may not be shared among themselves. The kind of information we are referring to include, for example, size of fish stocks, the number of stakeholders and preferences about allocation of the resource among stakeholders and other interested parties and over time. Once this information is acquired, it has to be sorted and organised in such a manner for it to be meaningful to all users.

The information search and acquisition costs are costly and they are closely related to strategic and coordination costs. Since participants in fisheries co-management systems face asymmetrical information problems, they may behave strategically or opportunistically to maximize their own welfare in providing information to management authorities and thus aim to avoid social and economic responsibilities altogether. This strategic and opportunistic behaviour, coupled with difficulties stakeholders incur in acquiring and integrating information used in reaching decisions, are one of the components of the transaction costs in fisheries co-management.

One of the many challenges facing the fisheries co-management regime is how to get the fishers to reach some level of consensus on certain contract or collective actions with regards to resource management. The collective fisheries decision-making costs include dealing with fisher's problems, participating in meetings, making policies, *making* rules and regulations, communicating decisions to the community, and coordinating tasks with local and central fisheries authorities. As individual fishers have different sets of information and interests which seldom match, it will take a special effort just to bring them together, let alone reach an agreement on some uncertain processes [25, 26].

Even if they agree to meet, some actors will behave strategically or opportunistically so that they obtain maximum benefits from the proposed project. In the event that they manage to draw up "acceptable" rules and regulations to all resource users, they still have to communicate the decisions to their peers and some form of coordinating mechanism with local and central fisheries authorities has to be planned. Coordinating actions of diverse actors requires that considerable time and other resources be devoted to the process of gaining agreement,

monitoring activities and evaluating performance. These are some of the transaction costs in the collective fisheries decision-making process.

The third major component of transaction costs is the collective fisheries operations costs. This component can in fact form the strongest counter-argument for the centralized resource management system. It is argued that if the resource is to be managed by both the central agency and the community, the operations costs can be quite substantial to ensure that rules are followed, conflicts among users are resolved and the reward system from the new institution is fair and equitable. There is validity to this reasoning. Operations cost can be quite significant in carrying out a management regime. Operations cost comes in three forms:

- a) Monitoring, enforcement and compliance costs,
- b) Resource maintenance costs, and
- c) Resource distribution cost

Monitoring, enforcement and compliance costs include the monitoring of fisheries rules, monitoring the fishing areas, catch record management, fishing inputs, conflict management and resolutions and sanctions for rule violations. In resource maintenance costs, the transaction costs result from fishing right protection, stock enhancement activities and resource assessment work to ensure that the stocks in the area are not over-exploited.

Resource distribution costs include the cost of distributing the fishing rights to the appropriate stakeholders and costs of managing the participation of the stakeholders and administering the rights to the fishery [27, 28].

Monitoring, enforcement and compliance costs in fisheries management alone can be substantial. As an example, in Indonesia, where a centralised fisheries management system is in place, the monitoring, enforcement and compliance costs as measured by government expenditure increased from about 5 percent of total fisheries development expenditure during the 1976-1980 period to about 16 percent during the 1986-1990 period. This amounts to about IDR 7.753 (US\$3.10) million during 1976-1980 period and IDR 41.564 (US\$16.63) million during the 1986-1990 period. For the 1991-1995 period a sum of IDR 80.797 (US\$32.32) million was allocated for monitoring, enforcement and compliance expenditure for the Indonesian Marine and Fisheries Ministry [28-30].

It may be argued that under a co-management system the enforcement and compliance costs may be lower as there may be increased compliance realised from the increased legitimacy of the regulations and allocation procedures adopted by the community. But enforcement and monitoring requires substantial resources and there are likely to be economies of scale from the use of monitoring and enforcement vessels by a larger fishing community as represented by the centralised management system.

The co-management system therefore represents a shift in the burden of financing the costs of governance of common property resources from the central or public purse to *collective* groups or individuals involved in managing the resource. This shift in the costs from the central authorities to user groups has implication for overall management costs and the capability of user groups to bear such costs. The benefits from such a shift are obviously improved compliance and lower management costs. It is the ability of user groups, especially in over exploited fisheries, to bear the cost of governance from the minimal rents from such fisheries that is often questionable.

In many fisheries systems the costs of maintaining and enhancing the resource through material interventions involves large investments and long gestation periods to realise the

benefits. These costs are often incurred by national agencies in most countries. A move towards co-management systems will call for the community to spend resources for such maintenance and replenishment interventions. Most communities will be reluctant to incur such costs as the benefits may often accrue to future generations and others since fish are migratory resources. Such investments are important for long term sustainability of the resources and may not have been considered in co-managed systems.

New institutions often require members to sacrifice time and effort to bring people together for decision making and enforcement. Since the benefits of such institutions flow to all members irrespective of participation, the free rider and public goods nature of institutions can pose problems for co-managed institutions. Unless some form of benefits is readily available to members who sacrifice their time, the durability of the institutions will be at stake. In addition, the equity and fairness aspects of the allocation of the benefits and costs of running the institutions will be affected. In overexploited fisheries the resource rents might be so low that fishers may not be able to maintain the institution.

The costs mentioned above may not be readily apparent but their identification is crucial in determining the sustainability of fisheries co-management systems. In centrally based management systems the funds for operating and maintaining the system most often come from the general tax revenue and the element of cross subsidies from other sectors of the economy may be in effect. In co-managed systems the costs often have to be borne by the resource users and the community and obtaining subsidies from another sector may be difficult. A thorough examination of the often hidden transactions costs is necessary in an assessment of the feasibility of co-management as an alternative fisheries management approach.

3. DISCUSSION

An approach to measuring transaction costs of fisheries co-management systems is first to look at a co-management systems in terms of processes in both a static and dynamic sense. By process we mean looking at the details of the activities involved in the development of the co-management system over time.

The activities involved in the process include, in a simplified sense:

- 1) recognition of need for new management regime, discussion and meetings, information collection, organizing and leadership, defining the management objectives and strategies, and development of institutional arrangements;
- 2) community education and adjustment of institutional arrangements; and
- 3) monitoring and enforcement, maintaining institutional arrangements, adjudicating conflicts, sanctioning violators and adjustments in institutional arrangements. Some of these activities are one time, i.e, recognition, while others are continuous, i.e. information collection or adjustment.

The sum of each of these activities will be the total transaction costs of initiating, implementing and maintaining the co-management system. The process can be viewed in terms of a time frame in which we could look at three basic stages. The first stage is the stage of devising, creating, obtaining information and decision making. The second stage could be the implementing stage which involves dissemination of information and explanation of how the community system will work. The third stage will be the maintaining, monitoring, enforcement,

adjudicating and sanctioning activities, as well as the costs of making decisions within the current set of rules and the costs of making decisions to revise the rules themselves as conditions in the fishery changes.

In general, a co-management system can be evaluated in a two-step procedure - the static and dynamic analysis. The first step is a static analysis whereby costs and benefits are quantified on activities involved in stage 3 which represents the current stage (time t).

This is the stage in many of the on-going fisheries co-management initiatives worldwide. The second step involves the dynamic analysis of costs and benefits in stages 1 and 2 which involves backtracking to time 0. Time 0 refers to the initiation of the process involved in getting the system off the ground. It, in some sense, is a dynamic process. The combined static and dynamic analyses will provide a "complete" picture of the transaction costs involved in the whole process of co-management.

As suggested by [10, 11] a standard cost-benefit framework can be used to evaluate the net benefits and net costs of a co-management system. The measurement process can be carried out as follows. The first step is qualification, that is the identification of the amount of resources or time used in each process activity. The second step is quantification; that is, the valuation of the time or resource. However there are some issues with regard to how the time spent should be valued. For example questions may arise as to whether all of the time spent in meetings by the stakeholders are necessarily for managing the resource. Time could be spent for producing more than one outcome, and fishers would also consider meetings as a consumption good that, for example, enhances their sharing of fellowship or exchange of gossip or ingesting of coffee, as suggested by [13, 14, 17, 18].

This points to the fact that we may have to develop a more workable method for allocating time spent simultaneously on more than one production process. There are obviously many challenges in the development of appropriate measurement conventions and the appropriate wage rates that can be used for valuing time spend in organising, implementing and maintaining a fisheries co-management system.

4. CONCLUSIONS

In welfare analysis the Pareto criterion is used to judge whether one approach to overcoming an externality is better than another. As stated by [13] once transaction costs are admitted, different property rules give rise to different welfare frontiers. Each of the property rules will also exact its own unique magnitude and distribution of transaction costs. Implementation of different property rules, liability rules, regulations, incentives, customs and behavioral standards, and other non-market devices, therefore, represent separate institutions with distinct economic consequences. The inherent transaction costs of each specification of each institution will produce an institutionally specific production possibility frontier and utility possibility frontier.

Co-management of fisheries involves the implementation of different property rules, liability rules, regulations, incentives for resource extraction and distribution. As discussed earlier, the institution of these property rules involve transactions costs that will alter the production possibility frontier and the challenge is to determine if the frontier will be moved in or out as the result of the implementation of the new institutional arrangement. There is a need to empirically evaluate the nature of the transaction costs involved in fisheries co-management

institutions as a basis for defending a move away from the more centralised form of fisheries management institutions. The discussion presented in this paper will serve as a basis for further operationalization of the three categories of transaction costs and for empirical case study analysis.

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